

International Law, Cybernetics, and Cyberspace, in *Computer Network Attack and International Law* (Naval War College International Law Studies "Blue Book" Volume 76), pp.59-71. by Anthony D'Amato. Code C001

My pleasant assignment this morning is to talk about the future of computer network attack under international law. Any prediction is difficult to make, but the hardest thing of all to predict is the future. If I wanted to play it safe I would just stand here be quiet for thirty minutes. Yet we all know that if there is one prediction that can be asserted with a confidence level of 100%, it is—no matter what the topic might be—any law professor in this country who is given the job of talking about it will talk about it.

There has already been a lot of talk this week about rules of international law, and I sense a certain amount of discomfort about the old, received rules of international law. We've been cited rules dating from 1949, 1945, 1929, and back as far as 1907 and 1899. Somehow they seem archaic when compared with a revolutionary new technology. Professor Yoram Dinstein has advised the convening of an international conference to update the old humanitarian rules of warfare. But pending the replacement of existing rules by new ones, Professor Dinstein contends that the existing rules will serve us well enough if we apply them as written. He appears to view these rules as a kind of international legislation. I do not completely share that point of view. Perhaps this betrays my common law bias, but I think there is a kind of spirit of international law that shapes the rules on the books and provides a basis for interpreting them.

This spirit is evolutionary. Being aware of it gives us a basis for predicting how the rules of international law may bend and change to fit new situations. Since any international crisis will appear quite different to decision-makers on the inside than all the previous ones they've experienced, simulated or studied, it is indeed a kind of rigid thinking to say we should treat this crisis by applying the same rules we applied to the last one. It would be somewhat like accusing generals of fighting the previous war. But rules of law are like that; as words on a paper or on a screen, they don't change by themselves; they stay the same. And they were obviously fashioned to cover past situations. Thus I argue that we cannot take our stand solely upon the rules of international law as written. These rules have to be interpreted in light of new circumstances.

And yet it is clear that if we simply change the old rules to apply to new situations, the rules will be sapped of all their vitality. There's no use having any rules of law at all if they can be changed at will; that would amount to anarchy. Thus I want to argue that we are constrained in the degree of latitude that we can give to the interpretation of old rules to fit new situations. And this constraint comes, I argue, from a good faith appreciation of the structure of international law itself.

What is the structure of international law? We begin by recognizing that it is, and must be, a self-perpetuating coherent set of rules that operate within the arena of international relations. Because it is dependent upon a multi-state environment for its own existence, international law consists of rules that are designed to maintain the peace

and stability of those states, for total anarchic war is the absence of rules. International law opts for stability by ensuring that its rules minimize the friction among states and provide for peaceful resolution of disputes. If despite its rules war breaks out, then its rules attempt to contain the war, minimize the damage caused by war, and provide for a secure peace following the war. An example of a set of international legal rules providing for the containment of war are the complex and realistic rules of neutrality, fashioned over centuries, which specify the acts that neutral nations may or may not take during a war in order to maintain their neutrality. And a classic example of a rule favoring an agreement to stop the war is the rule that treaties of peace are valid even though the losing side could be said to have been coerced into signing the treaty by the threat of continued war if it did not sign.

Although the content of the rules of international law have not changed dramatically over the course of the past five thousand years, they have been adjusted and modified to meet new situations and contingencies. This adjustment operates through an elaborate system of customary law that modifies rules in light of feedback mechanisms. These mechanisms include courts, foreign offices interacting with each other (the “*dedoublement fonctionnel*”), diplomatic communications, international legal conferences and codification conventions, negotiations of bilateral and multilateral treaties, and so forth. International law is, in brief, a cybernetic system. Its rules are useful only if they are functional—that is, only if they promote the stability of the system. The feedback mechanisms, which are the hallmark of cybernetic systems, continuously measure whether rules of the system operate to resolve disputes rather than aggravate them. If a rule has a tendency to aggravate disputes, then it is reinterpreted, modified, or in drastic cases overruled and replaced by the a rule that stabilizes the system.

It follows that too rigid an interpretation of any given rule could lead to a rupture in the system. Let me call an absolutely rigid interpretation a “robotic” interpretation. A robot will interpret a rule exactly, without taking into account its real-world consequences.¹ For example, the Standing Rules of Engagement for U.S. Forces of October 1, 1994, provide in its first rule that a military commander has the right to use all necessary means to defend the military unit, and that none of the remaining rules in the ROE can limit this inherent right. If a robot were programmed with this rule, it would not hesitate to employ a hugely disproportionate weapon in the defense of its unit, including a nuclear missile that could start a global conflagration. Thus the first rule of the ROE cannot be given a robotic interpretation. The rule is instead directed to a commander who is familiar with many other rules, with the requirements of warfare, and with the general principle of military proportionality. In short, the rule on the books was made by humans with

¹ Of course, a list of “real world consequences” can be programmed into the robot in the first place, in which case the robot will take those consequences into account. But if the consequences are not foreseen by the human programmer at the time of the programming—which is the usual case in war where surprises are part of the strategy of war—then the robot will simply not know about them and will not take them into account. At the present and reasonably foreseeable state of computer technology, a computer cannot “see” and “analyze” the real world and “evaluate” whether a given operation could be counterproductive in terms of its foreseeable real world consequences.

the often unarticulated premise that humans like them would interpret the rule. A military rule presupposes a military interpreter.²

Sometimes the laws of war build terminological flexibility right into their own language. Many of the older rules of warfare, for example, prohibit acts that are “not justified by military necessity.” Such rules also betoken the good military judgment of a human being. Legal restraints on warmaking stem from the need to keep the international system stable. Many years ago Quincy Wright put this another way: the goal of the military during a war is not just to win the war but to win the subsequent peace. If force is used that is not justified by military necessity, the seeds will be sewn of future revenge; hence a stable peace may not have been secured. “Military necessity” should be construed as “necessary to win the engagement at hand” and not to demonstrate brutality by unrestrained killing of enemy civilians.

The cybernetic system of international law is thus a purposive system. Its rules cannot be interpreted literally or applied mechanically, because each rule is simply an indication of how the system should deal with disruptions that may arise. Our bodies are purposive systems; if surgery is needed to remove a tumor, the surgeon operates with as little damage to the surrounding tissue as possible. For obviously the idea is to remove the tumor and not to kill the patient. A ship is an example of a self-contained purposive system. The primary purpose of a purposive system is survival—persistence through time.

In order to survive, purposive systems attempt to maintain systemic equilibrium. When our bodies are invaded by a flu virus, our temperature rises so as to provide a hostile environment for the invaders; when the virus is defeated, our temperatures return to normal. Similar servomechanisms exist on larger military vessels; a torpedo hit on the hull may trigger an automatic seal-off of the compartment that is being flooded. A thermostat is one of the simplest servomechanisms; there are many more we can think of.

Purposive systems are able to survive and to reverse disequilibrating interruptions because they have elaborate internal communications systems. We don’t have to tell our bodies to raise our temperature; our blood stream carries the message of outside virus invaders to our central nervous subsystem which communicates with the subconscious parts of our brains and in effect turns up the heat. On board a ship, the internal communications are elaborate and highly structured to carry messages of the ship’s condition to all hands. There are fail-safe mechanisms that operate by default in case the intra-human messages are disrupted.

The communications on board a ship are structured by elaborate rules, jurisdictional assignments, protocols and regulations. These constitute the internal laws of the system. Any person on board who acts in a way that jeopardizes the survival of the ship is immediately arrested; any person who acts to upset the equilibrium of the ship is also stopped. All the everyday rules and regulations of the ship are designed to actualize

² It is not clear, however, whether the rules contained in the Internal Revenue Code presuppose human interpreters, even though it is often claimed that IRS agents are human interpreters.

the two primary goals of persistence through time and the maintenance of systemic equilibrium.

Just as a ship's rules are designed to maintain the integrity of the floating military unit, the rules of international law are designed to maintain the integrity and peace of the states of the world in their international relations. The essence of all these rules is the communication of information. Naval rules are worthless unless communicated. The equilibrium of our bodies is maintained by an elaborate system of neuron communications into and out of the brain and spinal column.

My thesis this morning is based upon the signal importance of the communicative aspect of rules. Without communication the rules do not work. And if the rules do not work, the entire system can break down, with adverse consequences to everyone.

The importance of communication in international law is illustrated by one of its most ancient rules: the personal immunity of diplomats and ambassadors. Even during wartime nations realized the importance of keeping open the channels of communication with their enemies. Diplomatic immunity under international law is well known. The relation to internet communications is obvious. I would like to discuss a more subtle and perhaps more illuminating practice allowed by international law that also has a long history: letters of marque and reprisal.

Back in the days when there were no international courts, no international peace-keeping organizations, and nations did their best to avoid war because of the unforeseeable calamities that war could bring, a curious practice of a kind of limited private law arose. Key to this practice is what might be termed "unilateral communication." A message is sent out that is intended to be received, but a response is not required. The message is contained in a letter of marque and reprisal.

To envisage the situation, imagine five hundred years ago that merchant M in nation A was one of a class of rich international traders, importing and exporting goods. In the course of his trade, M sends a caravan of silks, which he purchased in A, into nation B to be sold. With the selling price (in B's currency, of course), M intends to buy goods in B that are relatively scarce back in A, and transport those goods back to A to be sold there. In every transaction, as usual, M takes a percentage for himself. M and his fellow merchants are very important to the king of A because taxes on their profits are the king's primary source of revenue.

Now let us assume that a greedy provincial governor in B, seeing the large amount of money that M has obtained by selling the silks in his province, decides to levy a 100% tax on the money that M's trading activities in B have amassed. M's employees in B are simply merchants; they do not have the power to resist the provincial governor. As a result, their capital as well as their profits are confiscated and they return to A empty-handed.

An outraged M reports to the king of A the “denial of justice” within B. But the king does not want to start a war against nation B. There are too many risks, too many uncertainties in war, and in addition the king simply cannot afford to finance an all-out war. True, the king admits, the queen of B does not want war either, and for the same reasons. But once a war between two sovereign nations is started, who knows what the result will be?

So we assume that at that point, M offers to mount a private mercenary attack against B. In that way, by looting and pillaging, M can get his money back and in addition teach B a lesson. Such an action would probably drive the king into an unwanted war. And the king may not be quite powerful enough to stop M from doing it, especially if M recruits his fellow tradesmen to help in the enterprise.

Thus the stage is set for a deal between the king and M. The king wants M to go ahead but in a limited way, one that would be sufficiently justified that the queen of B would not feel honor-bound to go to war to resist it. The only thing that would be so justified would be what Aristotle called compensatory justice. M should have the right to be compensated for his losses plus the cost of obtaining that compensation. So the king issues to M a letter of marque and reprisal. The letter contains the terms of M’s planned expedition into nation B. It specifies the geographical limitation of the expedition—in this case, the particular province whose governor took away M’s assets and profits. It specifies the amount that can be recovered—in this case, property and other valuables equal in amount to M’s losses plus interest plus the cost of paying the mercenaries. It specifies the persons against whom the losses can be recovered—in this case, probably, all officials and all private citizens in the province, perhaps with officials coming first. The fact that innocent civilians are going to be robbed to pay for M’s losses is unavoidable. In principle they should seek recompense from the queen of B, who should levy against the governor of the province and who in the future should ensure that none of her subordinates mistreat foreign traders in this fashion.

M’s motivation in obtaining the letter of marque and reprisal is not so much so that he can show it to officials (or the queen) in B during his mercenary expedition there, but rather to legitimize his expedition in his home country A. After all, if M proceeds without the king’s approval, he might eventually return to A only to face arrest for his private breach of the peace. Moreover, M’s ability to recruit mercenaries within A will be greatly facilitated by the legitimacy of the letter of marque and reprisal; otherwise, a potential recruit would reasonably worry about arrest in A when the expedition is completed. Therefore, as I’ve said, the letter is just a one-way communication within nation A. It is not necessary for the queen of B to read it; it’s “power” is exhausted once M receives it from the king of A. But if M respects the conditions of his reprisal raid into B, then the queen of B can see, by the results, that M confined himself to the province of which he complained that his assets were confiscated by the governor, and that M helped himself to compensatory justice.

In this fashion, many limited wars were fought under the aegis of letters of marque and reprisal. Sometimes the mere issuance of such letters were enough to

provoke the monarchs of neighboring countries to offer restitution in order to avoid the impending mercenary raid into their territory. And naturally, over the course of time, the conditions for the issuance of letters of marque and reprisal were spelled out in treaties of peace. The Treaty of Westphalia recognizes the potential legitimacy of limited armed attacks as reprisals for denial of justice. Farther along in time, reprisal raids were replaced by judicial procedures. By the 1920s, for example, the United States and Mexico set up a Joint Arbitration Tribunal which settled all outstanding claims between American citizens against Mexico on the one hand, and Mexican citizens against the United States on the other. Since payments to the aggrieved plaintiffs were secured by net-net transactions between the two governments, only the monetary difference at the very end had to be paid in specie.

This subsequent history shows that the early letters of marque and reprisal,³ by allowing limited war, operated as a deterrence to general war. When people are robbed, they need restitution. When they are robbed by another country, the alternative is either war or self-help. The history of the use of letters of marque and reprisal constitutes an example of my general point that even a war can be, in some circumstances, not systemically disequilibrating but rather a method of preserving and restoring systemic equilibrium. If all wars in the future are intended to be limited wars (we can hardly contemplate a world war in this era of weapons of mass destruction, though we must be certain that it will not erupt by accident), then we need to be very careful about preserving the communications network that in the past has been instrumental in keeping wars limited.

Thus, I contend that the main lesson for present purposes of this short history of letters of marque and reprisal is the importance of communication—both internally and externally—as a means of limited warfare. In considering the escalatory potential of destroying computer internet traffic in future conflicts, we should not just look at the disruption of communications with the enemy but also consider the severe negative consequences to ourselves if the disruption cannot be pinpointed and spreads to affect the network in its entirety. For although a letter of marque and reprisal signified an agreement between the sovereign and one of his subjects (the king of A and his subject M in my example), it was also meant as a communication to a foreign country (to the queen of B, in my example). While it was desirable that the foreign sovereign read the letter, it was not necessary. Many communications today are of this one-way type. In the recent NATO bombing of Yugoslavia, for example, NATO leaders held numerous press conferences which they were confident were being read by Milosevic and others in Belgrade. Limited-war aims must be communicated to the enemy whenever possible. They must be credible (as indeed were the letters of marque and reprisal, which were not casually issued by any means). And they must be continuously communicated, for when

³ Even the Constitution of the United States gives Congress the power to issue letters of marque and reprisal (although the power was actually exercised only during the sea war of 1800 with France, and it was not a “classic” situation of self-help but rather a roundabout way of enlisting the help of private vessels in a national war).

the enemy is suffering its darkest days it must be fortified by the belief that its leadership continues to hold the key to armistice and a peaceful settlement.⁴

Of course no one can foresee what will cause future wars to break out, But among the causes that have led to wars has been the need to protect by armed force the lives of innocent persons in foreign countries. When those innocent lives were a country's own citizens, then intervention to protect them has been a common *casus belli* for several centuries. Only recently has intervention extended from nationals to non-nationals. As I contended in an article in 1982, intervention of the latter type is designed to protect our "internationals."⁵ Our internationals are people everywhere, with whom we share a mutual commitment of protection under the developing international law of human rights.

Once any war has begun, the international system tries to bring the system back to equilibrium. Thus we have in international law the phenomenon of the humanitarian laws of war. Occasionally I've had the feeling during this conference that some military planners and targeters appear to believe that the laws of war are an evil imposed by the lawyers and politicians, and that their job is to adhere to the letter of the rules while violating the spirit. They seem to say that the most important goal in war is to win it as soon as possible. And indeed there is a logic to that position. Ending a war quickly will save many lives. The problem is that nations that get an upper hand during a war often convince themselves that the quickest way to end the war is to terrorize the enemy's civilian population. I think that General Curtis LeMay's terror bombing of Tokyo suburbs in the spring of 1945 were well-intentioned in this regard. Nevertheless those raids constitute, for me, the clearest example of a war crime in the entire Second World War. What did the bombing "communicate" to the people of Japan? That they should surrender unconditionally to an enemy who was ruthless enough to drop flaming napalm on women and children living in wooden homes? If LeMay believed he was saying, "Surrender now and we won't keep on doing this," he may in fact have communicated "Better to die than surrender to the devil incarnate." What the humanitarian laws of war do is to take this kind of calculation away from those who would emulate General LeMay. The laws of war prohibit the deliberate targeting of civilians. I think in the judgment of most observers, military and civilian, the exercise of this kind of restraint during a war is more likely to lead to a quick peace and more likely to lead to a lasting peace.

Moreover, from the international systemic viewpoint, given the fact that war itself may be a necessary equilibrating adjustment to preserve deeper systemic values,

⁴ Controversy remains whether the Allied insistence upon "unconditional surrender" unnecessarily prolonged World War II. Of course, in 1945, German and Japanese leaders did not know about the potential of being tried as war criminals. If they had been able to foresee Nuremberg and the Military Tribunal for the Far East, would they have surrendered at all? I discuss some of the problems of negotiating a peace when the negotiators themselves may find themselves indicted for war crimes once the peace is established, in Anthony D'Amato, "Peace v. Accountability in Bosnia," 88 *American Journal of International Law* 500 (1994).

⁵ Anthony D'Amato, "The Concept of Human Rights in International Law," 82 *Columbia Law Review* 1110 (1982).

prolonging a war is not necessarily a bad thing. It may be important for systemic value preservation to prosecute the war the right way even if doing so prolongs the war. This is perhaps a deeper reason for ruling out the deliberate terror bombing of civilians.

But the viewpoint of the international system is not necessary. You can obtain the same result from the point of view of a nation looking outward at the international system. For if the maintenance of the system is necessary for lasting peace and order, then each nation partakes of that systemic goal in its own foreign policy. The systemic viewpoint is primarily a useful heuristic that enables us to predict the ways in which the system itself strives to maintain its equilibrium. Once we've identified the ways, each country's national interest is served in facilitating them.

I have mentioned so far the rules of diplomatic immunity and the history of letters of marque and reprisal as two of the ways that the international system recognizes disruptions to the system and is able to communicate effectively to restore equilibrium. A third mechanism is the one mentioned by Professor Dinstein: that customary international law permits espionage. Although each nation may punish spies, they are often exchanged for a nation's own spies who have been caught by the exchanging country. It would have been easy for international law to have generated a rule prohibiting espionage, but the fact that it allows for espionage is a further strong affirmation of the importance of the exchange of information. There have been many instances in which a nation's military posture appeared bellicose to a neighbor, yet intelligence networks exposed the reality that there was no bellicose intention. Without that information, the neighboring country might have launched a preemptive attack, starting a war by mistake. Even when a nation is attempting to start a war against its neighbor, the international system is well served by intelligence information that allows the neighbor to get prepared for an attack. Preparation often dissuades the attacker from going ahead. None of this is to say that the exchange of information prevents all wars from breaking out. But it has stopped some wars that would have been the result of a mutual mistake, and it has served to limit wars that have already broken out by conveying information as to military intentions.

In recent years observers have been somewhat surprised by the slow and deliberate way the Security Council has conveyed to countries such as Iraq and Yugoslavia the intentions of the major powers if those countries did not cease and desist their unlawful acts. The clarity of communications is probably responsible for a great reduction in casualties than would have occurred if the UN's motives and intentions had been kept secret.

Where do these arguments lead, in terms of international law? They lead me to predict that attacks on the internet will soon be seen as clearly illegal under international law. Maybe customary international law has already reached that position. No matter what short-term military advantage might be seen in disrupting another country's internet system, the disruption may spread to the point where it is totally counterproductive. But even if it can be kept contained within the target state, it nevertheless violates, in my view, the international system's attempt to end the war and win the peace. In a sense—

although I do not want to be taken literally on this—disrupting the internet is like unleashing biological warfare: the limits are unpredictable and the method is inhumane. What is inhumane about disrupting a target state's internet communications is that it deprives innocent people within that target state from the only possibly effective means they have of obtaining external information and using it to communicate with each other and possibly to oppose the war from within. In the recent NATO attack on Belgrade, some citizens of that city were able to obtain news of the war from nongovernment sources.⁶ Unfortunately NATO targeted some of the Belgradian communications facilities. I think that was a mistake; it set a precedent that could backfire; and it did not noticeably shorten the war.⁷ Whether that targeting was illegal is not a question that will be addressed in any foreseeable forum in the foreseeable future. But I believe that informed international legal opinion will in the near future weigh in on the side of the illegality of attacks against the internet.

I believe this because the stability of the international system is dependent upon the free and efficient flow of information within and among the units that make up the system. The more freedom of international communication we have, the less the likelihood of war and other disruptions to the stability of the international system. The global internet, with its already achieved interconnectivity across national boundaries, is a natural heir to the rules of diplomatic immunity, letters of marque and reprisal, legality of espionage and intelligence-gathering, and many other communicative aspects of international law.

⁶ It was in NATO's interest to accurately inform Serbian citizens about the war and about NATO's limited war aims. Consider what happened in the first half of 1945 in Japan. The Japanese people were incessantly reassured by the press that the Allies were on the verge of being beaten and peace was imminent. Well, the papers were right about the imminence of peace, but they just had the sides mixed up. If the internet had been invented at that time, there would have been no way for the Japanese people to have been fooled by the Japanese controlled media. Our campaign to demoralize the Japanese people could have been accomplished more swiftly and with considerably less loss of life. Last month Loral Space and Communications Limited said it might be forced to cut transmissions into Yugoslavia from one of its satellites under the general trade embargo that was proposed by the United States. Fortunately, State Department spokesperson James Rubin quickly denied that there were plans to interfere with internet access for citizens of Yugoslavia.

⁷ Indeed, the Serbian news sources that remained in internet communication provided useful information to American citizens and the American press. During the recent NATO bombing of Yugoslavia, I got my news of the progress of the bombing attacks from Beograd and other Serbian internet sources. I soon found out that the New York Times and the Washington Post were getting their information from the same internet sources that I was using. What reason did we have to trust any of this information when we knew that the Milosevic government was censoring it? Let's take a specific case: a building in downtown Belgrade is struck by a missile, and the collateral damage in fact kills ten civilians. Now the Serbian internet could inflate the casualties and say there were 50 civilians killed. But this kind of inflation, repeated over many bombings, could intimidate and terrorize the population of the city, and Milosevic could be counted on not to want to do that. All right, take the opposite extreme: they report no civilian deaths. But that falsification would encourage NATO to increase the bombardment, figuring that it's a surgically precise destruction of Serbian infrastructure with no loss of civilian life. So the safest path, the path of the least chance of government interference, is simply to report the accurate number of deaths, in this case ten. And as the Times and the Post, and I for that matter, discovered in the course of the war when there was independent empirical verification, that the Serbian internet information about the bombings was by and large rather close to accuracy.

I am not claiming that during a war there would be a prohibition against disrupting the enemy's command-and-control communications system. If that system is separate from the internet, it is fair game as it always has been. If instead the enemy is using the internet itself for its military command and control system, then why disrupt it when a better alternative is to break through its code? Of course in an actual conflict the military commander on the ground will decide whether such an alternative is better. That is why I am making the stronger point that a rule of absolute prohibition of internet disruption is in the best interests of both sides in the long run and therefore is likely to be soon recognized as a foundational principle of international customary law.⁸

Finally, I predict that in the near future we will see massive public support throughout the world for the inviolability of the internet. Although a very recent phenomenon, the internet in my view is securing for itself a place in public consciousness that will be impossible to dislodge. Indeed, the internet has become one of our vital national interests. It will be something we will have to protect in the event of a war. It is not just a mechanism like previous communications systems (the telephone, the radio, and television). Instead, it has fostered a new kind of community awareness and empowerment.

I hope it doesn't sound too much like science fiction to say that some people already are living in virtual communities. Their chatroom partners come from all over the world, people who share similar interests. We will see an increasingly specialized and fine-tuned system of chatrooms where we will be able to see on our computer screens the faces of the people with whom we are communicating—GeoCities in real time in full color. People who live in these virtual communities also live in real communities; they have dual citizenship. A person can be an American and also a citizen of America On Line; another can be a citizen of Ecuador and Excite; another of the Netherlands and Netscape; and another a dual citizen of Yemen and Yahoo. People are now able to buy and sell goods directly from each other—foodstuffs from exotic places, native works of art and artifacts (which are skyrocketing in price on the internet), travel, and services. People can play games against opponents from all over the world. Many people are finding the internet passionately consuming of their spare time, and others are finding a way to make a living on the internet—either creating technology, or investing, or buying

⁸ I believe that the United States has far more to lose if our computer networks are attacked than we could ever hope to gain by attacking the computer networks of other countries. Earlier in this conference someone shrugged off the damage that might happen to our banking and brokerage system by saying, "well, so what if the Dow Jones drops 30%?" If that's all that happens, I would agree. But that's not what's going to happen. What will happen is people across the nation will find their internet connections down and the television saying "don't worry, you haven't lost your life's savings." And they will call their banks and stock brokers and get a busy signal. And the word will sweep the nation that credit cards are no longer going to be accepted, and if you have some hard cash on hand that's the only thing that will get you food. And there will be riots in every city and village, and people will raid the grocery stores and steal all the food. You and everyone else will fear that all their money—in banks, in stock accounts, in retirement plans—may have been wiped out by the internet attack. Even if later it turns out that there was enough redundancy in the storage system to retrieve many of the financial records, it may come too late to prevent riots and insurrections. The dimensions of a national disaster of this kind could far surpass anything in our nation's history.

and selling, or providing the one thing in business transactions that computers are still deficient in—a human touch.

I've exaggerated my point, of course, but in this risky game of prediction we sometimes have to think outlandishly. As the world shrinks in size, as communication and knowledge-sharing become the key concepts of the twenty-first century, the internet will increasingly be valued as a precious resource, the "heritage of mankind" in the words of international law. For this reason as well as the systemic considerations I outlined earlier, I think that computer network attack will soon be the subject of an outright prohibition under international customary law.

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