

Chapter 18. WARFARE AND POPULATION DISPLACEMENT

The present book has the...purpose of straightening thought about war and peace.... [I]t seemed best to refrain from condemnation altogether. For indignation is so easy and satisfying a mood that it is apt to prevent one from attending to any facts that oppose it. If the reader should object that I have abandoned ethics for the false doctrine that “to understand everything is to pardon everything”, I can reply that it is only a temporary suspense of ethical judgment, made because “to condemn too much is to understand little.”

L. F. Richardson, 1960

Statistics of Deadly Quarrels

I. Introduction

War is one of the most dramatic types of interactions between human groups. Indeed, it is one of the most dramatic types of human behavior. It is also arguably one of the most important types of interactions in terms of its effects on the sizes and distribution of human populations and on the human evolutionary process in general. It is also one of the most characteristically human kinds of behavior. Other animals often fight, but very few of them fight in large, organized groups against other large, organized groups the way humans do. Only humans have the requisite levels of cooperation, coordination and division of labor.

Thinking about war arouses mixed feelings of horror and fascination. As the quote from L.F. Richardson in the epigraph suggests, war is hard to think about analytically. People tend to have highly charged but highly ambivalent feelings about war. On the one hand, war is a frightening, dangerous, and destructive phenomenon. We are horrified by the prospect and actuality of it. On the other hand, the actions of individuals in war often exemplify admirable human tendencies to bravery, honor, loyalty, and lack of self-regard. We tend to condemn war, but glorify warriors.

Richardson's own feelings were typically ambivalent. Despite his being a pacifist Quaker and a conscientious objector, he served as an ambulance driver with a French division on the Western Front during WWI. He writes of the motives for volunteering, but for one phrase, much as any other patriotic volunteer might: “In August 1914 I was torn between an intense curiosity to see war at close quarters, an intense objection to killing people, both mixed with ideas of public duty, and doubt as to whether I could endure danger.” Richardson was a pioneering student of turbulent flow in fluids (some of you may have heard of the Richardson number) and weather forecasting (Richardson pioneered the com-

puter-based weather prediction methods that are now the basis for the T.V. weatherperson's forecast). After the war, and until his death in 1953 (his book is posthumous) he devoted a large proportion of his effort to the scientific study of war. *Statistics of Deadly Quarrels* is based on the statistical study of some 600+ wars of various sizes between 1820 and 1952. This book, along with a somewhat similar effort by Quincy Wright (*A Study of War*, 1965) are counted as the classics in the field of attempts to understand war from a scientific point of view.

Why do people fight at all? In this chapter, we will examine the theories proposed to explain war, and review some of Richardson's and other's data about the phenomenon. Why does violent conflict have the pattern it does in humans? Given that they do fight, why do they so often fight in groups, rather than as individuals? Then we will look at some of the ecological and evolutionary consequences of war. War has a substantial impact on the movements of people, diseases, and ideas, and is a stimulus for technical improvement. We will try to follow Richardson's advice to be dispassionate; let us understand clearly the nature of the beast, the better to avoid his bite perhaps.

Warfare is an extreme example of outgroup conflict & ingroup cooperation. In addition to an interest in war per se in this chapter, we want to use war as an example of intergroup conflict and within group cooperation. All societies are full of conflicts between individuals, kin groups, tribelets, ethnic groups, classes, interest groups, etc. Societies compete among themselves for markets, political influence, etc. Usually these conflicts involve little violence, although the spoken or unspoken threat of violence is present in the background as a coercive tactic and/or as a motive for diplomatic and political efforts to resolve disputes by agreed upon legitimate means. Legal systems depend ultimately on the ability to use violence, if necessary, to ensure compliance. Generalizations about war apply in some part to all types of human conflict. Because the costs of violent conflict are so high, and because violence has attracted so much attention by evolutionary biologists, social scientists, and historians, it ought to be a good phenomenon against which to test general explanations of patterns of conflict and cooperation. Many of the same considerations will apply to more mundane conflicts, for example between interest groups and political parties in a democracy.

Violent conflict is one of nature's dirty tricks, according to the main hypothesis of this chapter. Violent conflict is an example of something that can plausibly arise by evolutionary processes like selection without being adaptive, at least in the usual sense of the word. At several points in this class, we have met similar cases. Evolution tends to adjust sex ratio to 1:1 despite the fact that this leads to too many males, female choice sexual se-

lection can lead to maladaptive exaggeration of display characters, and cultural evolution can lead to reductions in fertility. We argue that the logic inherent in violent conflict and threats of violence can be favored by evolutionary processes even though we all become worse off because of the existence of the capability to wage war.:

Violent conflict may be one of nature's dirty tricks. Even though the possibility of large scale war leaves us all worse off, the logical dynamics associated with violent conflict and threats of violence can be favored by evolutionary processes.

II. Classical Models Of War

A. *Definitional Matters*

Wars are large-scale human conflicts in which deaths occur. The line of division between wars, feuds, and simple murder is not easy to draw, hence Richardson's general term "deadly quarrels". Much of the theory will apply to any kind of use of force or threat of force to gain one's ends at the expense of someone else's, so the exact place we draw the distinction is not important in the first instance. However, to understand the peculiarly human tendency toward modest amounts of small-scale fighting and large amounts of large-scale fighting, we need to account for war specifically. Let us define war proper as fights between social units larger than kin groups that are conducted with the intent to kill or capture opponents.

B. *Yanomamo Warfare*

The anthropologist Napoleon Chagnon's (1988) studies of violent conflict among the Yanomamo, a group of hunter-horticulturalists living in the (until very recently) remote tropical forest on the border between southern Venezuela and northern Brazil, is a classic study of warfare in politically societies. The Yanomamo live in villages of about 100 people, each of which is politically independent. There is a very considerable amount of violence between communities because there are no supra-village leaders to referee disputes. The whole Yanomamo population numbers about 15,000. The root motive for most fights between groups is over women: sexual jealousy, suspicions of infidelity, forcible kidnap of women, and failure to give a promised girl in marriage. However, revenge for earlier killings is a source of continued friction after the original fight. An offended village can nurse a grudge for a decade or more before getting the opportunity for a revenge killing. Typically, 10-20 warriors from a village sneak through the forest to the vicinity of the village where

the past killer of one of their people lives. They try to kill the killer, but any adult male will do. Killers become *unokai*, a special, high-prestige status. About 35% of adult males are *unokais*, but of men over 40, about 60% have killed. About 30% of all adult male deaths are due to violent conflict. The Yanomamo are polygynous, and *unokais* tend to have more wives and more children than those who haven't killed. In addition to deadly fights, the Yanomamo have a graded series of non-lethal conflicts, including shouting matches, club fights and fights with axes and machetes. In lethal fights bows and arrows are the preferred weapons. The non-lethal fights often occur during visits between groups and also between men within villages. Yanomamo males cultivate a reputation for ferocity. Men who fail to do so may find that other men begin to attempt to seduce their wives and carry off their daughters. Men are especially likely to lose their women if they patrilineage as a whole gets a reputation for cowardice.

The Yanomamo pattern of warfare is just on the boundary of our distinction between warfare and feud. Yanomamo villages are organized around patrilineal kin groups, and most people in any given village are related. When villages split they generally do so along kin group lines. The average relatedness of individuals in the villages is 0.06-.12 (recall that full sibs and parents and offspring have a relatedness of 0.5). Thus, when a war party of 10-20 leaves on a mission of revenge, it will include mainly genetic kin, albeit some of rather distant relatedness.

Chagnon argues that his data are typical of violent conflict in the small-scale societies that all humans lived in until improvements in crop production made larger and denser settlements possible in the last few thousand years. He also argues that the reproductive advantages of *unokais* may explain, with the help of kin selection, the scale and pattern of conflict among the Yanomamo. Others think that the Yanomamo are unusual in the amount of small-scale cooperative violence, and that most past peoples had more sophisticated political institutions limiting feuds but organizing proper wars (Price and Brown, 1985, cited in chapter 3). It is interesting that when most vertebrates cooperate in dangerous fights that it is in very small groups, such as pair of brothers. A well-organized war party of 20 or larger is not known for any animal organization of combat, the social insects excepted.

Chagnon reports that a Yanomamo man sent to the territorial capital for nursing training was very excited by the concepts of police and laws. It is not clear what fraction of hunting and gathering and simple horticultural societies had at least rudimentary political institutions of law and policing, but it is interesting that a Yanomamo would think this a good idea. (In highland New Guinea many people welcomed Dutch and Australian police after World War II because it is no fun to live under a permanent regime of feud and small-

scale warfare.) It would seem that peace-making institutions might readily spread if invented among groups like the Yanomamo.

C. A Simple Game-Theoretic Analysis

The most basic theory of war has been developed using game theory. Recall how game theory works: The idea is that all kinds of situations in which there are interactions between individuals leading to gains and losses have something in common. In particular, “players” typically employ “strategies” designed to guess how another player will respond and then play the game so as to maximize returns to themselves. There are two general types of games, zero sum and variable sum games. “Zero sum” games are those in which a fixed set of resources have to be divided between players. Many games of skill and chance are of this type; only one team can win the ball game or a particular hand of cards. Although people often think of economic competition and the like as zero sum games, they are probably rare in real life.

Most real-life “games” are variable sum games. In variable sum games, the total payoffs to players depend on the strategies they choose. War is an example of this last type. If a war is conducted, both sides will typically suffer casualties and losses of resources. War is like playing poker while burning much of the money that might be won to keep warm. As long as the war goes on lives and resources are being destroyed, usually at a significantly higher rate than capture of resources even by the winner. The winners may sometimes be better off due to booty and so forth, but the total losses will most often exceed total gains of resources because war is wastefully destructive. On average, we can all expect to be worse off at the conclusion of a war. In modern wars at least, and probably all but those relative handful of situations where the winning side is overwhelmingly powerful or lucky, warfare will result in losses in excess of gains for *both* sides, even the “winner.”

The paradox of war is that everybody loses, yet everybody still arms themselves. From this perspective, understanding war means understanding why people engage in such apparently maladaptive behavior. The very nature of war seems to make some form of pacifism the only sensible strategy, yet warfare and the preparation for war is nearly universal. Why? Are people just stupid?

Simple game theory analysis helps clarify the paradox. Game theorists (e.g. Schelling, 1966; Maynard Smith, 1984; Zagare, 1987) have thought a lot about games that roughly capture the nature of violent conflict. Here is a prototypical “war game” (if you think about it you will see that many kinds of ordinary bargaining situations have the same structure):

Game 1

	Player 1	
	<i>fight</i>	<i>don't fight</i>
Player 2		
<i>fight</i>	P1 gets -100 P2 gets -100	P1 gets -25 P2 gets +25
<i>don't fight</i>	P1 gets +25 P2 gets -25	P1 gets 0 P2 gets 0

We imagine that the game starts in a time of peace. After that at each time step each player can choose to send an army to seize a bit of territory (fight strategy). In the next time step the other player responds with a fight or don't fight strategy and then the payoffs are collected. Then, the next time step starts and the players keep fighting, surrender, or make peace.

In the end, pacifists lose. Game theorists argue that games like this capture the general property of warfare. Forced seizure of another's resources pays off handsomely, but only if the other party does not resist. If there is resistance both sides lose a lot. Notice that this is an inherently nasty game. Neither player can afford to be a pacifist, even though neither player really wants to go to war, unless the other is a pacifist. A pacifist has no choice but to lose any fights another player wishes to impose upon him. And evolutionary considerations suggest that if we start out with a world full of pacifists, fighters can invade if something like game 1 obtains. Therefore, one cannot expect the other player to be a pacifist; pacifism is not an Evolutionarily Stable Strategy. (Recall that an ESS is a strategy that can resist invasion by another strategy when it is very common. If pacifists are very common, a rare fighter mutant will easily victimize them, be favored by selection, and increase rapidly on the evolutionary time scale.)

Maynard Smith illustrated the problem with what he called the "hawk-dove" game. He was thinking of birds defending territories for nesting. In the hawk-dove game, individuals can adopt either the hawk strategy, "fight for any territory you want, and fight to defend one if you have it," or the dove strategy, "occupy any open territory, but never fight." In this game, neither strategy is generally an ESS. When doves are rare, it pays to be a hawk, but when hawks are very common, it pays to play dove because the hawks spend a lot of time in costly fights with each other. Maynard Smith also investigated a strategy he call "bourgeois." Bourgeois strategists follow the rule "never fight to take a territory, but always fight to defend it." This strategy is an ESS, and cannot be invade by either hawk or dove. The war game, by allowing for partial seizure of territory by surprise attack, at no cost to the attacker unless the victim launches the mutually costly counter attack, is a rather

nastier game than the one Maynard Smith studied, but even in his game pure pacifism (all dove) certainly isn't an ESS.

Most perversely, in our war game both players have an incentive to attack first. Notice that whoever goes first confronts the victims of attack with a nasty dilemma. The victims have already lost 25 units, and if they decide to fight, will lose 75 more. A rational victim will swallow the loss it seems. This game turns the pacifism intuition on its head. Now it seems as if the world should be full of hair-trigger fighters who grab any opportunity to execute a preemptive first strike against any other player, for fear of being the victims if they don't strike first. Now we have to explain why the real situation is usually better than this, if a long way from pure pacifism, or even Maynard Smith's Bourgeois ESS.

War can be deterred by credible threats to retaliate. Schelling stresses the importance of communication in games like this. Suppose we can communicate effectively a willingness to go to war in the above game even if the cost is -100 if the other fellows strike first. We might invoke some principle of territorial integrity and try to convince our antagonist that we'll play a bourgeois style strategy, promising to retaliate if attacked, while assuring one and all that we ourselves have no territorial ambitions. If our threat and promise is believed, the other fellows will not strike first. It would be foolish to try to gain an advantage of 25, if you know that the next thing will be a -100 war, especially if you believe that the other guys will not strike first. As the theorists say "a credible threat will deter attack." So far so good. If both sides adopt this strategy and are believed, then we have "stable deterrence," and war will not occur. This is how the situation that prevailed between the U.S. and the USSR from 1950-1990 was often characterized. There is a hook here, however.

We have to be a bit irrational to accept the -100 rather than the -25 loss when confronted with a first strike, say the Warsaw Pact seizure of West Germany, to use the case that worried military planners in the Cold War period. "Better Red than Dead" people sometimes said. Especially in the case of nuclear war where the cost of a full-scale war is unimaginably large, the threat is not very credible if the players are rational¹. Our threat

1. Former President Ronald Reagan's famous (or infamous depending upon one's politics) "Evil Empire" speech is a case in point. At a time when most U.S. political leaders were attempting to tone down warlike rhetoric, Reagan lambasted the USSR as an "evil empire" that must be stopped at any cost. According to the logic described in this chapter, Reagan's speech may have helped motivate the Soviets to bow out of the arms race over the following several years. Many of us believed that Reagan was a doddering old zealot who really believed his militant rhetoric. More importantly it seems that Soviet policy makers really believed it, decided they couldn't win the Cold War, and, in essence, surrendered! Did he really believe it? We'll never know because no one called his "bluff".

will be credible if we can (irrationally) convince ourselves and our enemies that we are really playing the following game instead of the prototypical war game (Game 1 above):

Game 2

Player 2	Player 1	
	<i>fight</i>	<i>don't fight</i>
<i>fight</i>	P1 gets -20 P2 gets -20	P1 gets -25 P2 gets +25
<i>don't fight</i>	P1 gets +25 P2 gets -25	P1 gets 0 P2 gets 0

In this game, our threat is quite credible. If player 2 attempts to get +25 from us by fighting, we will surely fight as well, robbing him/her of the gain, because it is better to lose -20 than -25. Here there is no first-strike temptation, and deterrence is much more effective than in the case of game 1. Note that we are all better off if we *believe* this is the game we are playing, even if we actually are in the game 1 situation. It seems as if we are all better off if we are a little bit crazy, believing that war is much less dangerous than it actually is. On a small scale the Yanomamo man's dramatic displays of his fierceness, or the modern American street gang members demands for respect lest violence ensue, can be interpreted as mechanisms to try to make threats credible.

Irrational strategies lead to plausible coercion. However, if we admit irrational strategies, it is not clear we can make any gains. For example, suppose there is reason to believe that one player in this game is a bit crazy. A crazy player, or even just a bold gambler of the stripe of Napoleon or Hitler, can take advantage of the -100 (negative) payoff to coerce the other player rather than to deter. Suppose that the militaristic leader of a neighboring society is player one in the game above. Suppose he gives a speech in which he demands a bit of our territory (worth 25 units) or he will go to war. He brags that his army is so potent that he can whip us easily if we resist. At worst, it will only cost him -20. Our military chiefs say this is nonsense, the payoff is as in Game 1, not Game 2; war will cost both sides about -100. We may even know that our enemy's military chiefs are telling him the same thing. Hitler's military planners were much more rational than he was, and greatly feared his reckless course of aggression. But if our enemy persists in this irrational belief he will go to war and cost us both -100. If we are rational, at this point we should give up the territory, that will only cost us -25. This is essentially what the British and French "appeasement" strategists did when giving Hitler the German speaking areas of Czechoslovakia.

But if there are other rational leaders out there, they may observe our action and decide to pretend to be irrational to victimize us for another 25. Or the original militarist may come back for more, as Hitler kept doing. Or the militarist may just be bluffing. In communicating an apparently irrational willingness to fight, the militarist has put us on the horns of an exquisite dilemma. To win this game, not only must one be crazy, you must try to convince the craziest “statesman” around that you are crazier than he is. So the theory seems to say. Eventually, you may have to appeal to a sacred principle and call the crazy man’s bluff, as the French and British finally did when Hitler invaded Poland in 1939. Of course, Hitler wasn’t bluffing, he was a genuine megalomaniac!

Even the weak can be strong if their threats are credible. For example, let’s take another situation. Suppose we are a powerful but rational aggressor. We can easily impose a disproportionate cost on a neighbor if he chooses to resist, say four times as many casualties as we will take. Let us say we want a bit of territory worth a 1000 casualties. We demand the territory, and threaten our victims with 4000 casualties unless we get it. Suppose our victims respond that this is territory sacred to their nation, that their sense of honor is completely outraged by such a demand, and that they will fight to the last soldier (say they have 10,000). (This situation corresponds roughly to Polish responses to the demands of Nazi Germany in 1939.) If they are not bluffing, it is going to take 2,500 casualties of ours for a territory worth only 1,000, so we will be deterred. Do we attack in hopes that they are bluffing? Do we attack for fear that some of our previous victims will contemplate revolt if we do not follow through? Will the threats of the weak to fight irrationally be credible? In recent decades, the North Vietnamese and the Afghans showed the US and the USSR that they were willing to accept huge casualty rates in apparently very asymmetrical contests with Great Powers. The Somali warlord Mohammed Aidid has recently showed how a objectively weak but determined group can take on the UN, backed by world opinion and excellent US infantry, and win. George Washington strategy to win the American War of Independence is another example of the power of the determined weak against the strong. The Americans were hardly ever strong enough to win battles. But by demonstrating that they were capable of fighting on indefinitely, we eventually convinced the British the cost of winning was too high. Evidently, we should take the threats of the weak seriously.

No combination of strategies will solve the problem. The message seems to be that the rational player will always lose to irrational players in a world like this. Some game theorists have reached just this pessimistic conclusion. But if everyone is really irrational, then wars are likely to break out by accident. There is plenty of evidence that irrational players existed during WWII, such as Hitler, and for different reasons Japan. Plenty of wars do

seem to have broken out by accident and through gross miscalculation, like WWI. Thus, no combination of rational and irrational strategies seems to solve the problems caused by the game of war. This, combined with the commonness of wars, suggests that simple game theory analysis has something to say for it. But the fact that war is usually not perpetual—even between hereditary enemies—suggests that it is incomplete. Like the model of malthusian growth, the simplest game theory seems to tap a major underlying part of the problem of war, but needs some refinement.

D. More Complex Strategies

Schelling argues that humans have developed very elaborate strategies to avoid the worst consequences of “games” like war. For example, conflicts are typically escalated slowly, as the contenders assess each other’s resolve and explore compromises that might avoid the -100, -100 type payoff. Given the great advantage of surprise attack in war, it is remarkable how few wars start without extensive threats and negotiation. For example in the WWII case, only the German attack on Russia was a real political surprise. All the other international attacks that built up into this conflict were preceded by extensive exchanges of threats, diplomatic maneuvering, etc. Pearl Harbor was a strategic surprise attack, but the outbreak of war between Japan and the US had been considered likely for months and virtually certain for weeks before hostilities opened, as intense diplomacy and active sabre-rattling resulted in no compromises. Schelling imagines that these activities are an attempt to resolve the conflict short of war (or to make peace after a war has begun) by communication about intention, resolve, etc. The following two sections are examples of the arguments he developed.

One very general strategy is to try to arrange to convey a mixture of rationality and irrationality to opponents. Let us suppose we define our “sacred principles” so that we tell any potential enemies that we are nice reasonable fellows; we’ll suffer a certain amount of insult without going to war. However, the boundaries of our nation itself are sacred, and our honor can be trampled upon only just so much. As enemies start to insult us with their demands and seizures, we’ll remain calm for a while (because we know we’re strong, but we certainly don’t want to start a fight if it can be avoided, especially over trifling mistakes you might have made, or over reasonable disagreements and grievances we may have). Nevertheless, if you press our principles at some point we’ll get mad, and then, no matter how irrational it is, we’ll fight. None of us can be just sure when the restraints of reason will leave us. The best thing for potential enemies to do is to tread lightly around us and not risk challenging our honor. We all recognize this strategy. It is the image of heroic characters of fiction, and of the image that modern states try to project in their foreign policy.

Ronald Reagan played the roles in the movies, and then played them for real as President. This is a nearly universal strategy in “game” situations of the type we are considering.

Such strategies are reminiscent of the Bourgeois strategy in Maynard Smith's game. The reason such rules work so well is roughly this. If natural selection can settle upon some random rule to decide the game without a fight, players who follow the rule will do much better against each other than pure hawks who fight all the time. When playing against each other, Bourgeois players avoid the losses suffered from fighting another hawk. At the same time, however, they impose a penalty on any hawks who try to take an occupied territory. Strategies that take advantage of some asymmetry in the situation to resolve the conflict don't pay the costs of fighting. If some such strategy becomes reasonably common everyone who plays it against a fellow player will win the rewards of peace. But anyone who violates the rule will get sure retribution.

In this model, ownership is just an arbitrary rule, chance determines who gets there first. In fact, the owner probably has some investment in learning the territory not possessed by a potential invader that gives an additional reason for this particular rule to evolve. In any case, if all players agree on some sacred principles, like the principle of ownership being special, we may often be able to avoid wars. Indeed, the sanctity of borders is one of the key concepts we use to try to avoid war; violating another nation's frontier is typically the act that initiates hostilities.

Ritualization of conflict is very common. It may pay to advertise intentions, willingness to fight. If you are operating with some rule like Bourgeois, it often pays to let all potential contestants know precisely what will make you mad enough to fight. It may pay to advertise your fighting ability so weaker opponents do attack you by mistake. The idea is that each player would like to know the fighting ability of the opponent. Of course, each player is motivated to exaggerate its own ability and willingness to fight, especially if relatively weak. It is valuable to try to detect who is bluffing and who is not. Thus two contestants dance about and shout, trying to figure just how strong an opponent is. If he is clearly stronger and appears to know it, it is time to cut and run. And this is what animals often do; birds sing and engage in ritualized conflicts that are usually short of all-out fights.

In very general terms, people use the same strategies as birds. We articulate our principles in long speeches, send diplomats to explain the speeches, deliver ultimatums, rattle sabers, have military parades, conduct “maneuvers”, etc., apparently in an effort to assess resolve and strength so as to avoid all-out fights whenever possible. If all signals were honest communications of intentions and capabilities, we (and animals) would perhaps never actually fight. However, as we've seen bluff and deception can also be tempting strategies.

(There is a myth that animal fighting is so well ritualized that real injury is rare. In fact, as with humans, ritualization often succeeds, but also often fails.) Do our German opponents believe that we (the English) believe that they believe that our ally (France) is really only bluffing, and that we'll (Britain and France) all back down if they attack? If so what should we do about it? The British and French were fully resolved to go to war in 1939 if the Germans invaded Poland, but they couldn't get Hitler to believe them. It is practically impossible to play such intricate games perfectly, so disasters like World War II happen.

D. Fighting in Groups

The main way that human conflict differs from animal conflict is that humans commonly fight in groups. Animal fighting by contrast is almost always between two contending individuals. The exceptions are that close kin sometimes collaborate in fights. For example, Jane Goodall (1986) has described an example of "war" between two troops of chimpanzees, in which parties of two or three related males attacked and killed members of another troop. The social insects sometimes have organized fights between whole colonies. As we saw, even very simple human societies like the Yanomamo can do considerably better than this.

Humans are much more like the social insects than typical mammals in this regard. Even the simplest human societies can usually assemble war parties numbering in the 10s to 100s. Only a few societies, such as the Gebusi studied by Knauff(1985) appear to lack the ability to cooperate in fairly large numbers for war with neighbors. Very frequently, societies can mobilize all the adult males that it is logistically feasible to assemble for fights, although there are other cases in which fighting between groups within easy walking distance is common, such as Highland New Guinea.

Cooperation in war can be rewarding, but the public goods/altruism problem returns. The benefits of fighting collectively are very great. All other things being roughly equal, it is large armies that win wars, as Clausewitz (1830 [1976]) observed. Two-against-one is the classic recipe for an easy victory. An early 20th Century theorist of war, F.W. Lanchester (Jones, 1987), developed a theory that the superiority of a larger army relative to the smaller is in proportion to the ratio of the square of numbers, not the linear ratio. Doubling your force relative to your enemy multiplies your power by 4. His reasoning is simple. Suppose a force of 100 confronts a force of 50, and that 10% casualties are caused by each volley of fire. In the first volley, the larger force is reduced to 95, and the smaller to 40. In the second round, the large falls to 91, and the smaller to 30, while in the third the numbers are 87 and 21. The larger force will soon annihilate the weaker, and still have most of its strength intact. Thus there is a great advantage to assembling the largest possible fighting

force. The problem is that fighting produces public goods. Defense and booty are collectively acquired, and the risk to the soldier for doing his share is very large. It will require powerful kin selection, reciprocity, or group selection mechanism to get collective fighting. Not surprisingly, only a few animals have managed to solve this problem. Humans are one of them, and it is of great theoretical interest to know the reason. It is also of practical interest, since this is one problem we would probably be better off not having solved. It would be nice to unsolve it, so long as we can avoid unsolving other public goods problems, such as peace within groups. *It definitely will not do to go back to being typical mammals.*

III. The Natural History of Warfare

A. Basic Data

Nearly all societies known have wars. A reasonable amount of work has been devoted by anthropologists to the study of “deadly quarrels” among primitive peoples. Unlike what you may have read, there are very few completely peaceful societies. K. F. Otterbien (1985) a student of the evolution of warfare, found that 92% of the societies in his cross-cultural sample of mostly primitive societies engaged in warfare. The ones that did not were exceptions for obvious reasons (small societies alone on distant islands, or relict hunting groups dominated by an overwhelmingly more powerful group). However, there are substantial variations in military organization, the size of groups that commonly cooperate in violent conflict, the prevalence of inter-society vs. between society violence, the magnitude of casualties in fights, and the frequency of fights.

B. Andreski’s Three-Dimensional Taxonomy of Military Institutions

The anthropologist Stanislav Andreski (1968) developed a useful scheme for classifying military structure, and discussed its relationship to other culture core factors. Essentially, he systematically assembled the data from the discovery of human diversity as it pertains to military matters. He used three variables to classify military institutions:

(a) *The military participation ratio (MPR)*, is the proportion of able-bodied males enrolled in the warrior class. This varies as a function of military technology. How costly it is to train and equip an effective warrior determines whether this is a specialized or general occupation. When the best technology is expensive metal armor, and the training period long, the MPR is low. Mass armies are a product of simple or cheap technology, stone-tipped spears or mass produced rifles.

(b) *The degree of subordination*: A hierarchical command structure is militarily most effective, but in many egalitarian societies, people will not tolerate such structures. This is supposed, for example, to be one of the disadvantages of democracies in military competition with more command oriented states, though the democracies may compensate with higher morale, more individual

initiative, and other advantages.

(c) *The cohesiveness of the military organization*: To what extent will the separate parts of the military organization of a society come together to act in concert? Subordination implies cohesiveness but not the other way round. In some societies, a common bond of sentiment may cause the assembly of large armies, without there being any overall command structure. The tribal segmentary lineage systems separate substantial cohesiveness with little subordination.

Andreski scored various feasible combinations of these three dimensions on a high-low scale to get an ideal-type taxonomy for analytical purposes. We'll adopt his convention of using capitals for High on the dimension and lower case for low.

1. *The M-s-c type (many simple hunting and gathering, and horticultural societies)*: This characterizes societies with high participation, but low subordination and cohesion. This type is characteristic of hunters and gatherers and simple horticulturalists. Dispersed residence, egalitarian norms, and simple weapons seem to favor this type. Some such societies are characterized by very active feuding and small-scale warfare, but large-scale military operations are inhibited. The warfare among simple horticulturalists in New Guinea and Amazonia is often close to the extreme of this pole and is relatively well-studied. Settlers expanding on a frontier often exhibit this type, as in the self-help military activity of Anglo settlers against the Indians.

2. *The M-s-C type (many horticultural and pastoral societies)*: This is the same as discussed above, but with high cohesion added. The Plains Indian tribes and other pastoral societies furnish examples. Here a bond of sentiment and norms of within group peace make the whole tribe an effective fighting unit despite weak subordination. According to Otterbein (1968), cross-cultural evidence shows that type one societies are characterized by patrilineal residence, whereas type two societies are characterized by matrilineal residence or other institutions, such as men's societies, that cross-cut the loyalties of closely related males. Recall here the discussion in Chapter 13 on conformist transmission and the evolution of altruism, where we discuss another study with the same general result. The key idea is that the size of the unit that cooperates should be determined by the size of the unit that is socialized together, and subject to conformist transmission.

3. *The m-s-c type (feudal anarchy)*: In this type low military participation is combined with low cohesiveness and subordination. This is the pattern of feudal anarchy. When weapons are expensive, as the equipment of medieval knights was, single heroic warriors and small collaborative groups of warriors may be the dominant pattern. This pattern seems most common on frontiers (e.g., the areas of militarized Germanic expansion east into

country dominated by the Slavs during the Middle Ages), or in central areas after a breakdown of central authority. There is a disproportion between the sophistication of weapons and the sophistication of political institutions.

4. *The m-S-C type (small professional armies)*: The existence of a small, cohesive, disciplined military elite is a common pattern for agrarian states. When weapons are expensive, and/or the mass of people cannot be trusted with weapons, this type will arise.

5. *The m-s-C type (warrior conquest societies)*: This is a relatively rare one. It usually occurs as a transitional type when an M-s-C society imposes itself by conquest on a host population. Ancient Sparta was an example of a society that managed to institutionalize this type for a long period after the Dorian conquest of Greece. Usually, after a period of consolidation, these mature into agrarian states of the m-S-C type.

6. *The M-S-C type (modern armies)*: Mass, disciplined, cohesive armies are the type we are mainly familiar with in the industrial world. Industrial improvements in weapons and transportation, plus the rise of nationalistic sentiments has made such armies *de rigueur* ever since the French Revolutionaries showed how effective this pattern could be. Napoleon's conquests were possible because the French got a head start on this type using the mass enthusiasms of the 1792 revolution as a basis for expanding military recruitment to the whole male population, and the rationalism of the period as a basis for organizing, equipping and supplying the huge armies that resulted. Historically, a few agrarian states used this style of organization when they could depend on the loyalty of the majority, and weapons were cheap enough to equip such armies. Alexander the Great used such an army of Greeks for his conquests, and the Venicians developed their navy on this principle in the early period of her dominance. Normally, however, the expense of arms and the narrow power base of agrarian societies made arming the mass of subjects unattractive to rulers.

Andreski was much interested in the evolutionary transformations from one type to another. You can duplicate his reasoning for yourself, following the hints given above about weapons costs and political evolution.

IV. Hypotheses

A number of hypotheses have been advanced to account for the existence of warfare and to explain the variations in scale and frequency we know to exist. This area is rather confused and controversial. Perhaps warfare has confused most scholars except the game theorists because most people have hunted for an adaptive explanation for war, or have considered it merely stupid and evil. The game theory models are not nearly as well appreciated

by anthropologists, at least, as they should be. Few have considered the possibility that evolutionary processes can favor behaviors that are so pathological (relative to common-sense ideas of adaptation) as violent conflict. Even smart and well-meaning folk get trapped by the logic of the war game; *it is the situation that is fiendish more than the individuals*². The following discussion hits some of the high points.

A. Evolutionary Mistake Hypotheses

Robert Ardrey and some other popularizers of animal behavior studies have argued that humans are innately aggressive. In the distant past we were selected for abilities to defend territories and mates, and in recent times this tendency finds a pathological outlet in war. The problem here is that first we need to understand why any animal would engage in games of the negative sum type, and specifically why, if the vestigial instinct exists, it gets expressed as large scale conflict. Why aren't we satisfied with barroom brawls and ritualized equivalents such as football, hockey, etc.?

Warfare could also be a cultural rather than a genetic vestige. This is a cultural variant of the Ardrey hypothesis. Warriors are often motivated by cultural notions of honor and prestige to fight. It seems possible that these notions were once adaptive but no longer are. Or it is possible that they are maladaptive outcomes of the runaway indirect bias process, and never were adaptive in the usual sense of the word. The anthropologist C. R. Hallpike has defended a hypothesis like this.

B. Individual Advantage Hypotheses

The anthropologist W. Durham (1976) gives a sort of sociobiological explanation for war. He thinks that wars enhance the individual fitness of participants through acquisition of booty by winners, and through effects on inclusive fitness of those who lose their lives, say defending their kin. This hypothesis will clearly fit some kinds of small-scale fighting well. Selection should favor selfish seizure of others resources if the benefits exceed the losses.

This hypothesis begs the problem of war, if not of violent conflict more generally. First, the destructive nature of violent conflict seems to guarantee that fighters on average must lose resources. Fighting consumes resources, but doesn't produce any, seemingly guaranteeing the negative sum game analysis. The lucky few may find temporary conditions where the acquisition of resources by violent seizure pays dividends but how could this be the general case? Even primitive war seems to give examples of negative sum games

2. This is not to say that we count Hitler, Napoleon, and Ghengis Khan among the world's basically well-meaning citizens!

in which neither party can expect a net positive payoff. In the beginning, the more militarily able groups may prosper on booty, but the destructive nature of war means that losers are likely to disappear or acquire the means to defend themselves. Second, when the groups fighting are much larger than a kin group, selection ought to favor cowards and slackers, those that expose themselves to minimum risks to acquire booty or provide defense. Both booty and defense are public goods, and subject to all the problems we have already examined.

C. Group Advantage Hypothesis

Several anthropologists have advanced the hypothesis that warfare serves group-functional purposes. We have met group selection mechanisms that might be used to explain how all this works. Either the conformist transmission effect (frequency dependent bias), or the tendency of the runaway process to generate group variation, might lead to the large scale of war as well as individual sacrifices for the production of public goods we observe. A convincing hypothesis should be able to account for both of these factors.

This hypothesis is so common in anthropology that we might think of it as the orthodox view although it often is difficult to imagine how such behavior could have evolved. In particular, the hypothesis is defended by A.P. Vayda, R.A. Rappaport, and Marvin Harris, among others. Vayda (1960) started things off by arguing that Iban and Maori warfare were adaptive because war in those cases functioned to redistribute populations relative to space. Warfare evened out resources and optimized population growth.

It was not clear, however, how warfare was adaptive when land became scarce. Rappaport (1968) tried to deal with that problem by arguing that warfare also was a means of population regulation—a way of removing enough persons from the population to prevent overuse of resources and environmental degradation. He argues that the population control system of the Tsembaga Maring of New Guinea is embedded in a cycle of rituals that involve the slaughter of pigs. These belligerents may resume hostilities only after the climax ritual has been completed and this is possible only when there are many pigs available to slaughter. Foin and Davis (1987) used mathematical models to test several alternative hypotheses about the stability of Maring ecosystems. They summarized the pig ceremony/warfare dynamics as follows:

Rappaport proposed that the key epideictic [ceremonial] signal for the Tsembaga Maring is the intensity of female labor. In the Maring division of labor, females are principally responsible for pig husbandry. Women tend the gardens, prepare the food, and feed the pigs. These are labor-consuming tasks; Rappaport estimated that immediately before the ceremonial pig slaughter that he witnessed, pigs were consuming...[more than half of the main carbohydrate source foods]. Gardens were 36% larger before the pig sacrifice than after-

wards. The intensity of female labor is directly proportional to pig density and thus is an attractively simple index of environmental quality. Rappaport argued that as labor devoted to pig husbandry increased, complaints about the workload would also, thus triggering a *kaiko* [ritual festival] as the only response that could relieve the workload. An incidental, but crucial, consequence of the *kaiko* is that warfare usually resumes shortly thereafter (Foin and Davis, 1987:12).

As the timing of the ritual is dependent on the size of the pig herd, rituals (and warfare) usually occur in 10-12 year intervals. Thus, occasional warfare runs the population and regulates it well under carrying capacity, but does not occur so frequently that too many people are removed.

Marvin Harris (in Ferguson, 1984) also thinks that primitive warfare is a population regulator, but is unconvinced by Rappaport's argument; his own is both more clever and more contrived. He notes that primitive warfare is in general unlikely to be an effective means of regulating population growth, as only males are likely to be killed. Killing males has little effect on population growth, especially where polygyny is practiced (e.g., combat deaths in World War II had little effect on European population growth rates; an awful lot of males have to be killed before there are too few to get the essential business of sexual reproduction accomplished!). Thus, if we wish to marshal a convincing argument for the regulation properties of warfare, it must somehow be connected with the removal of females, too. Harris claims it is, but in a circuitous way.

In Harris' view that happens through a connection that war has with female infanticide; he thinks that female infanticide is much more common than it is reported to be, since it more often takes the form of benign neglect rather than overt homicide. But the question that rises is how are parents motivated to overcome their reluctance to remove their own children? The answer is that warfare provides the incentive. Consistent warfare implies that group survival is dependent on males. That, in turn, encourages development of a male-centered ideology that exalts males and denigrates females; thus, female infants have no cultural value and are slaughtered for the welfare of the larger population.

Warfare also helps limit population is a less direct way, according to Harris. When groups fight consistently, they are likely to leave some intervening space between belligerents unoccupied. That limits the amount of territory available for exploitation and limits population, although it simultaneously provides refuges for wild life and seed dispersal. The main conclusion, however, is that female infanticide and warfare are the price that primitive peoples pay for population regulation. (The problem, of course, is that most of the reported cases of female infanticide occur among foraging populations that rarely practice extensive warfare at all, seems unrelated to warfare, and occurs for reasons that benefit in-

dividual parents rather than social groups).

You should all be able to spot the problem with these hypotheses; selection on groups ought to favor increases of those groups! The typical anthropological argument seems to produce population regulation among a group of groups, all Maring, not just the units like the Tsembaga that compete. This seems more likely to be a by-product of warfare, not something that a group selection process would favor directly.

In the case of the war-like forest horticulturalists of the Amazon, like the Yanomamo, population densities are very low indeed. Here it can be argued that the variable-sum nature of chronic warfare has reduced human populations far below carrying capacity as an unintended consequence of war. The Yanomamo move frequently and keep large spaces between themselves and hostile neighbors, much larger than resource conservation seems to require. In addition to the group selection mechanism, the more perverse processes outlined by the game theorists seem to be operating. Conflict over resources does seem to be an important underlying motive for warfare, but this is likely to favor groups that can expand using military superiority. In a highly competitive situation like that faced by the Yanomamo, the size of population depends upon maximizing security against attack, and the tropical forest makes surprise easy, and first strike the strategy of choice. Irrespective of subsistence carrying capacity you've got to be so distant from hostile neighbors as to make attack unlikely.

In other words, the typical group-functional hypotheses miss the perversity of the evolutionary situation set up by the war "game" analysis. Warfare is liable to evolve even if makes everybody worse off. From this perspective it is vain to look for ordinary adaptive arguments for warfare.

D. Deterrence/Coercion Hypothesis (Evolutionary Tragedy Hypotheses)

This theory follows from the conclusion of the last paragraph. The game theorists' analysis seems to suggest that it is an error to treat the 'evolutionary mistake' hypotheses and the functional hypotheses as if they were opposites. To the extent that evolution under war "game" conditions leads to a certain irrationality and to a rather pathological result, it may be that the two hypotheses are really the same. The proud, touchy, boastful warrior, who loves war and fighting for its own sake may in whole or in part be the evolutionary result of the peculiarities of the situation of the potential use of violent conflict for coercion. Thus, a hypothesis like Hallpike's may be quite consistent with functional evolutionary explanations in the context of the overall perversity of the problem of war. We might call this the "evolutionary tragedy" hypothesis; the only practical way to avoid victimization by aggressors and to avoid most wars is to be conspicuously prepared to fight. The penalty here

is that mistakes will be made, in part because of the underlying first strike logic of the war game. It is functional to prepare for war in a world of pacifists, because they are so easily taken advantage of. In a world full of warriors, one must be prepared to fight to defend oneself. To prepare for war is sort of an irrational necessity. How would *you* characterize it?

Evolutionary Tragedy Hypothesis:
Preparing for war is an irrational necessity. The only practical way to avoid being victimized by aggressors and to prevent most wars is to be conspicuously prepared to fight. The penalty here is that mistakes will be made, in part because of the underlying first strike logic of the war game. In a pacifist world it is still functional to prepare for war because pacifists are so easily taken advantage of. In a world full of warriors, one must be prepared to fight to defend oneself.

E. Group Selection Hypothesis

An element of group selection seems necessary to explain the scale that war reaches, at least in advanced agrarian and other more complex societies. The deterrence hypothesis seems to be necessary to explain the apparent tendency of societies to engage in wars, or at least be armed and ready to engage in them, even though on average they result in a net loss to all participants, but the same theory applies at any scale of conflict. As we argued in Chapter 13 as well as here, warfare is an example of the extreme degree of cooperation, and human cooperation is hard to explain using conventional evolutionary mechanisms.

A compound hypothesis, combining the basic deterrence game theory model of violent conflict with the hypothesis that cultural group selection provides the mechanism to account for the large scale of human warfare, is plausible on deductive grounds.

V. Test of Hypotheses

If the compound hypothesis is correct, and the evolutionary mistake, individual advantage, and simple group selection hypotheses are less correct or partial explanations, the data should show the following kinds of patterns.

A. Pattern 1: Conflict Should Have a Tendency to Be Ritualized

Societies should have a tendency to use displays of power and saber-rattling much more frequently than actual wars breaking out. Wars should result from miscalculations, where compromise failed or where the eventual losers miscalculated their chances.

Primitive war, especially among horticulturalists, is notoriously highly ritualized. Many battles take place at set times, and are broken off after a few casualties. Often, there are various contests short of deadly fights that seem to be tests of strength, such as the club fights of the Yanomamo, the singing insult fights of Inuits, etc.

In the modern period, showing the flag in troubled waters, diplomatic threats, and the like are much more common than actual wars. And little wars, perhaps to demonstrate intent to bigger enemies (e.g. the U.S. invasions of Grenada and Panama) are much more common than big wars, which however, are responsible for a very disproportionate share of casualties (Richardson's data). Impressionistically, errors seem to be a common cause of costly wars.

Actual wars should tend to result from miscalculation, when ritualized communication of strength and intent fails for some reason. We have already considered examples from WWII. Consider a completely different scale of organized violence, gang warfare in American urban areas. Normally gangs are deterred from entering the territory of other gangs and other major aggressive acts by the threat of retribution. Low level scuffles maintain the credibility of deterrence by ritual demonstrations. Occasionally, the impulsiveness and touchiness of gang members leads to unpredictable outbreaks of drive-bys, and retaliation for same. Incidentally, successful gangs are neighborhood institutions of fairly considerable sophistication. The element of cooperation involved is often underestimated (Sanchez, 1991).

Societies should also take great pains to display and make credible their willingness to go to war if pressed too hard, even though they also attempt to leave open avenues for compromise. Perhaps the most clear cases in support of this hypothesis are the polices of small neutral countries like Switzerland and Sweden. They are too small to provide a credible offensive threat to their neighbors, but spend large sums on defensive weapons and training. Any of their neighbors could defeat them, but none have tried recently, perhaps because the threat is credible and the neutralism believed. These countries can play "bourgeois" to the hilt. Note that large countries cannot adopt this strategy too freely, because their military preparations are too easily viewed as posing a first strike offensive threat. The Soviets worry about US military preparations, but can afford to ignore the Swedes and the Swiss in most calculations.

Similarly, the warrior complex of many horticultural and pastoral societies might be interpreted as an attempt to convince neighbors of their fierceness. Headhunting, reckless displays of courage, a touchy sense of honor, and the like, combined with an active diplomacy via marriage exchanges, ceremonies and the like seem to fit this expectation. The Ya-

nomamo certainly cultivate their violent reputations, as we saw. Urban gangs have institutions rather resembling these.

B. Pattern 2: Most Wars Fought Between, Rather than Within, Societies

If a group selection processes is operating, wars should be fought disproportionately between societies, rather than within them. According to L. F. Richardson's data, internal war is scarce relative to war between distantly related groups. That is, the social units that are group-selected should provide domestic tranquility, but wars between such units should be fairly common. Richardson's data on recent wars support this hypothesis. International conflicts are much more common than civil wars, and most civil wars involve major cultural differences between the participants (e.g., class differences as in the Russian Civil War, sectional differences as in the American, or religious differences, as in the case of the 350 year-long Irish rebellion against Great Britain). Also, Richardson's data show a marked tendency for culturally similar countries not to be involved in wars against each other, despite a tendency for neighboring countries to fight each other. Similarly, ideological differences are often important in wars. An alternative hypothesis here is that miscalculations are less likely between ethnically and ideologically similar people, who are less likely to misjudge each other's intentions.

The segmentary principle works in highly war-like pastoral and horticultural peoples and in modern contexts. Even though there is much small scale fighting, distinctions are made along ethnic lines. War with co-ethnics tends to be rarer, and more highly ritualized. War with true foreigners usually lacks the casualty-limiting prohibitions that characterize intra-ethnic fights³. John Dower's *War Without Mercy: Race and Power in the Pacific War* (1986) examines the effect of racism on the way the war between the U.S. and Japan was conducted. Dower draws upon American and Japanese songs, slogans, cartoons, propaganda films, and secret reports. to study how and why each side characterized the other as subhuman—and the effects of those characterizations on how the war was fought. Figure 18-1 illustrates how conflict between nations with very different cultures can be exacerbated by the perception of opponents as inhuman.

Historically, the group selection process might result in a steady escalation of the scale of cooperation over time. That is, all other things being equal, large societies can mobilize more resources for defense and offense than small ones. Also, large societies can perhaps provide more domestic peace and prosperity than small ones through solving public goods problems. One might argue that the tendency for social and political units to increase

3. Recall here the segmentary principle that is most clearly exhibited in the case of pastoral societies.

Figure 18-1. War between peoples whose cultures are truly “foreign” often lacks the casualty-limiting prohibitions that characterize intra-ethnic fights. Here cartoons from U.S. popular media during WWII are compared with similar Japanese cartoons. (Source Dower 1986:184-193.)

a) “Exterminationist sentiment... was reinforced by depicting the Japanese as vermin.” The following cartoon appeared in *Leatherneck Magazine* in March 1945, the same month that the U.S. began incendiary bombing of Japanese cities (Dower 1986:184).

Louseous Japanicas

The first serious outbreak of this lice epidemic was officially noted on December 7, 1941, at Honolulu, T.H. To the Marine Corps, especially trained in combating this type of pestilence, was assigned the gigantic task of extermination. Extensive experiments on Guadalcanal, Tarawa, and Saipan have shown that this louse inhabits coral atolls in the South Pacific, particularly pill boxes, palm



trees, caves, swamps, and jungles. Flame throwers, mortars, grenades, and bayonets have proven to be an effective remedy. But before a complete cure may be effected the origin of the plague, the breeding grounds around the Tokyo area, must be completely annihilated.

b) In this folkloric rendering by Sugiura Yukio, “Japan’s wartime mission is associated with the divinely born Momotaro... who, with the aid of a dog, pheasant, and monkey subdued threatening demons from a distant land (Dower 1986:198).”



in size over time during the last 10,000 years supports this prediction.

C. Pattern 3: Wars Tend to Cost Both Sides More Than They Gain

If wars mostly result from failures of deterrence, rather than from rational use of military power to take advantage, wars ought to commonly cost both sides more than they gain. This seems to be impressionistically correct for major recent wars at any rate. L. F. Richardson reports that economic causes cannot account well for wars, but he did not make any analyses that test this prediction exactly.

IV. Consequences of Warfare

Wars have winners and losers, and losers often have to flee. The society with the better resource-use strategy and that is able to maintain a higher population, will generally out-compete a technically less sophisticated society. Appeals to violent conflict are likely to speed up this process.

Weaker societies may adopt the military and subsistence techniques of stronger ones as a defensive measure, more or less conscious of the fact that failure to keep up will leave them vulnerable to conquest or eviction.

The anthropologists Naroll and Wirsting (1976) attempted to calculate the relative importance of population migration and borrowing in cultural evolution. They compared long lists of traits in 78 triads of societies, a “base” society, a distant society with a similar language, and a neighboring society with a different language. The neighbors with dissimilar languages tended to be more similar than the distant ones with similar ones. However, this comparison does not control for environmental similarities and differences. It is clear that population movements and expansions have been important in cultural evolution but relatively how important is difficult to say on present evidence.

Epidemic diseases often accompany conquerors, as we will see in a later chapter. Also, prolonged campaigning in a given region has led to drastic depopulation as a result of direct deaths of civilians, famines, and disease. For example, the 100 Years War in France was very destructive, as were the wars of religion in Germany, and the prolonged civil wars in Chinese history. As was mentioned above, chronic warfare among stateless people may keep populations far below carrying capacity, though the case is controversial.

VII. Conclusion

Compared to the scale of the problem, we know surprisingly little about why war exists. To our way of thinking, the evolutionary tragedy that derives from the nature of con-

flict is part of the explanation. The other part derives from the human propensity to cooperate. This last part gets us from murder to war. This is a highly unpleasant conclusion, because it leaves us with only the clumsy, error-prone process of deterrence due to an irrational willingness to fight to avoid fighting and victimization by coercion. If anybody has a good idea for getting out of this mess, they should speak up!

Note that we have now assembled a considerable fund of examples where selective forces on culture and genes will not result in adaptations in the usual sense. Although we can conceive of a peaceful society—one that does not have excessive males, and is free of exaggerated, maladaptive traits arising from runaway processes—evolutionary forces may well tend to lead us away from such a state! Understanding that much of the problem of large-scale conflict arises from the dynamics inherent in use of force situations gives us important clues about how to manage conflict on this scale. These clues are hidden by many contemporary social science approaches that tend to assume that the intentional actions of individuals and groups are the sole source of social problems.

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