17.42
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WEAPONS OF MASS DESTRUCTION AND WORLD POLITICS

I. WEAPONS OF MASS DESTRUCTION: WHAT THEY ARE

Three types of weapons are grouped together (perhaps unwisely) under the rubric of "Weapons of Mass Destruction" (WMD). Of these, nuclear and biological weapons are potentially far more powerful than chemical weapons.

Biological and chemical weapons have been outlawed by international treaties. The United States dropped its offensive bioweapons program in 1969.

Key background questions:

A. **Would the world be better off if nuclear weapons had never been invented? Would it be better off if nuclear weapons were now abolished**?

B. **Would the world be better off if biological weapons had never been invented? Would it be better off if biological weapons were now abolished?**

C. **If nuclear and biological weapons cannot be abolished or controlled, what should we now do?**

II. THE TECHNICAL EFFECTS OF THE NUCLEAR REVOLUTION

Technologies rarely have decisive effects on war or politics; more often technology is bent to serve politics or military doctrine. Nuclear weapons are an exception. They overwhelm politics and doctrine.

Five cascading technical effects flow from the nuclear revolution. These cascade further into political effects listed below in Sections IV and V. The technical effects are:

A. Effect #1: hydrogen bombs offer an increase of **six orders of magnitude** over the power of the TNT explosives used in World War II. The atomic bomb = x 1,000 increase on TNT; the hydrogen bomb = x 1,000 increase on atomic bombs.

B. Effect #2: due to 'A', the destructiveness of nuclear weapons, the "cost exchange ratio" vastly favors retaliators over attackers who try to disarm them. Nuclear weapons pack tremendous explosive power in devices that are cheap, light, easily hidden, protected, and delivered. Hence destroying nuclear weapons is very hard, protecting and delivering them very easy.

C. Effect #3: due to 'B'--a cost-exchange ratio that heavily favors retaliators over attackers--a relationship of MAD ("Mutual Assured Destruction") develops between major powers. Both can destroy the other's society even after absorbing an all-out counterforce attack by the other. In short, both have a "second strike countervalue capability."

In the Cold War both the US and USSR sought to avert MAD, preferring instead to deny the other a second-strike countervalue capability, but they could not escape it. Technology overrode their desires.

Today China and Russia may not have a second strike countervalue capability against the U.S. This reflects their lack of effort. They could get a second-strike countervalue capability if they pursued one.

D. Effect #4: "flat of the curve" dynamics. One of MAD's special characteristics is the "flat of the curve": beyond a certain point, the capacity to inflict damage on the other society, or to prevent damage to one's own, is inelastic to the size and capability of one's own force or one's opponent's force. Capabilities are absolute. Implication: MAD prevents preventive war.

E. Effect #5: the "multiplier effect." The efficiency with which one side must strike the other's forces in order to leave the other unable to inflict unacceptable damage in retaliation increases sharply as the arsenals on both sides grow. Even an inefficient strike can reduce the retaliation to acceptable levels if both arsenals are very small; even a very efficient strike (e.g., 99 percent effective) can fail to reduce retaliation to acceptable levels if both arsenals are very large. Hence first strikes are least thinkable when arsenals are large, suggesting the argument that "the more weapons both sides have, the less the risk of their use." Implication: the India-Pakistan nuclear competition is more dangerous than was the U.S.-Soviet competition.

F. And a political effect: Most scholars argue that MAD is a defensive revolution in warfare. Conquest is very hard in a MAD world. But see below for qualifications to this argument.

III. ALTERNATE NUCLEAR DOCTRINES: COUNTERVALUE vs. COUNTERFORCE STRATEGIES

A. Countervalue vs. Counterforce Nuclear Strategies
Nuclear weapons present states with two basic nuclear doctrines: counterforce and countervalue.

>> **Countervalue**: the enemy society is targeted. Political aims are achieved by threatening to punish

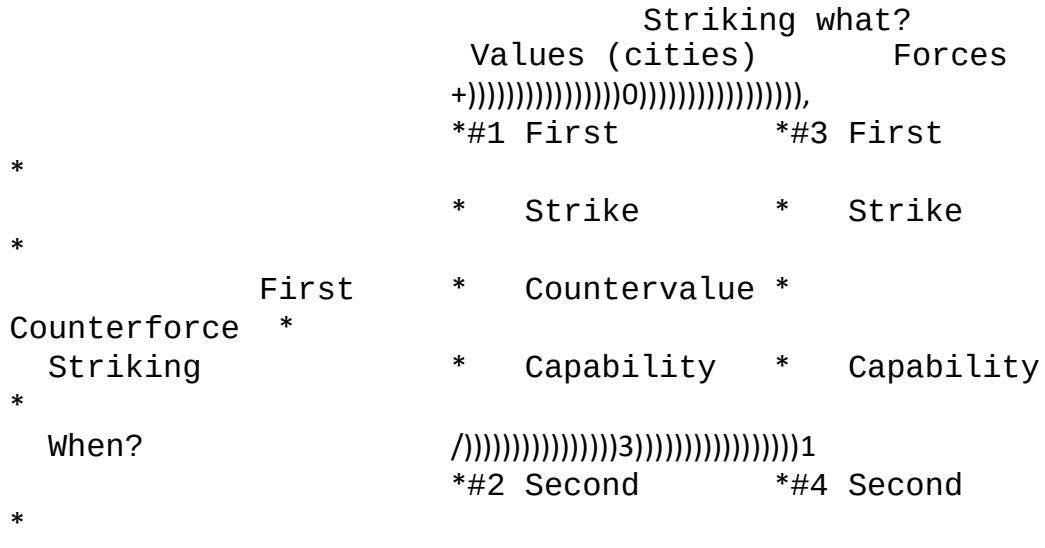
the adversary by destroying its population and industry.

>> **Counterforce**: the enemy nuclear forces are targeted. Political aims are achieved by threatening to disarm the adversary--that is, to remove its capacity to inflict punishment on oneself.

Since forces can be used first or second, we have a crude universe of four possible nuclear capabilities:

1. First-strike countervalue capability: the capacity to launch a first strike that inflicts unacceptable damage on the adversary's society.
   This capability is very easy to build, for reasons noted above in Section I, but is quite useless.
2. Second-strike countervalue capability: the capacity to absorb an all-out counterforce first strike and inflict unacceptable damage on the adversary's society in retaliation.
   This capability is easy to build for reasons noted above in Section I.
3. First-strike counterforce: the capacity to launch a first strike that removes the adversary's capacity to inflict unacceptable damage on oneself in retaliation.
   This capability is very hard or impossible to build for reasons noted above in Section I.
4. Second-strike counterforce capability: the capacity to absorb an all-out counterforce first strike and mount a counterforce counterattack that leaves the attacker's forces unable to inflict unacceptable further damage on one's own society.
   This capability is even harder to build than a first-strike counterforce capability.

These four capabilities can be displayed in a 2x2 table:



Second * Strike * Strike *
Countervalue *
Counterforce *
Capability * Capability *

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Cold War-era debates over US nuclear doctrine focused on whether the US should be content with capability #2 (second strike countervalue capability) or should also strive for #3 (first strike counterforce capability) against the USSR. More recently, many analysts suggest that the U.S. should deny even capability #1 (first strike countervalue capability) to states like North Korea and Iran.

B. Countervalue vs. Counterforce Strategic Nuclear Weapons: What Are they?

> **Second-strike countervalue nuclear forces** can survive a surprise attack and retaliate against the attacker's cities or other "value" targets.

An example of a pure second-strike countervalue weapon is the U.S. Polaris ballistic missile submarine fleet of the 1960-1980s era. Polaris submarines could hide from attack in the vast ocean and their missiles could strike an attacker's cities, but these missiles lacked the accuracy to destroy another state's hardened forces.

> **First-strike counterforce nuclear forces** can be used to destroy an opponent's nuclear forces in a first strike.

An example of a pure first-strike counterforce weapon in a U.S. vs. Russia or China context today is a highly accurate intercontinental ballistic missile (ICBM) based in a vulnerable soft silo. It could be used to launch a surprise attack on another state's nuclear forces, but it could not survive an attack, so it could not retaliate against the attacker's cities.

Another first-strike counterforce weapons system is area national missile defenses (NMD) deployed to protect cities. The role of NMD in a first strike would be to knock down warheads missed by the first strike that are retaliating against the attacker's cities. In this role NMD is the defensive half of a first strike system and thus is essentially offensive despite its defensive appearance.

(NMD configured to defend ICBM fields or other nuclear forces rather than cities is part of a second-strike countervalue capability, not a first strike system, since it protects the national nuclear deterrent

from first strike and does not protect cities from retaliatory attack.)

IV. THE POLITICAL EFFECTS OF THE NUCLEAR REVOLUTION IF NUCLEAR ACTORS ARE DETERRABLE. THAT IS, ONLY STATES (NOT TERRORISTS OR OTHER NON-STATE ACTORS) POSSESS NUCLEAR WEAPONS; AND THESE STATES ARE CASUALTY-SENSITIVE, CLEAR-PERCEIVING, NOT HYPER-AGGRESSIVE, CANNOT TRANSFER NUCLEAR WEAPONS ANONYMOUSLY, AND CAN BUILD SECURE ARSENALS

Assume that nuclear actors have six attributes: (1) They have a clear return address--a territory they control. (That is, they are states, not non-state actors). (2) They are casualty-sensitive. (3) They do not value conquest or the destruction of others unduly, e.g., they do not value it more than others value freedom. (4) Their perceptions of their surroundings are fairly accurate--they have some capacity to assess their neighbors' capabilities, and to correctly anticipate how these neighbors will respond to their conduct. (5) They are unable to use or transfer nuclear weapons anonymously. (6) They have the industrial capacity to build large, secure arsenals. If so, the nuclear revolution has seven positive consequences:

A. First-strike advantages disappear, hence "crisis instability" and preemptive war also disappear. Flat-of-the-curve dynamics (see 'IID') erase first-strike payoffs. Even if a country can shift the force ratio in its favor by striking first, it merely moves itself and its enemy laterally on the flat of the curve. The relative ability to bounce rubble changes, but nothing else.

B. "Windows" of opportunity and vulnerability disappear, hence temptation to preventive war also disappears. See previous point, 'IV A': windows disappear for similar flat-of-the curve reasons.

C. Resources are less cumulative. Flat-of-the-curve dynamics diminish the additivity of resources; even large shifts in the control of industrial resources, or in control of advantageous geographic positions, won't move either power off the flat of the curve. Also, nuclear forces can be delivered over great distances, hence don't require proximity to function, so bases matter little. (Though this was less true earlier, e.g., in 1962.)

D. Less false optimism. Nuclear weapons create very certain physical results, eliminating miscalculations of relative capability. They still leave room for miscalculations of relative will, however.

E. **Defense-dominance**, hence fewer wars for security and wars of opportunity. The nuclear revolution strengthens defender-states and weakens aggressor-states, since

conflicts in a MAD world become contests of will, and defenders nearly always win contests of will. Under MAD each side can harm the other without limit. Disputes are then settled in favor of the side that cares more about the issue, and hence is willing to run a greater risk or pay a higher price to prevail. Contests of will are nearly always won by defenders, since defenders value freedom more than aggressors value conquests. If so, conquest among great powers is impossible unless one power acquires a first-strike counterforce capability against the other. A first-strike counterforce capability is essentially unreachable between powers of remotely comparable resources, hence conquest is also impossible among them.

> Qualification: nuclear weapons are less useful for defending one's allies than for defending oneself. States nearly always have greater resolve than states that seek to conquer them, so defenders can credibly threaten to use nuclear weapons to defend themselves. It is less clear that states have greater resolve than aggressors who seek to conquer their allies. The problem of "extended deterrence" therefore arises: it is hard to credibly threaten to use one's nuclear weapons to defend allies. This leaves allies less protected.

F. Limited war. Logic suggests that causes of war and intense war are similar. If so, logic suggests that the nuclear revolution may--counter-intuitively--promote limited war as well as less war.

G. Slower arms racing.

H. On the other hand ... "Nuclear weapons raise states' anxiety about preserving the credibility of threats. Threats to use nukes are often suicidal, hence incredible. Hence states are drawn to use conventional forces to persuade others that they will use nuclear forces, e.g., as the U.S. did in Korea and Vietnam."

V. THE POLITICAL EFFECTS OF THE NUCLEAR REVOLUTION IF NUCLEAR ACTORS ARE NOT DETERRABLE--THAT IS, THEY HAVE NO RETURN ADDRESS, OR ARE NOT CASUALTY-SENSITIVE OR CLEAR-PERCEIVING, ARE HYPER-AGGRESSIVE, CAN TRANSFER NUCLEAR WEAPONS ANONYMOUSLY, AND CANNOT BUILD SECURE ARSENALS

If we relax the six assumptions outlined at the front of in Section IV then the benefits of MAD evaporate and the dark face of MAD appears.

A. If the first five assumptions are relaxed, the benefits of the nuclear revolution are lost, even reversed. Defenders no longer have the clear upper hand. The security dilemma reappears.

Moreover a new danger emerges. States now must face the possibility of being physically destroyed--by a crazed, non-deterrable adversary--even if they cannot be conquered. This may impel them to take drastic steps if a nuclear-armed neighbor seems to be taking leave of its senses. If the crazed neighbor seems certain to attack eventually, killing hundreds of millions, a preemptive strike against it becomes sensible, even though the neighbor's retaliation will kill tens of millions. (In short, a "survival dilemma" arises, parallel to the "security dilemma." "The measures each state must take to ensure its physical survival threaten the sovereignty and physical survival of other states.") States also face the risk of anonymous use by rogue states or movements. Such rogues are less deterred because they can hope that their responsibility will not be discovered; or, if they are non-state actors (such as terrorist groups) because they have no territory to hold hostage.

We saw the first conflicts of this kind in the post-9/11/01 U.S. effort to destroy Al Qaeda and the 2003 U.S. war on Saddam Hussein's Iraqi regime. The Bush 43 administration feared that AQ and Saddam were not deterrable, might acquire and use nuclear weapons against us, and so had to be destroyed. Current talk of war with North Korea and Iran has similar logic.

B. If the sixth assumption is relaxed MAD itself may be frail or may never develop. A first strike may be feasible by one or both sides. Hence MAD between superpowers can be good, but nuclear proliferation to small states can be bad.

Bottom line: nuclear weapons are Janus-faced. They cause peace or war, security or insecurity, depending on ... us! They pacify a world of states that are casualty-sensitive, fairly clear-perceiving, not hyper-aggressive, unable to use or transfer nuclear weapons anonymously, and able to build secure arsenals. If these conditions are relaxed--if non-deterrable states or terrorists acquire nuclear weapons--the benefits of the nuclear revolution evaporate and a horrific dark side appears; nuclear weapons themselves become a cause of war.

Since 1990 these issues have been cast in a far darker light by three events: (1) the appearance of nuke-seeking rogue states (North Korea, Iran, perhaps at one time Saddam's Iraq); (2) the acquisition of nuclear weapons by a state that may leak them to terrorists (Pakistan!); and (3) the collapse of security of the Soviet nuclear arsenal after 1991, raising the risk of nuclear sale or theft of Soviet nuclear weapons or materials to terrorists. (This problem has now been addressed but not completely solved.)

So some now worry that non-deterrable nuclear states may soon appear, and non-deterrable terrorists may acquire nuclear arms.

VI. ALTERNATE NUCLEAR ORDERS: MAD AND ITS ALTERNATIVES

What global nuclear order would be best?

A. How many nuclear powers is best?

1. No nuclear powers, nuclear weapons are never invented and remain unknown. A now-impossible world still worth evaluating.
2. No nuclear powers, in a world of nuclear knowledge. We would achieve this if today's nuclear powers disarmed. This is MARNE ("mankind absolutely rejects nuclear explosives," a non-nuclear world.)
3. Few (5-10) nuclear powers. Is this the most peaceful of all possible worlds?
4. Many (80-100) nuclear powers.

B. In a world that includes nuclear powers, what distribution of capabilities is best? Distinguish these possibilities:

1. MAD ("Mutual Assured Destruction"), a world where nuclear states have secure second-strike capabilities against one another.
2. BAD ("both are defended"), a world of symmetrical powerful population defenses.
3. WORSE ("winning only requires striking early"), a world of mutual first strike capabilities.
4. USA ("Unilateral Superiority--American"), a world where the U.S. is top dog--it has second-strike countervalue and first-strike counterforce capabilities against all other nuclear powers.
5. UN control of nuclear weapons.

If choice were possible, which would you choose?

VII. THE BIOLOGICAL WARFARE REVOLUTION

Bioweapons differ from nuclear weapons in five prime regards. Hopeful differences:

A. Infectious biological weapons are very indiscriminate. They may blow back against users and users' societies. If so, their use is suicidal. If this is true, even extreme terrorists will hesitate to use bioweapons unless the terrorists seek to destroy their own societies. Only psychopaths will find them useful.

B. Defenses are more feasible against bio attack than against nuclear attack--but the attacker still has a large advantage. Defenses may thus be possible but at a poor cost-exchange ratio.

Qualification: developing biodefenses may require developing bio-offenses in order to test the new defense

against them. If so, we are on a treadmill. Defense --> offense --> defense --> offense.

Worrying differences:

A. Biological weapons are far cheaper to make than nuclear weapons so even non-state actors (terrorists) may be able to make them--and terrorists are far harder to deter than states.

B. Biological weapons can be used anonymously so, again, their use is especially hard to deter.

C. Biological weapons programs have no clear signature that distinguishes them from peaceful biological research. As a result an arms control regime that bans bioweapons is probably impossible to devise.

As a result of differences C, D, and E, some argue that bioweapons use cannot be deterred and perhaps cannot be defeated. If so bioweapons are truly weapons from hell, perhaps posing a greater long-run danger than nuclear weapons. Their dark shadow will lie across the future of the human race as far as the eye can see. Our only hope lies in defenses--an answer that may be a weak reed.1

Some people discount the bioterror danger because the United States and most other major powers have been uninterested in developing bioweapons. (The U.S. abandoned its offensive bioweapons program in 1969). They infer from this that bioweapons aren't very useful and so won't be further developed or used. But while bioweapons may be unuseful to **states**, they are useful to **terrorists** who seek vast destruction instead of finite military objectives. The appearance of skilled terrorist groups that aspire to mass murder (Al Qaeda) means that a new class of potential bioweapons users has appeared. These weapons now have customers!

Many were also lulled by the world's success in surviving the nuclear revolution. They assumed that nuclear, chemical, and biological weapons were all of a piece (all were "weapons of mass destruction") and that measures that worked with one (arms control, deterrence) would work with all three. But as noted above bioweapons are harder to control by agreement than nuclear weapons and their use is harder to deter. This is because bioweapons are more likely to be obtained by non-deterrable terrorists; they can more easily be used anonymously; and arms control to halt their spread is harder.

In Kurt Vonnegut's novel Cat's Cradle a mad scientist invents a new crystalline form of water--"ice nine"--that

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[1] My thinking on bioweapons reflects work by Prof. Greg Koblentz of George Mason University, an MIT political science department PhD.

solidifies at 90 degrees fahrenheit. Its release ends life on earth by freezing the oceans.

Bioengineers have developed a powerful new tool for gene editing: crispr-cas9. **Does crispr-cas9 = ice nine?** Will bad actors use it to develop hyper-lethal hyper-contagious pathogens? If so, what can we do in response--if anything??

If we survive cripr-cas9, what next? Will the biotech revolution hand us some other biotech "ice nine"--a vastly destructive technology that we can't handle, and will spell our demise?

Physicist Enrico Fermi notes empirical evidence from the cosmos that may be relevant to this issue. Google up "Fermi paradox." "Where is everybody?"

17.42 Causes and Prevention of War

Spring 2018