

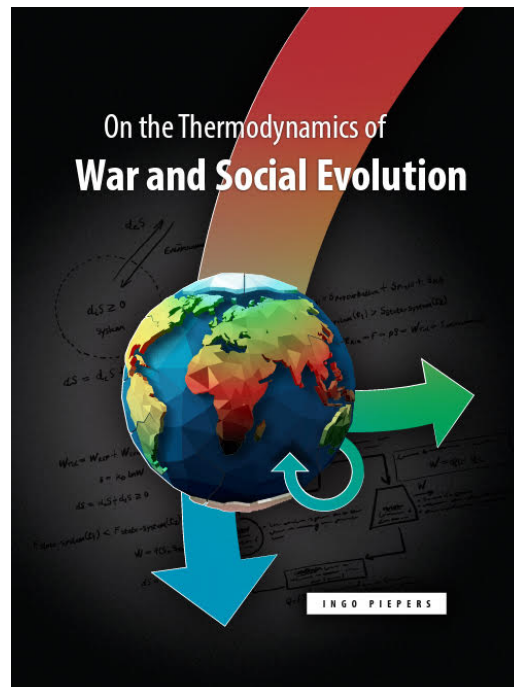
A critical evaluation of “*The Better Angels of Our Nature*”, a study by Steven Pinker

Ingo Piepers

Global4cast.org, Amsterdam, The Netherlands
ingo@global4cast.org

Version: May 5th, 2019 (050519)

*This paper was initially published on May 10th, 2017. The observations and arguments presented in this paper are confirmed by my latest research “**On the Thermodynamics of War and Social Evolution**” (2019). The latest research provides a (more) in-depth scientific explanation.*



ABSTRACT

In this paper, I evaluate Steven Pinker’s study with the title “*The Better Angels of Our Nature. A history of violence and humanity*”. In this study, Pinker optimistically argues that ‘*violence of kinds*’ is decreasing, and that we are now experiencing a ‘*Long Peace*’. I show that as far as war and the war dynamics of the System are concerned, this is not the case; to the contrary, the System is currently producing a fifth - a first global - war cycle. I show that Pinker’s optimistic interpretation is based on a wrong interpretation of war data, and the absence of a scientific theory: Pinker - and other historians - failed to identify that the System regulates its energy-state through an emergent self-reinforcing dynamic, consisting of accelerating war cycles with remarkable consistent properties.

war | war dynamics | finite-time singularity dynamic | accelerating war cycles | social integration and expansion

SIGNIFICANCE STATEMENT

Our understanding of the war dynamics and development of the System still are very rudimentary; until now we failed to recognize that the System is highly deterministic. Our limited understanding of the System’s (war) dynamics and development contributes to the dire condition of the System, and our impotence to take control over the System. Humanities experience with war - our inability to take control - has caused a condition of *collective learned helplessness*. A paradigm shift is urgently needed to improve the quality of historical research and policy advise.

I. INTRODUCTION

In his book with the Title "*The Better Angels of Our Nature. A history of violence and humanity*" Steven Pinker optimistically argues that "*we may be living in the most peaceful time in our species' existence*" and argues that "*despite the constant stream of news about war, crime and terrorism, violence of all kinds has been decreasing*". "*No aspect of life is untouched by the retreat from violence*", according to Pinker and that we now witness a 'Long Peace', a condition that can be attributed to "*the better angels of our nature*" (1).

The study was published in 2011. Although '*the world*' and its (war) dynamics have changed dramatically in the meantime - as my research predicts (2), (3) - Pinker's study is meant to stand the test of time, as he argues himself.

In his analysis, Pinker focuses on "*violence at many scales, in the family, in the neighbourhood, between tribes and other armed factions, and among major nations and states*". Pinker observes that since the Second World War (1945) "*the global trends in almost all of them, viewed from the vantage point of the present, point downward*".

Pinker argues that since the Second World War a sharp decline can be observed in the frequency and destructiveness of wars.

I argue that Pinker's conclusions - at least his conclusions regarding the war dynamics of the System - are wrong and based on a misreading of the statistics he used for his research.

Pinker - as well as other scientists and historians - have failed to identify: (1) cyclic patterns in the war dynamics of the System, (2) the 'underlying' laws and mechanisms that determine and shape these dynamics, and the development of the System, and (3) the purpose of war dynamics, to regulate the tension levels in the System.

Pinker and other historians and social scientists, miss the crucial point, that deterministic laws provide a 'playing field' - a domain - for social development and events (that to a degree are probabilistic/contingent). These 'underlying' laws and mechanisms determine and shape the (war) dynamics and development of the System. Social developments - including historical processes - can only be understood and be correctly interpreted, when this 'underlying' deterministic domain - and its interaction with probabilistic events - is taken into consideration.

Pinker's conclusion and optimism are - regretfully - not justified. His study "*The Better Angels of Our Nature. A history of violence and humanity*" (1), like Francis Fukuyama's book "*The End of History and the Last Man*" (4), and the 'claims' both scholars make, are the result of the same shortcoming: the absence of a scientific framework. The result is not a thorough scientific analysis, but - I regret to say - wishful thinking.

In this paper, I present an analysis of Pinker's research and present my arguments.

The introduction of this paper is followed by a short overview of Pinker's observations and conclusions related to the war dynamics of the System. In the chapter that follows, I discuss my research, and explain the discrepancies between Pinker's and my own findings. In this chapter I refer to the appendix of this paper, where I discuss Pinker's analysis in more detail.

In the final chapter - with the title: 'Paradigm Shift' - I discuss, the reasons why historians and social scientists have failed - and still fail - to identify patterns in the war dynamics of the System, and in the relationship between war (and war dynamics) and the development of the System.

In my research, I show that physical laws also apply to social systems and their dynamics, and that a paradigm shift is urgently needed to give historical research a scientific footing. A 'narrative approach' to the analysis of historical processes and developments cannot serve as a substitute for the scientific method. The (generally) poor quality of foreign policy advice is also related to this fundamental shortcoming. I argue that my research provides ample proof that the application of the scientific method - in combination with new insights in complex systems and networks, and the application of concepts related to theoretical physics - enables us to start understanding the functioning of the (international) System, and the role we - humanity - play in the dynamics of this System.

II. PINKER'S OBSERVATIONS

In this paper, I focus on Pinker's analysis of war dynamics of the System and his interpretation of the data he uses. Pinker's analysis and interpretation are discussed in chapter 5 of his book, with the title: "*The Long Peace*" (1).

Pinker explains, I quote: "*The goal of this chapter is to identify the components of the long-term trends in wars between states. I will try to persuade you that they are as follows*":

Pinker's four components of the long-term trends in wars between states are:

- No cycles.
- A big dose of randomness.
- An escalation, recently reversed, in the destructiveness of war.
- Declines in every other dimension of war, and thus in interstate war as a whole.

Pinker is not able to persuade me that his conclusions are correct, to the contrary. Based on a detailed analysis of his study (see appendix), I come to the following conclusions concerning his four components of long-term trends, Pinker argues he identified:

(1) **Cycles do exist.** The System¹ - Europe² - produced four accelerating and remarkably consistent war cycles during the period 1495-1945, that accompanied a finite-time singularity dynamic that was instrumental in regulating the energy-state of the System. The System collapsed in 1939. By means of the fourth systemic war (the Second World War, 1939-1945) that followed the collapse, simultaneously two non-anarchistic structures were implemented in Europe (that merged into one, following the collapse of the Soviet Union in 1991), and a first

¹ The System I refer to, consists of interacting communities (that eventually evolved into states), and of international orders these communities 'interactively' implement(ed) and on which they collectively depend for their survival. The 'parts' - basic elements - of communities are individual human beings and 'groups' they form.

² If in this paper, I refer to 'the System', I refer to communities (later states) in Europe that until 1939 made up the (core of the) System and dominated its war dynamics.

international order at the global scale of the (now) global System. The global System is now producing a first *global* war cycle, that could well be the first war cycle of a *second - now global - finite-time singularity dynamic*, that will also be instrumental in the process of *social integration and expansion* of the global System.

(2) **It is not randomness.** The war dynamics and development of the System are determined and shaped by underlying deterministic laws and mechanisms. The randomness Pinker observes, is mostly the manifestation of chaotic war dynamics that are deterministic - but also intrinsically unpredictable - in nature. Randomness and probability are restricted to (contingent) dynamics and events, in the *contingent domain* of the System: But there only is *latitude* for contingency as long as deterministic laws are obeyed (2). Deterministic laws - for example - determine the start-time, duration and severity (battle casualties) of systemic wars, while 'only' the justification to fight these wars and how we fight, are left to our 'human' discretion. Our *free will* is much more limited than we think it is, and as far as free will exists, we do not use it wisely; we let ourselves be guided by *selfish (interacting) self-fulfilling prophecies*, that ensure we obey the laws that apply to the dynamics of the System.

(3) **The destructiveness of war is not reversed, to the contrary.** See also above. If we do not take control of the self-organized - potentially self-destructive - war dynamics of the System, which have their autonomous momentum, war will become increasingly destructive, and expand to a global scale of the System.

(4) **There is No decline in any dimension of war.** See above.

There is no '*retreat from violence*' as Pinker argues (1). To the contrary: We obey the destructive regime the System imposes on us, in its System's efforts to regulate the energy state of the System, and optimize 'collective' survival.

Humanity's nature has not fundamentally changed; that would be remarkable given the time scale evolutionary process work on; modernity can still not compensate for humanity's limitations. The current developments in the System are powerful reminders of these limitations.

Pinker argues that *six trends* can be observed (1). The *Long Peace* Pinker refers to (the fourth trend), he argues took place after "...*the end of World War II. The two-thirds of a century since then have been witness to a historically unprecedented development: the great powers, and developed states in general, have stopped waging war on one another. Historians have called this blessed state of affairs the Long Peace*". As I explain in this paper, this is an incorrect observation, based on misinterpretation of war data, and unawareness of the presence of four accelerating war cycles, and a fifth (now global) war cycle that is unfolding.

I regret to say that Pinker's "*New Peace*" does not exist: A new series of (accelerating) war cycles - but now at a global scale of the System - is in the making.

III. A CONSISTENT FRAMEWORK FOR ANALYSIS

The problem is that Pinker - as well as other historians and social scientists - failed to identify a number of very persistent and consistent patterns - regularities - in the war dynamics of the System, that started - ‘emerged’ - around 1495, when circa 300 communities in Europe (predecessors of state-structures) became sufficiently connected, and interacted sufficiently to produce system behaviour. In 1495, Europe (the System) acquired sufficient critical mass to produce a self-sustaining finite-time singularity dynamic that was accompanied by four accelerating war cycles; the singularity dynamic constituted an emergent mechanism that regulated the energy-state of the System, and eventually produced a next level of social integration and expansion (1945) (5).

The *System* consists of interacting communities (that evolved into states), and of international orders these communities ‘interactively’ implement and on which they collectively depend for their survival. The function of international orders is to regulate interactions between communities, in efforts to maintain the status quo.

From that point in time (1495), the process of *social integration and expansion* - that was already unfolding for some time in Europe - accelerated dramatically, and a self-reinforcing feedback structure started dominating the war dynamics of the System: The war dynamics of the System were instrumental in integrating the growing communities in Europe, and expanding Europe - the core of the System - to the non-core (‘the rest of the world). The core of the System (Europe) grew in several respects: The population size of the respective communities, but also their size: the number of communities/states decreased from circa 300 in 1495 to circa 25 in 1939 (2), (3).

During the period 1495-1945, the System - of which Europe constituted the core - produced four accelerating war cycles; each war cycle consisting of a *relatively stable period*, followed by a systemic war (see below figure).

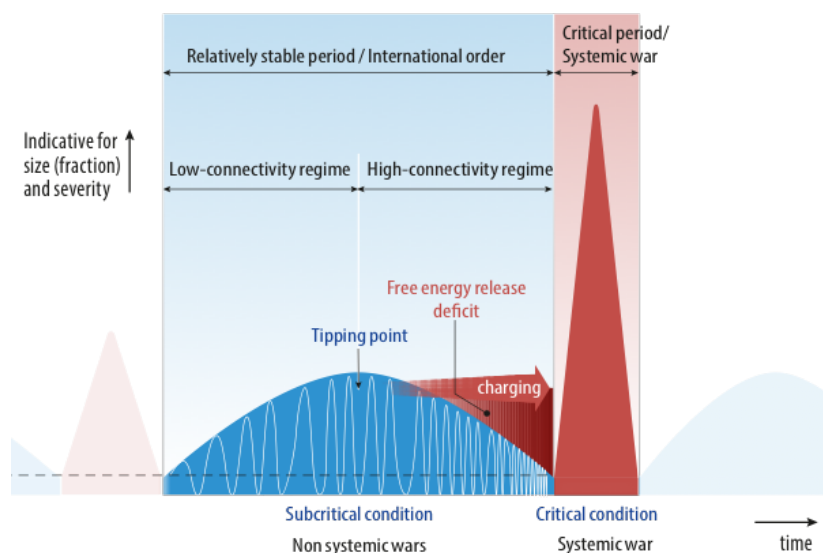


Figure 1: This figure shows a schematic representation of a single war cycle: a relatively stable period, during which an international order is in place, is followed by a systemic war, when an ‘upgraded’ order is implemented. During relatively stable periods, the System is in a subcritical condition and produces non-systemic wars, whereas during systemic wars, the System is in a critical condition.

During relatively stable periods an 'international order' is in place - initially only consisting of a simple rule-set - that ensures that interactions between communities (eventually states) are regulated. During relatively stable periods, the System produces non-systemic wars, to release tensions and solve issues between communities/states. Non-systemic wars ensure the status quo (the international order that was in place).

However, at a certain point - the *tipping point* of the relatively stable period (international order) - the connectivity of the network of issues and tensions - of which communities/states are integral parts - becomes too connected to allow for (sufficient) release of tensions, and instead of being released and issues being resolved, tensions and unsolved issues increasingly accumulate in the System.

At a certain point, the accumulating issues '*percolate*' the System and the System becomes *critical*, until now (1495 - present) this has happened four times. The critical condition results in a systemic war; a war in which all Great Powers in the System participate, and that typically results in the design and implementation of an upgraded order. The upgraded international order, enables a new relatively stable period. Whereas non-systemic wars are about maintaining the *status quo*, systemic wars are about *change*, upgrading the international order.

My research shows that wars can be considered tension releases, that are instrumental in regulating the energy-state (tension levels) in the System (5).

These tensions are the product of population growth and rivalries between communities in System that is anarchistic in nature: Increasing connectivity - a function of population growth - and anarchy are intrinsically incompatible. The urge to survive is the most fundamental '*driver*' of human behaviour, and also explains their '*need*' to group in communities to be able to develop and exploit economies of scale and scope to better fulfil basic requirements, including security.

The four accelerating war cycles constitute a *finite-time singularity dynamic*. This self-organized - emergent - phenomenon, reached the singularity in finite-time in 1939. At that point, the anarchistic System - Europe - reached the *critical connectivity threshold*, the point when the core of the anarchistic System (Europe) produced '*infinite*' amounts of tensions, the System could no longer regulate.

The finite-time singularity that was accompanied by four accelerating war cycles constitutes an *emergent* property of the System; a self-reinforcing and self-regulating dynamic. The growing production of tensions - energy - in the System, a result of population growth and intensifying rivalries between communities, powered the unfolding of the finite-time singularity and the four accelerating war cycles. The war cycles regulated the energy-state of the System. By means of systemic wars, the System upgraded its organisation (international orders); upgrades were implemented - and necessary - at an increasing rate (2), (5). These upgrades enabled - facilitated - further population growth and development, and ensured *charging* of the System for a next systemic war and upgrade.

In short: Population growth resulted in tensions, that were then used to upgrade the organisation of the System (the international order), to enable further population growth and development; a pattern that repeated itself four times during the period 1495-1945.

The finite-time singularity dynamic - the four accelerating war cycles - were instrumental in a process of *social integration and expansion*: At the start of the finite-time singularity dynamic in 1495, Europe consisted of circa 300 diverse and loosely connected communities with a total population of 83 million; when the singularity dynamic reached the critical connectivity threshold in 1939, and the System (Europe) produced '*infinite*' amounts of tensions, and

consequently collapsed, Europe consisted of circa 25 standardized and highly connected states structures with a total population of 544 million.

During the unfolding of the finite-time singularity, the process of the development of 300 diverse communities into 25 highly standardized state-structures, and the simultaneous upgrading of successive international orders into increasingly 'intrusive' - far reaching - rule-sets, constitute a *coevolutionary process* (2).

Community structures (eventually states) and the international order developed together; one is the product of the other, and vice versa. This coevolutionary process also qualifies as a *path-dependent dynamic*, that (increasingly) *locked-in* on integration. The increasing integration of states was 'shaped' through successive increasingly 'intrusive' international orders. However, at the same time as this process of integration '*crystallized*', states became increasingly powerful war machines, that were at the same time increasingly dependent on each other for their mutual survival. Increasing interdependency went together with increasing intense rivalries, an incompatibility that is intrinsic to anarchistic systems: (increasing) connectivity and anarchy results in the production of increasing amounts of tensions.

In 1939, the System (its core, Europe) reached the *critical connectivity threshold*, a level of connectivity that resulted in the production of 'infinite' amounts of tensions that could no longer be regulated by the anarchistic System. The amounts of tensions that were produced at an accelerating rate forced the anarchistic System to implement upgraded orders with a frequency that was no longer sustainable: the destructive energy that had to be deployed (to upgrade international order) had reached levels that could no longer be produced, and caused levels of destruction that would result in collective self-destruction.

I will explain this important point also from a somewhat different perspective: During the period 1495-1939, Europe - the core of the System - developed from a '*fluid*' - *loosely connected* - condition in 1495, into a '*solid*' - *tightly connected* - condition in 1939. The decreasing Great Power status dynamics (2) and the increasing solidification of borders between communities during the period 1495-1939 are indicative for this process: The System - its core - became increasingly 'permanent', but also brittle (2), (5).

During the four relatively stable periods of the four war cycles, the core of the System (Europe) lost its ability to release tensions by means of non-systemic wars, while at the same time the rate of production of tensions, and their 'amount' accelerated. The increasing inability to 'produce' non-systemic tensions releases - non-systemic wars - can be attributed to the increase of *the overall connectivity* of the System, a function of population size (2), (5). This 'inability' increasingly stripped the System of the possibility to regulate tensions during relatively stable periods, in other words to maintain the status quo of the System. Consequently, increasing amounts of tensions had to be released with an increasing frequency by means of systemic wars: Relatively stable periods became increasingly shorter, while simultaneously, the frequency and amplitudes (severity) of systemic wars accelerated.

By means of the fourth systemic war (the Second World War (1939-1945) that followed the collapse of the core of the System in 1939, the System experienced a *phase transition* that had *two closely related effects*: (1) in Europe two non-anarchistic structures were implemented in Western and Eastern Europe, respectively controlled by the United States and the Soviet Union, and (2) a first international order was simultaneously implemented at a global scale of the System (the United Nations). The United States and the Soviet Union functioned as *lynchpins* between the new European order, and the first global order.

The phase transition resulted in the implementation of *dedicated hierarchies* - integrative structures that transcended state structures - in Western and Eastern Europe, respectively controlled by the United States and the Soviet Union.

At that point, emergent regulation of the energy state within these non-anarchistic structures was replaced by deliberate regulation through integrative structures (dedicate hierarchies); these structures could ensure regulation without the deployment of destructive energy. Because of the implementation of these dedicated hierarchies, the intrinsic incompatibility between connectivity and anarchy (the security dilemma) was abolished and tension levels were significantly lower (at least within these non-anarchistic structures). Furthermore, there was agreement that the remaining tensions would be resolved /regulated through consultation.

During the period 1495-1939, Europe not only integrated step-by-step, but Europe - the core of the System - also increasingly expanded to the non-core of the System; shortly after the third systemic war (the First World War, 1914-1918), European states controlled about 80-90 percent of non-core territories by means of their colonies (6).

During the fourth systemic war (the Second World War, 1939-1945) not only the core of the System (Europe) collapsed because of the unsustainable tensions it produced, but the System also *globalised*. Globalisation was accomplished through the coupling of the European and Asian war clusters (during the Second World War, 1939-1945), in which the United States played a crucial role. The moment - 11 December 1941 - Germany declared war on the United States in support of its ally Japan that had attacked the United States on 7 December 1941 in Pearl Harbor, the fourth systemic war became a global war.

Through the phase transition - the fourth systemic war - with its two closely related effects, the core and the non-core of the System *merged*.

Through the two integrative structures (dedicated hierarchies) that were implemented in Europe - and controlled by the United States and the Soviet Union - tension production in Europe was again manageable. The rivalries between European Great Powers were now replaced by (increasingly) intense rivalries between the United States and the Soviet Union, in which European states became subordinate 'players' in support of their respective controllers.

This development resulted in a stand-off in Europe, that was 'contained' by a (mutual) deadlock, a result of *'mutual assured destruction'* that could be accomplished with the respective nuclear arsenals of the United States and the Soviet Union. During the Cold War, war as an instrument of (rational) policy had no utility: It would result in collective self-destruction, while the urge to survival was (and still is) at the basis of the war dynamics of the System.

The stand-off lasted until 1991, when the Soviet Union collapsed. The period 1945-1991, was used by Western European states, to further integrate, and exploit economies of scale and scope. After the collapse of the Soviet Union, (1) Russia - the Soviet-Union's core - was initially preoccupied with its consolidation, (2) the United States considered its *mission* accomplished (its interests to be secure) and focused on the economic exploitation of the global System, and (3) Europe further developed its integrative structures (the European Union), and absorbed Eastern European states in the process, that chose to join the European Union.

Pinker has not identified the finite-time singularity dynamic, and the four accelerating war cycles that accompanied it. Nor is Pinker aware that data-analysis shows that the now global System produces a fifth - a first global - war cycle. For the period 1495-1945, the finite-time singularity dynamic and the four accelerating war cycles are the 'framework' to analyse the war dynamics of the System, and their relationship with - impact on - the shaping of the

direction of development of the System. The accelerating life-spans of successive cycles should be used as the unit of analysis of the war dynamics of the System, not periods of 25 year, as Pinker does.

Pinker - and Richardson - continuously wrestle with the 'inconvenient' observation that the war frequency of wars decreased while, the System at the same time produced a number of 'extreme' wars, the First and Second World Wars (the third and fourth systemic wars). The observation that the war frequency decreased during the period 1495-1945, is correct, but their conclusions are not: The fundamental difference between systemic and non-systemic wars cannot be ignored.

<i>Fundamental differences between systemic and non-systemic wars</i>	
<u>Systemic wars</u>	<u>Non-systemic wars</u>
The System is in a critical condition.	The System is in a sub-critical condition (except for the period 1657-1763, during the relatively stable period of the second cycle, when the System produced a series of non-systemic wars.
All Great Powers in the System participate.	Normally not all Great Powers participate (except for three non-systemic wars during the period 1657-1763).
Accumulated tensions are used to design and implement upgraded international orders.	Tensions are used to maintain the status quo, within the existing international order.
Timing, duration and severity are highly predictable.	Timing, duration and severity of non-systemic wars are normally - except for the period 1657-1763 - intrinsically unpredictable because of the chaotic nature of these dynamics.

Table 1: In this table, the most fundamental differences between systemic and non-systemic wars are shown.

Pinker is not aware of the fundamentally different function of both types of wars: Systemic wars are manifestations of criticality of the System, and during systemic wars accumulated tensions are used to design and implement upgraded international orders, that ensure new periods of relatively stability. Non-systemic wars on the other hand are 'just' local wars that do (normally) not involve all Great Powers in the System, and their function is to regulate interactions and tensions between states, within an international order that is 'in place'. Non-systemic wars are not about changing, but maintaining the status quo.

Pinker's as well as observations and conclusions of other historians, are also distorted by the phenomenon that during the period 1657-1763 (during the relatively stable period of the second cycle 1618-1792) the System produced a number of non-systemic wars, that involved all Great Powers in the System, but were not manifestations of criticality of the System and did not result in the implementation of upgraded international orders.

Due to the intense rivalry between Great Britain and France during the period 1657-1763, the number of *degrees of freedom* of the System - the number of other states that determine war decisions - was temporarily reduced to only two. Consequently, during the period 1657-1763, the System produced a series of periodic - very regular - but also unrestrained ('extreme') non-systemic wars: Tensions were produced at a high rate, and did - and could not - accumulate,

but were immediately released. The issues in the System - in fact there was only one (dominant) issue, the intense rivalry between Great Britain and France, - did not form an issue-network, that would at a certain point (the tipping point of the relatively stable period) start hindering the release of tensions by means of non-systemic wars (2), (3).

In case the System has three or more degrees of freedom, the System produces chaotic non-systemic war dynamics; states take at least two states (and their ‘position’) in consideration in their decisions to go to war or join a war. A third degree of freedom, has a balancing effect, and the war dynamics of the System are consequently more restrained. This restraint allows for the forming of an issue-network, that eventually becomes sufficiently connected to produce a network effect, which is a prerequisite for the accumulation of tensions, and for the System to become critical and produce a systemic war (2), (3).

The moment the intense rivalry between Great Britain and France was resolved (in favour of Great Britain), the System resumed its ‘default’ chaotic non-systemic war dynamics, and reached the tipping point in 1774; it was now only a matter of time before the System became critical (1792) and produced a second systemic war (the French Revolutionary and Napoleonic Wars).

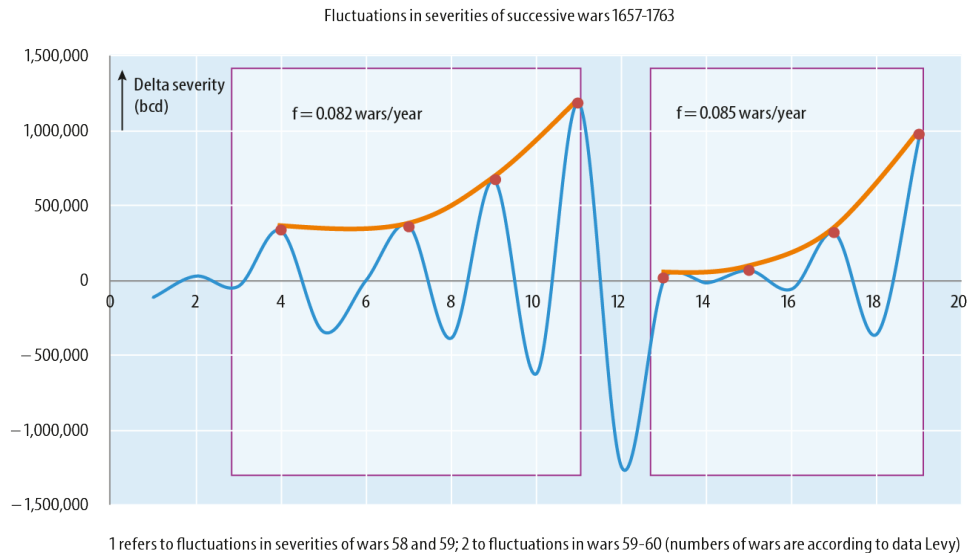


Figure 2: The data indicate that during the first exceptional period (1657-1763), non-systemic war dynamics were more extreme but also much more regular; during the second exceptional period (1945/1953-1991), in contrast, non-systemic war dynamics were highly subdued. During the period 1657-1763, two highly regular sub-cycles can be identified in the war dynamics of the System, with each sub-cycle defined by four non-systemic wars. The correlation coefficient of the severities of these two sets of wars is 1.00. The war frequencies of both sub-cycles were rather similar, 0.082 and 0.085 wars/year, respectively. Data from Levy (7).

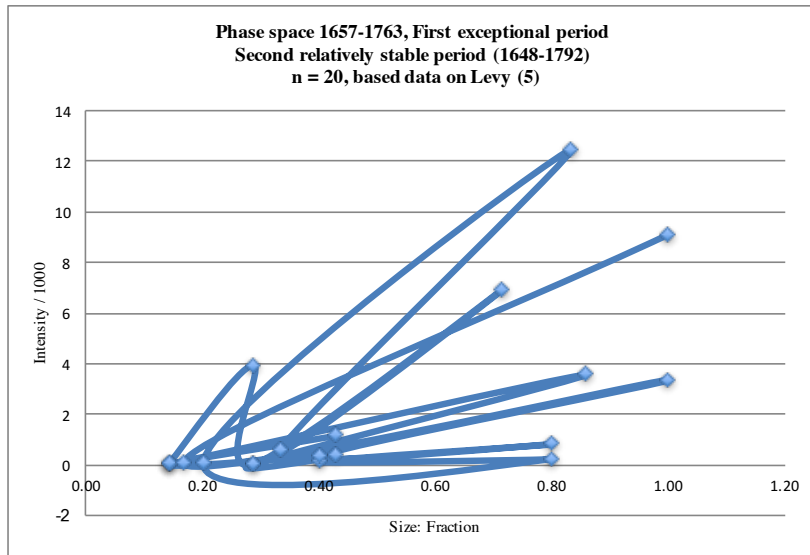


Figure 3: This figure shows the non-circular trajectories in phase space of the abnormal non-chaotic - periodic - non-systemic wars during the first exceptional period (1657-1763). The two subcycles shown in above figure (figure 2) are ‘enclosed’ in these trajectories. Data from Levy (7).

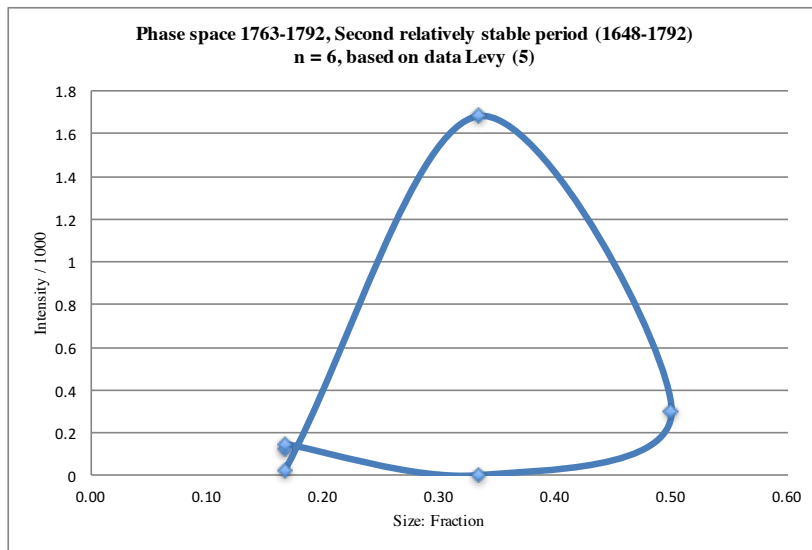


Figure 4: This figure shows the orbit (consisting of six non-systemic wars) the second relatively stable period produced following the first exceptional period (1657-1763), once the System in 1763 regained a third degree of freedom and resumed chaotic non-systemic war dynamics. During this relatively short period the System charged itself for a second systemic war. I argue that chaotic non-systemic war dynamics, which are intrinsically more inhibited than the preceding periodic war dynamics - are a precondition for the System to be able to become critical and reorganize itself. Data from Levy (7).

Furthermore, Pinker is not aware that the (now global) System is producing a fifth - a first global - war cycle (1945-....), that - analysis of data suggests - has a similar life-cycle as its four predecessors, and probably is the first war cycle of a second (now global) finite-time singularity dynamic.

Two ‘factors’ potentially confuse the analysis of the present war dynamics: (1) the fact that the non-systemic war dynamics were distorted during the period 1945-1991 because of the intense

rivalry between the United States and the Soviet Union, resulting in highly-suppressed war dynamics, and (2) the fact that the four war cycles the System produced during the period 1495-1945, concern the System when it was dominated by European Great Powers; it was above all a European System. During the fourth systemic war (the Second World War, 1939-1945) however, the core (Europe) and non-core merged, and the System globalised. Following the fourth systemic war (of the European System), the now global System is starting a second - a global - finite-time singularity dynamic, that is an emergent property of the System to regulate the energy-state of the global System (5).

Increasing rivalries and tensions between communities, an increasing number of (unsolved) issues, and increasing obsolescence and dysfunctionality of the international order are typical signs that the System requires an upgrade, which - until now - was typically accomplished through periodic system-wide release of tensions - energy - which was used to design and implement upgraded orders.

The current - now global - System, as I mentioned, is producing a fifth - a first global - war cycle. In fact, the now global System - like its 'predecessor' the European System (1495-1939) - is producing a second (now global) finite-time singularity dynamic it seems; this is a self-organized dynamic, that is instrumental in regulating the energy-state of the globalised System, in efforts to optimise the collective survival changes of communities and humans which are the building blocks of the System, which interact from a selfish perspective in efforts to ensure the fulfilment of their basic requirements to survive.

The conditions that enabled the inception and unfolding of the first finite-time singularity dynamic (1495-1945), also are in place in the current (globalised) System, including: Population growth, rivalries between states, and the absence of a regulatory mechanism - a dedicated hierarchy - that could replace the self-organized regulatory mechanism, the second finite-time singularity dynamic - and ensure effective regulation of the energy-state of the System, by other means than war.

A finite-time singularity dynamic generates/produces its own momentum: a series of accelerating war cycles, that will eventually be unsustainable and result in the collapse of the System, and a 'unavoidable' phase transition, to avoid collective self-destruction. The question is, can we - humanity - implement a deliberate man-made regulating mechanism with global reach to regulate the energy-state of the System, through a 'short-cut', that is without willingly obeying the potentially self-destructive finite-time singularity dynamic: Can we escape this war trap, and control our destiny?

Problematic is, that the System presently is in the *high-connectivity regime* of the first global war cycle: Instead of tensions being released and issues being resolved, they now accumulate in the System and reinforce each other. Consequently, politics are volatile, and distrust between states is high; rivalries intensify.

Issues in the System - that become increasingly connected, and reinforce each other - have no clear-cut solutions. The overwhelming complexity of the present situation results in inaction, or unidirectional efforts of states and oversimplification of the problems/issues. These efforts will - and can - only contribute to the already dire condition of the System. At present the dynamics of the System are dominated by self-reinforcing feedbacks/mechanisms, that result in more issues and tensions.

The solution - the implementation of non-anarchistic structures, is a logical next step in the long-term process of social integration and expansion - and was already 'contained' (enclosed)

in the preceding upgrades of the System. The war dynamics of the System, is about regulation of tensions, and integration and cooperation, that cannot be accomplished otherwise, but is vital for the survival of increasingly interdependent communities.

The finite-time singularity dynamic was a path dependent dynamic, that increasingly locked-in on further integration, for the very simple reason that cooperation has much more to offer than war and conflict: Through cooperation economies of scale and scope can be achieved that improve our ability to fulfil basic requirements (to survive), and our well-being.

The paradox is that integration could (so far) only be accomplished through increasing destruction, to the level that our collective survival was ultimately at stake. When we became aware that collective self-destruction was a matter of time, emergent regulation of the energy-state of the System in Europe was replaced by deliberate control through two integrative hierarchies that transcended state-structures in respectively Western and Eastern Europe. These integrative structures ensured deliberate human-control over the energy-state of these non-anarchistic structures: Self-organized regulation - imposed by the System - was replaced by deliberate human control, at least in Europe.

IV. PARADIGM SHIFT

Our limited understanding of the System's (war) dynamics and development contributes to the dire condition of the System, and our impotence to take control over the System. It seems that humanities experience with war, - our inability to take control, - has caused a condition of *collective learned helplessness*.

A paradigm shift is urgently needed to improve the quality of historical research and policy advise.

In this chapter, I address the question "Why the war cycles and the working of the System - and the simple fact that physical laws apply to its dynamics - were not discovered at an earlier stage?"

Several reasons and factors explain why the war cycles - and laws and mechanisms that produce them - were not identified at an earlier stage, including:

(1) **Unawareness - and denial - of the basic fact that physical laws also apply to social systems and their dynamics**. There is a great reluctance to accept - or even consider - the basic fact that physical laws also apply to social systems and their dynamics. It seems, that this is somehow an '*inconvenient truth*', because it (also) implies that our free will, is much more limited than we are prepared to accept.

(2) **Unawareness of the functioning of complex systems and networks, and the applicability of concepts related to theoretical physics**. Historians, social scientists and policy advisors are unaware of a basic understanding of the workings of complex systems and networks, and the applicability of concepts related to theoretical physics; this factor is closely related to the first factor.

(3) **A narrative approach to historical events and processes**. Historians and policy advisors typically use a narrative approach to explaining historical processes and to formulate policy advise, and ignore (because of unawareness, see above) physical laws and mechanisms that apply to social systems. With these narratives historians 'construct', they try to achieve a certain consistency, that satisfies our need for sense-making. Explanations are incomplete. Rigorous scientific methods need to be used.

(4) **Too short time horizon.** Historians normally use relatively short time spans to study events and processes. To be able to identify the four accelerating war cycles (1495-1945), a long-term perspective is required, at least from the start of the first cycle in 1495.

(5) **Doctrines and dogmas are confused with science.** During the unfolding of the finite-time singularity dynamic (1495-1945), a number of political and military doctrines and dogmas were formulated in efforts to (1) explain and justify certain actions and decisions, (2) to make sense of developments, and to serve as (3) guidelines for the effective deployment of destructive energy in the System. I refer for example to Clausewitz's theory 'On War' (8), and the predominant school of thought in international relations theory 'Realism' (9). These 'theories' are the products of the System, and it's typical dynamics. These 'theories' do not transcend the (peculiarities) of these dynamics (and certain interests that had to / must be served), and are only valid within the restricted narrative 'logic' of dynamics of the System during the period 1495-1945. They do not qualify as scientific theories, only as dogmas that justify the actions and decisions of actors in the System. These doctrines and dogmas are deeply embedded in the System; they are integral components of the System and its dynamics, and hinder the introduction of new ideas.

(6) **Humanities understanding of itself - and its role in the war dynamics of the System requires fundamental adjustment.** My research not only shows that physical laws and mechanisms apply to the System and its dynamics, but also that humans - humanity - is unaware of its great ability for collective self-deception. What we consider to be decisions out of free will, in fact are 'decisions' in which we obediently follow the System's deterministic demands. The timing of systemic wars - for example - and their duration and severity, obey deterministic and highly predictable laws. The third systemic war - for example - started at exactly the 'right' time (as prescribed by physical laws that apply), and its duration and severity were also highly regular and consistent. The System's collapse (its core, Europe) in 1939 also obeys a simple deterministic logic. How can we be 'misled' to think that these are deliberate human decisions? How could we be not aware that we follow the System's autonomous logic, that resulted in a war trap, we are integral parts of?

I attribute this worrying ability of humans to their ability for collective self-deception. We are able to attribute autonomous system-behavior to deliberate human decisions that are thought to be made out of free will, while in fact it is the System that determines our (re)actions. This behavior - our unawareness, and ability for collective self-deception - needs to be addressed, to be able to breach the second and potentially self-destructive finite-time singularity - a second *war trap* at a global scale of the System - that is now unfolding.

To achieve this, we should be aware that we - the System - 'charges' for war, because we 'create' collective psychological processes through 'interacting self-fulfilling prophecies'. The security dilemma is a crucial mechanism in this process. The security dilemma is intrinsic to anarchistic systems. In anarchistic systems, states are responsible for their own security, but - and that is the dilemma - a state's security (its military capabilities, and alliances) are another state's insecurity. The security dilemma works as a self-reinforcing mechanism that (especially) dominates the System dynamics during high-connectivity regimes of relatively stable periods. The security dilemma - and the interacting self-fulfilling prophecies it produces - justifies for all states in the System that they must prepare for war.

Ideologies - like nationalism and fascism - also are products and integral parts of the System's dynamics, especially the last war cycle (1918-1945) shows. During the unfolding of the finite-time singularity dynamic (1495-1945), tension production continuously accelerated, and constituted a self-reinforcing dynamic that increasingly became the dominant feedback

structure of the System (its core, Europe). States mobilized increasing amounts of resources to be able to meet demands for destructive energy: War - especially systemic wars - '*totalized*'. Societies were - and needed to be - mobilized to produce and deploy increasing levels/amounts of destructive energy, and consequently became 'legitimate' targets. Ideologies - like fascisms - served (and serve) several purposes: They were used to *justify* the levels of destruction that were considered necessary, helped *mobilize* societies, and helped to *channel* high levels of fears by identifying 'enemies' (that had to be destroyed).

From a system's perspective, the ideology of '*America First*' that is now '*evolving*' in the United States serves similar purposes as the ideologies I just referred to: '*America First*' is used to identify and create threats and enemies (to the United States' security, culture and economy), that can be used to *channel* and further 'mobilize' fear for political purposes, it is used to *justify* the deployment of destructive energy (its armed forces), and to *mobilize* resources (additional defense spending) to be prepared for the worst. These dynamics work as a self-fulfilling prophecy: The (aggressive) actions of United States will trigger responses that confirm its assumptions and that will then be used to justify further reinforce of this destructive dynamic. Similar processes will be (and already are) triggered in other states. Each state will find sufficient justification to escalate its dubious actions: The anarchistic System will not disappoint: every state will get its enemies.

The '*American First*' dynamic, and similar dynamics of other states (Brexit, Russia's assertive actions, etc.) are typical for high-connectivity regimes, when the (high) connectivity of the network of issues (increasingly) hinders the release of tensions; instead of being released, tensions and unsolved issues accumulate in the System, until the increasingly connected issues percolate the System, and cause it to become critical, and produce a systemic war. The current American 'dynamics' and dynamics of other states charge the System for a next systemic war. During this systemic war - as was the case during its four predecessors - the accumulated tensions will be used to design and implement an upgraded international order, that allows for a lower energy-state of the System and a new period of relative stability, that enables further growth and development.

(7) ***Incorrect 'starting points'***. Historians typically study historic events from 'the inside out'. Starting points are mostly specific events, and the longer-term context is mostly ignored. This study demonstrates that the context - the longer-term - is crucial to make sense of events. For example, this study shows that the stage of development of the lifecycle at the time of a war to a considerable extent determines and shapes certain properties of the war concerned.

(8) ***Incorrect unit of analysis***. War data have been studied and analyzed extensively by historians and social scientists. Typically, periods of centuries are used as units of analysis in efforts to identify patterns in war dynamics. This study demonstrates that the accelerating cycles - and their respective life-spans - that accompanied the finite-time singularity dynamic should be used as units of analysis to make sense of these dynamics.

(9) ***Ignorance of the fundamental difference between systemic and non-systemic wars***. The distinction between systemic and non-systemic wars is fundamental: systemic wars are not 'just' larger non-systemic wars; rather, systemic wars fulfill very different functions and have fundamentally different properties (see also table 1). Because historians did not use cycles as unit of analysis, and did not distinguish a fundamental difference between systemic and non-systemic wars, systemic wars were considered by many historians to be 'accidents' or anomalies; consequently, it was not possible to understand the war dynamics of the System. For example, historians have determined that the frequency of wars decreased over the long term; this observation is correct even when systemic wars are included in these calculations

and suggests that this trend points to a decrease in war activity. However, this observation is not correct. Although the number and frequency of non-systemic wars decreased over time, at the same time, the frequency of systemic wars increased, as did their severity. The System became more *robust* but also increasingly instable at the same time.

When the severities of successive cycles are related to the size of the population in Europe, analysis reveals that the severities of successive cycles are more or less constant, approximately 2.4% of the European population, as already mentioned (except for the second cycle; 3.9%) (2). However, one should remember that the same percentage of battle casualty deaths - approximately 2.4% of a growing European population - was produced during increasingly shorter periods of time because of the shortening of the lifespans of successive cycles. A cyclical perspective provides us with completely different insights into the war dynamics of the System.

(10) ***Unawareness of abnormal war dynamics during the period 1657-1763.*** Abnormal non-systemic war dynamics during the second relatively stable period (1648-1792) were not recognized as such, and for that reason, historians could not make sense of them. During the first exceptional period (1657-1763), the System produced a series of large (sometimes system-wide) wars, but they did not qualify as systemic wars: these wars were actually 'just' oversized non-systemic wars that the System could produce through a lack of a third (constraining) degree of freedom. The lack of a third degree of freedom was a consequence of the intense rivalry between Great Britain and France during that period, as already explained.

(11) ***Unawareness of the deterministic nature of the war dynamics and the development of the System.*** Until now, historians and social scientists have not been aware of the deterministic nature of the war dynamics of the System and the 'shaping effects' deterministic laws and mechanisms have, not only on wars themselves but also on the development of the System. Therefore, historical research has been based on an incomplete and consequently biased perspective.

In their efforts to make sense of historical events and processes, historians in some cases 'constructed' causalities that in fact did not exist or assumed that certain events were just coincidences or abnormalities, whereas in reality they were closely related to the deterministic nature of the System.

Discussions among historians about the relationship between the First and Second World Wars (respectively, the third (1914-1918) and fourth (1939-1945) systemic wars) are a case in point. In what I call the *deterministic domain* of the System (see also next point), the wars constitute the third and fourth systemic wars, respectively, that mark the final stage - the collapse - of the third (1815-1918) and fourth (1918-1945) cycles, respectively. These two cycles are distinct components of the finite-time singularity dynamic the System produced during the period 1495-1945. Both wars do not constitute one war that was temporarily interrupted, as some historians suggest, but rather are two distinct critical periods. Analysis of war data demonstrates this conclusively.

However, because of their proximity in time, events and social processes that are related to these two systemic wars in the *contingent domain* of the System were much more intertwined than was the case for events and social processes that were unfolding in the second (the French Revolutionary and Napoleonic Wars, 1792-1815), for example, and third (the First World War) systemic wars. The increasing interrelationship between events and social processes in the contingent domain does not make the First and Second World Wars - the third and fourth systemic wars - a single critical period in the deterministic domain. Although the fourth international order (1918-1939) was highly dysfunctional (10), it was an integral part of the fourth and final cycle the finite-time singularity produced.

Another example also sheds light on the impact of the underlying deterministic domain. I now point to the network effect I discussed that resulted in increasing local stability of states in the network of issues once the tipping point of the relatively stable period was reached. This network effect offers a plausible explanation for the 'abrupt' - unexpected - outbreak of the third systemic war (the First World War, 1914-1918), a phenomenon that historians have remained intrigued with to date (11).

Because of this effect, the average size of non-systemic wars started to decline from 1856 (i.e., the tipping point of the third relatively stable period) onward to approximately 'zero' shortly before the outbreak of the First World War. During the period 1856-1914, tensions and unresolved issues accumulated in the System, eventually resulting in a critical condition. A network of (unresolved) issues, and accompanying tensions, percolated throughout the System in 1914; the correlation length of the System had become one.

This network was then triggered by the assassination of Archduke Franz Ferdinand (heir to the Austro-Hungarian throne) on June 28, 1914 in Sarajevo, Bosnia. This relatively minor incident triggered a systemic response that then resulted in an 'upgrade' of the international order.

A third systemic war, as this perspective reveals, was not an 'accident' that could have been prevented, as certain historians suggest. The third systemic war was already in the making through the self-organized finite-time singularity dynamic the System had begun producing at its inception in 1495, which was accompanied by four accelerating cycles. The First World War, as we experienced and know it, was a 'contingent' version of an unavoidable third systemic war - a third reorganization - produced by the System.

(12) ***Unawareness of the interaction between two distinct 'domains'***. My research shows that it is possible to distinguish an 'underlying' deterministic and a contingent domain in the System that interact through the security dilemma and self-fulfilling prophecies of states. The patterns that can be identified and the underlying mechanisms that produced them suggest that the dynamics and development of the System are at least partially deterministic in nature, as I explained.

My research shows that from an analytical point of view two related and interacting 'domains' can be distinguished in the System: An 'underlying' deterministic domain and a contingent domain. To make sense of the System's war dynamics and development, it is important to understand what these domains 'do' and how they interact. The deterministic domain seems - at least partially - to determine and shape the war dynamics of the System, such as the start times and severities of systemic wars. The contingent domain, for example, determines the reasons for which wars are fought. The deterministic nature of the System leaves much less room for contingency - and 'free will' - than we assume (and most likely hope for).

However, the dynamics in the contingent domain can also have a fundamental impact on the deterministic domain. As mentioned above, the intensities of the rivalries between Great Powers during the first and second exceptional period (1657-1763 for Britain and France and 1945-1989 for the United States and the Soviet Union) determined the number of degrees of freedom in the System and consequently the nature of the non-systemic war dynamics of the System.

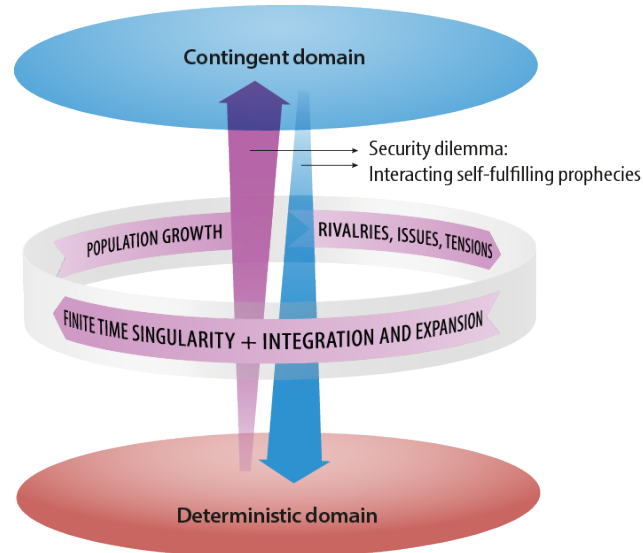


Figure 5: This figure shows two domains - a deterministic and contingent domain - that can be distinguished in the System. Both domains interact and synchronize their dynamics through the security dilemma and interacting self-fulfilling prophecies that this mechanism results in (2).

The distinction between a deterministic and contingent domain in the System raises the questions of how - through what mechanism - these two domains interact and how they synchronize.

I assume that the security dilemma of states in anarchistic systems is responsible not only for the production of tensions but also for the interaction between both domains. The security dilemmas of states also function as interacting self-fulfilling prophecies that shape expectations and provide justification for (war) decisions.

The impact of this mechanism - reinforcing self-fulfilling prophecies of states - dramatically increases once the tipping point is reached, and issues remain unresolved and tensions accumulate. Once the tipping point is reached, it is this feedback structure that 'pushes' the System towards a critical condition and to a systemic tension release (systemic war).

I assume that during the unfolding of the finite-time singularity dynamic that was accompanied by four accelerating war cycles (1495-1945), the deterministic domain increasingly locked-in on systemic war activity, and the 'need' to produce increasingly severe systemic wars with increasing frequencies, to 'upgrade' the System's order and provide relative stability (at an accelerating pace). During the period 1495-1945, the increasing dominance of the deterministic domain increasingly constrained our 'contingent latitude', our ability to influence its dynamics. We made war, and war increasingly made us: The System increasingly became a war trap.

APPENDIX: ANALYSIS OF PINKER'S ARGUMENTATION

In the appendix of the paper, I discuss Pinker's study - especially chapter 5 where Pinker discusses war and war dynamics - in more detail. My analysis - evaluation - of Pinker's study - as discussed in above chapters - I based on this analysis.

I present Pinker's arguments in 18 quotes; each quote is followed by a comment of mine.

In chapter 5, with the title "*The Long Peace*", Pinker makes the following observations:

Quote (1): *"In the early 1950s, two eminent British scholars reflected on the history of war and ventured predictions on what the world should expect in the years to come. One of them was Arnold Toynbee (1889–1975), perhaps the most famous historian of the 20th century. Toynbee had served in the British Foreign Office during both world wars, had represented the government at the peace conferences following each one, and had been chronicling the rise and fall of twenty-six civilizations in his monumental twelve-volume work *A Study of History*. The patterns of history, as he saw them in 1950, did not leave him optimistic: In our recent Western history war has been following war in an ascending order of intensity; and today it is already apparent that the War of 1939–45 was not the climax of this crescendo movement. Writing in the shadow of World War II and at the dawn of the Cold War and the nuclear age, Toynbee could certainly be forgiven for his bleak prognostication. Many other distinguished commentators were equally pessimistic, and predictions of an imminent doomsday continued for another three decades. The other scholar's qualifications could not be more different. Lewis Fry Richardson (1881–1953) was a physicist, meteorologist, psychologist, and applied mathematician. His main claim to fame had been devising numerical techniques for predicting the weather, decades before there were computers powerful enough to implement them. Richardson's own prediction about the future came not from erudition about great civilizations but from statistical analysis of a dataset of hundreds of violent conflicts spanning more than a century. Richardson was more circumspect than Toynbee, and more optimistic. The occurrence of two world wars in the present century is apt to leave us with the vague belief that the world has become more warlike. But this belief needs logical scrutiny. A long future may perhaps be coming without a third world war in it. Richardson chose statistics over impressions to defy the common understanding that global nuclear war was a certainty. More than half a century later, we know that the eminent historian was wrong and the obscure physicist was right."*

Pinker continues: "The 20th century, then, was not a permanent plunge into depravity. On the contrary, the enduring moral trend of the century was a violence-averse humanism that originated in the Enlightenment, became overshadowed by counter-Enlightenment ideologies wedded to agents of growing destructive power, and regained momentum in the wake of World War II. To reach these conclusions, I will blend the two ways of understanding the trajectory of war: the statistics of Richardson and his heirs, and the narratives of traditional historians and political scientists. The statistical approach is necessary to avoid Toynbee's fallacy: the all-too-human tendency to hallucinate grand patterns in complex statistical phenomena and confidently extrapolate them into the future. But if narratives without statistics are blind, statistics without narratives are empty. History is not a screen saver with pretty curves generated by equations; the curves are abstractions over real events involving the decisions of people and the effects of their weapons. So we also need to explain how the various staircases, ramps, and sawtooths we see in the graphs emerge from the behaviour of leaders, soldiers, bayonets, and bombs. In the course of the chapter, the ingredients of the blend will shift from the statistical to the narrative, but neither is dispensable in understanding something as complex as the long-term trajectory of war."

Comment (1): By making use of complexity and network science, and concepts related to theoretical physics, I show in my research that it is possible to identify highly consistent patterns in the war dynamics of the System, during the period 1495-1945. I also discuss laws and mechanisms that can explain these remarkably consistent patterns.

I show that during the period 1495-1945, the System produced a *finite-time singularity dynamic* that was accompanied by four accelerating war cycles (1495-1945); each cycle consisting of a relatively stable period - when an international order is in place, and tensions in the System are regulated by means of non-systemic wars - and a systemic war.

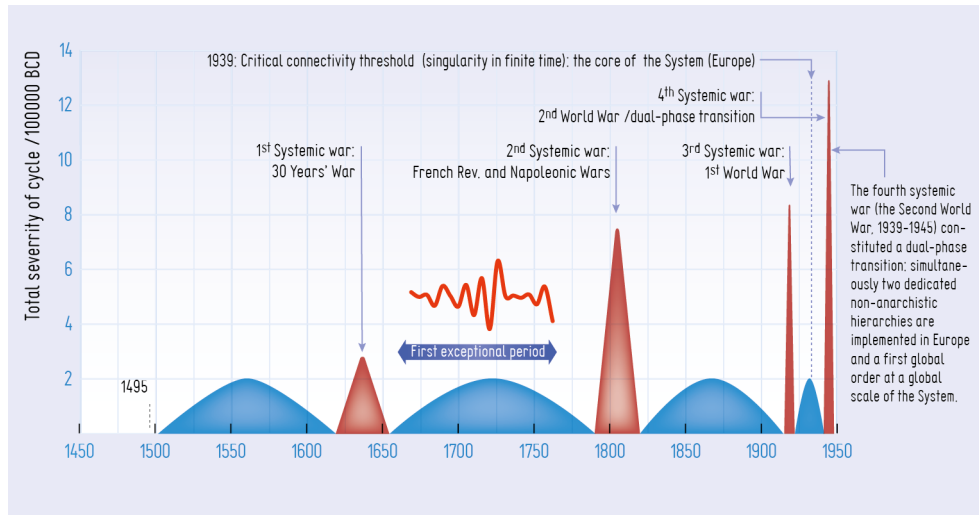


Figure 6: This figure is a schematic representation of the finite-time singularity dynamic that was accompanied by four accelerating cycles the System produced during the period 1495-1945. A fundamental difference exists between systemic and non-systemic wars.

Systemic wars (1495-1945)				
	<u>Systemic war</u>	<u>Period</u>	<u>No dataset Levy</u>	<u>Severity (bcd)</u>
1	The Thirty Years' War	1618-1648	46, 47, 48, 49	1,971,000
2	The French Revolutionary and Napoleonic Wars	1792-1815	84, 85	2,532,000
3	The First World War	1914-1918	107	7,734,300
4	The Second World War	1939-1945	113	12,948,300

Table 2: The table shows the four systemic wars that the System produced during the period 1495-1945, including their severities. Severity is defined as the number of battle-connected deaths (bcd) of military personnel of the Great Powers participating in a war (7). Data from Levy (7).

I show that systemic wars are instrumental in periodic ‘upgrades’ of the organisation of the System: During systemic wars tensions - energy - that have accumulated in the System are used to ‘design’ and implement upgraded international orders that better reflect the positions of power and influence of states in the anarchistic System, and which are better aligned with the (new) rules that underpin the new international order. Until now, the System produced four systemic wars.

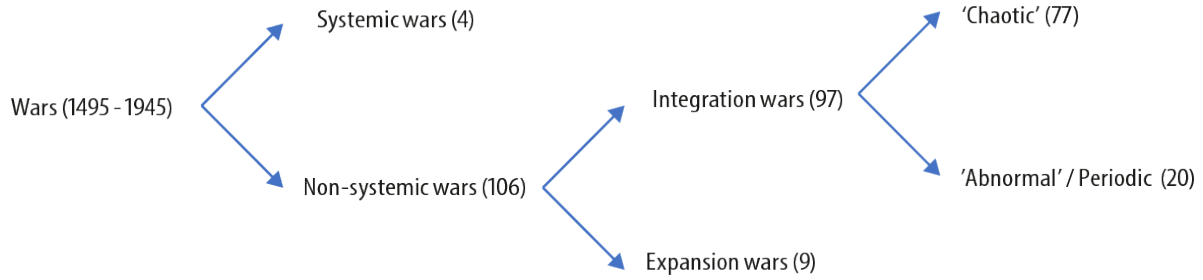


Figure 7: In this figure, a ‘taxonomy’ of wars is presented, including their respective numbers during the period 1495-1945. It is based on a cyclical perspective and on the different purposes of wars. Two main categories of wars can be distinguished: systemic and non-systemic wars. Depending on their ‘purpose’, non-systemic wars can either be ‘integration wars’ - closely related to the integration of the System’s core (Europe) - or expansion wars, which are manifestations of the expansion of the core (Europe) to the non-core, and of autonomous non-core war dynamics. Depending on the nature of their dynamics, integration wars can be ‘chaotic’ or ‘periodic’ in nature.

The finite time singularity dynamic - and the war dynamics - were (and still are) ‘powered’ by population growth and increasing rivalries between states. Tension production is intrinsic to anarchistic systems, because of the intrinsic incompatibility between connectivity and anarchy.

In 1939, the System - of which Europe constituted the core - reached the singularity in finite time - the critical connectivity threshold - and Europe (the core of the System) consequently collapsed. In response, the System produced a fourth systemic war (the Second World War, 1939-1945), which led in Europe to the implementation of non-anarchistic structures, controlled by the United States and the Soviet Union, and a first international order at a global scale of the System; the United Nations. During the period 1945-1991 - following the fourth systemic war until the collapse of the Soviet Union in 1991 - both ‘super powers’ functioned as lynchpins between the erstwhile core of the System (Europe), and the first global order. During the period 1945-1991, the intense rivalry between the United States and the Soviet Union dominated the System’s dynamics.

I argue that the first finite time singularity dynamic that was accompanied by four accelerating war cycles during the period 1495-1945, was instrumental in regulating the energy-state of the System and in a process of social integration and expansion of the System. During that period, Europe developed from a collection of circa 300 loosely connected and diverse ‘units’ (predecessors of state structures as we now know them) with a total population of circa 83 million in 1495, into a tightly connected network of circa 25 highly standardized and interdependent states with a total population of circa 544 million in 1939.

My research not only reveals these patterns, but also offers a consistent explanation.

Furthermore, I argue that the now global System is producing a next war cycle; the first war cycle at a global level of the (now) global System. It is not clear at this stage (too early to judge), but the present war cycle (1945-....) could well be the first cycle of a second finite-time singularity dynamic that is now unfolding at a global scale. If the same logic applies - and the conditions of the current System support this assumption - the second finite-time singularity dynamic will be instrumental in a the (further) process of social integration and expansion of the System towards a non-anarchistic system at a global scale.

Each cycle, including the current cycle, has a typical life cycle. Following a systemic war - which led to the implementation of an upgraded international order - non-systemic wars are on average still relatively small: The tension levels are still low, and the international order still is functional. However, over time, the average size of non-systemic wars - the data, and analysis clearly show - increase, until a tipping point is reached. From that tipping point onwards, the average size of non-systemic wars start to decrease. This effect - a network effect - can be attributed to the increasing connectivity of the network of issues and states in the System, that from the tipping point onwards increasingly restricts the ability of the System to release - and regulate - its tensions. Instead of being released by non-systemic wars, tension accumulate in the System and issues stay unresolved.

These issues and tensions percolate the System, and cause it to become critical. When the System is critical, it produces a systemic war in response. During the systemic war, the accumulated tensions are used to design and implement an upgraded order, that again allows for a period of relative stability.

Presently the System is in a high-connectivity regime, the 'regime' that follows the tipping point (and is preceded by a low-connectivity regime), and tensions and issues in the System can no longer be sufficiently released and solved, and instead accumulate and *charge* the System. A next systemic crisis, is just a matter of time. The next systemic war will be instrumental in the implementation of a second - an upgraded - international order at a global scale of the System.

In above quote (quote (1)), Pinker refers to two scholars who use fundamentally different perspectives: Both perspectives - as well as Pinker's approach - have their shortcomings: While Toynbee focuses on historical processes and social development in the - what I name - *contingent domain* of the System and uses a 'narrative' approach that aims to support a consistent 'story-line', Richardson's analysis is concerned with the analysis of data, related to what I name the ('underlying') *deterministic domain* of the System.

Because of a lack of 'understanding' of complex systems and networks at that stage, it was not possible to integrate these observations into a consistent framework.

My research shows that deterministic laws and mechanism determine and shape the war dynamics of the System and its development. Systemic as well as non-systemic wars are to a high degree deterministic in nature. The timing (start and end), duration and severity of the four systemic wars the System produced (1495-2017) for example, were highly regular, and predictable, contrary to the dynamics of non-systemic wars during relatively stable periods. The fact that non-systemic war dynamics are highly unpredictable, despite being deterministic in nature, can be attributed to their chaotic nature.

Pinker's observation - "*More than half a century later, we know that the eminent historian was wrong and the obscure physicist was right*" - is not correct.

Quote (2): "*The 20th century would seem to be an insult to the very suggestion that violence has declined over the course of history. Commonly labelled the most violent century in history, its first half saw a cascade of world wars, civil wars, and genocides that Matthew White has called the Hemoclysm, the blood-flood. The Hemoclysm was not just an unfathomable tragedy in its human toll but an upheaval in humanity's understanding of its historical movement. The Enlightenment hope for progress led by science and reason gave way to a sheaf of grim diagnoses: the recrudescence of a death instinct, the trial of modernity, an indictment of Western civilization, man's Faustian bargain with science and technology. But a century is*

made up of a hundred years, not fifty. The second half of the 20th century saw a historically unprecedented avoidance of war between the great powers which the historian John Gaddis has called the Long Peace, followed by the equally astonishing fizzling out of the Cold War. How can we make sense of the multiple personalities of this twisted century? And what can we conclude about the prospects for war and peace in the present one? The competing predictions of Toynbee the historian and Richardson the physicist represent complementary ways of understanding the flow of events in time. Traditional history is a narrative of the past. But if we are to heed George Santayana's advisory to remember the past so as not to repeat it, we need to discern patterns in the past, so we can know what to generalize to the predicaments of the present. Inducing generalizable patterns from a finite set of observations is the stock in trade of the scientist, and some of the lessons of pattern extraction in science may be applied to the data of history. Suppose, for the sake of argument, that World War II was the most destructive event in history. (Or if you prefer, suppose that the entire Hemoclysm deserves that designation, if you consider the two world wars and their associated genocides to be a single protracted historical episode.) What does that tell us about long-term trends in war and peace? The answer is: nothing. The most destructive event in history had to take place in some century, and it could be embedded in any of a large number of very different long-term trends. Toynbee assumed that World War II was a step in an escalating staircase, as in the left panel in figure 5-1. Almost as gloomy is the common suggestion that epochs of war are cyclical, as in the right panel of figure 5-1. Like many depressing prospects, both models have spawned some black humor. I am often asked if I've heard the one about the man who fell off the roof of an office building and shouted to the workers on each floor, "So far so good!" I have also been told (several times) about the turkey who, on the eve of Thanksgiving, remarked on the extraordinary 364-day era of peace between farmers and turkeys he is lucky enough to be living in. 8 But are the processes of history really as deterministic as the law of gravity or the cycling of the planet? Mathematicians tells us that an infinite number of curves can be drawn through any finite set of points. Figure 5-2 shows two other curves which situate the same episode in very different narratives."

Comment (2): Pinker - and other historians and social scientists - have failed to identify patterns in war dynamics and underlying laws and mechanisms that can explain their origins. The First (1914-1918) and Second World War (1939-1945), were respectively the third and fourth systemic wars, that concluded the third and fourth war cycles of the finite-time singularity dynamic. These two systemic wars were preceded by the second systemic war (the French Revolutionary and Napoleonic Wars, 1792-1815), and the first systemic war (the Thirty Years' War, 1618-1648).

In 1939, the System - until 1941 dominated by Europe (Europe constituted its core) - reached the singularity in finite time and consequently collapsed.

The severity of successive systemic wars, as well as the life spans of war cycles, developed very regularly, because of deterministic laws and mechanisms that applied (and still apply) to the System's dynamics.

Typically, Pinker - as well as other historians - think in terms of centuries ("*But a century is made up of a hundred years, not fifty*", see Pinker's quote above), or periods of 25 years, and use these 'convenient' human 'constructs' as units of analysis, ignoring the fact that a system can produce cycles - in case of the System four accelerating cycles - that determine what the *units of analysis* of the System and its dynamics should be.

Centuries are man-made constructs, and for that reason not useful units of analysis. War cycles and their life spans are the units of analysis that must be used to make sense of the System's dynamics.

Cycles (1495-1945)			
	<u>Period</u>	<u>Lifespan (years)</u>	<u>Total severity (bcd)</u>
1	1495-1648	153	2,976,000
2	1648-1815	167	7,550,300
3	1815-1918	103	8,484,680
4	1918-1945	27	13,283,300

Table 3: The table shows the main properties of the four cycles that the System produced during the period 1495-1945. Data from Levy (7).

Quote (3): “Richardson’s major discovery about the timing of wars is that they begin at random. Every instant Mars, the god of war, rolls his iron dice, and if they turn up snake eyes he sends a pair of nations to war. The next instant he rolls them again, with no memory of what happened the moment before. That would make the distribution of intervals between war onsets exponential, with lots of short intervals and fewer long ones. The Poisson nature of war undermines historical narratives that see constellations in illusory clusters. It also confounds theories that see grand patterns, cycles, and dialectics in human history. A horrible conflict doesn’t make the world weary of war and give it a respite of peaceable exhaustion. Nor does a pair of belligerents cough on the planet and infect it with a contagious war disease. And a world at peace doesn’t build up a mounting desire for war, like an unignorable itch, that eventually must be discharged in a sudden violent spasm. No, Mars just keeps rolling the dice. Some half-dozen other war datasets have been assembled during and after Richardson’s time; all support the same conclusion. Richardson found that not only are the onsets of wars randomly timed; so are their offsets.”

Comment (3): It is essential to distinguish between two types of wars: systemic and non-systemic wars, which have fundamentally different properties, **see table 1:** Both categories are deterministic in nature. The intrinsic unpredictability of non-systemic wars can be attributed to their chaotic nature. Chaotic dynamics, are very difficult to distinguish from random dynamics. Pinker misses the most important point, as I explain in above comments: The System is anarchistic, and obeys deterministic laws and mechanisms, that to a high degree determine and shape historical processes and social development, towards increasing levels of integration.

Quote (4): “Richardson examined a number of possible cycles for wars of magnitudes 3, 4, and 5 (the bigger wars were too sparse to allow a test), and found none. Other analysts have looked at longer datasets, and the literature contains sightings of cycles at 5, 15, 20, 24, 30, 50, 60, 120, and 200 years. With so many tenuous candidates, it is safer to conclude that war follows no meaningful cycle at all, and that is the conclusion endorsed by most quantitative historians of war. The sociologist Pitirim Sorokin, another pioneer of the statistical study of war, concluded, “History seems to be neither as monotonous and uninventive as the partisans of the strict periodicities and ‘iron laws’ and ‘universal uniformities’ think; nor so dull and mechanical as an engine, making the same number of revolutions in a unit of time.”

Comment (4): Pinker’s conclusion - “With so many tenuous candidates, it is safer to conclude that war follows no meaningful cycle at all, and that is the conclusion endorsed by most quantitative historians of war” - is not correct. As I showed and explained in previous comments: Patterns do exist, and can be explained with a consistent framework. Pinker’s

statements - and of the historians he refers to - show the limitations of the research methods these scholars applied, and their failure to identify the four accelerating war cycles the System produced during the period 1495-1945, and their highly consistent regularities. It also shows the ability of historians to adjust their observations and their interpretations 'at will' to various (inconsistent) narratives, they promote.

<i>Relatively stable periods (international orders)</i>						
	<u>Period</u>	<u>Lifespan (years)</u>	<u>No. of integration wars</u>	<u>No. of expansion wars</u>	<u>War frequency (integration wars)</u>	<u>No. of Great Power status changes (Europe)</u>
1	1495-1618	123	45	0	0.37	8
2	1648-1792	144	34	5	0.24	6
3	1815-1914	99	16	4	0.16	2
4	1918-1939	21	2	2	0.10	1

Table 4: This table presents the main properties of relatively stable periods (international orders). Basic data from Levy (7).

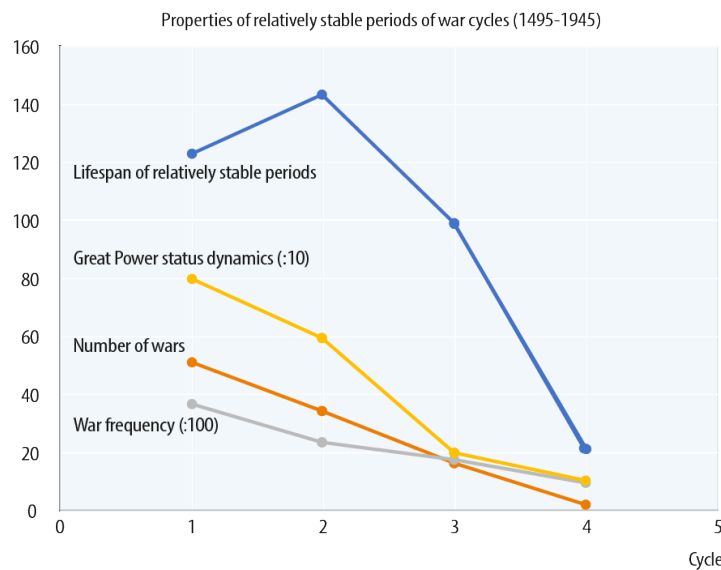


Figure 8: This figure shows the development of the number of non-systemic wars, of war frequencies and of Great Power status changes in Europe during the four successive relatively stable periods that can be distinguished, in addition to their lifespans.

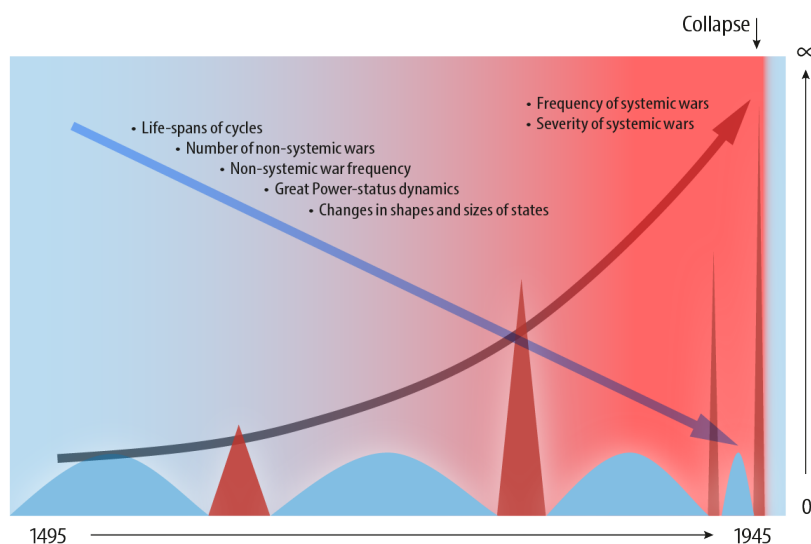


Figure 9: This figure shows schematically the development of the properties of the System's core. All the properties consistently converged toward values that could no longer be sustained, resulting in the core's collapse in 1939.

Quote (5): “Could the 20th-century Hemoclysm, then, have been some kind of fluke? Even to think that way seems like monstrous disrespect to the victims. But the statistics of deadly quarrels don't force such an extreme conclusion. Randomness over long stretches of time can coexist with changing probabilities, and certainly some of the probabilities in the 1930s must have been different from those of other decades. The Nazi ideology that justified an invasion of Poland in order to acquire living space for the “racially superior” Aryans was a part of the same ideology that justified the annihilation of the “racially inferior” Jews. Militant nationalism was a common thread that ran through Germany, Italy, and Japan. There was also a common denominator of counter-Enlightenment utopianism behind the ideologies of Nazism and communism. And even if wars are randomly distributed over the long run, there can be an occasional exception. The occurrence of World War I, for example, presumably incremented the probability that a war like World War II in Europe would break out. But statistical thinking, particularly an awareness of the cluster illusion, suggests that we are apt to exaggerate the narrative coherence of this history—to think that what did happen must have happened because of historical forces like cycles, crescendos, and collision courses. Even with all the probabilities in place, highly contingent events, which need not reoccur if we somehow could rewind the tape of history and play it again, may have been necessary to set off the wars with death tolls in the 6s and 7s on the magnitude scale. Writing in 1999, White repeated a Frequently Asked Question of that year: “Who's the most important person of the Twentieth Century?” His choice: Gavrilo Princip. Who the heck was Gavrilo Princip? He was the nineteen-year-old Serb nationalist who assassinated Archduke Franz Ferdinand of Austria-Hungary during a state visit to Bosnia, after a string of errors and accidents delivered the archduke to within shooting distance. White explains his choice: Here's a man who single-handedly sets off a chain reaction which ultimately leads to the deaths of 80 million people. Top that, Albert Einstein! With just a couple of bullets, this terrorist starts the First World War, which destroys four monarchies, leading to a power vacuum filled by the Communists in Russia and the Nazis in Germany who then fight it out in a Second World War. . . . Some people would minimize Princip's importance by saying that a Great Power War was inevitable sooner or later given the tensions of the times, but I say that it was no more inevitable than, say, a war between NATO and the Warsaw Pact. Left unsparked, the Great War could have been avoided, and without it, there would have been no Lenin, no Hitler, no Eisenhower.

Other historians who indulge in counterfactual scenarios, such as Richard Ned Lebow, have made similar arguments. As for World War II, the historian F. H. Hinsley wrote, "Historians are, rightly, nearly unanimous that . . . the causes of the Second World War were the personality and the aims of Adolf Hitler." Keegan agrees: "Only one European really wanted war—Adolf Hitler." The political scientist John Mueller concludes:

These statements suggest that there was no momentum toward another world war in Europe, that historical conditions in no important way required that contest, and that the major nations of Europe were not on a collision course that was likely to lead to war. That is, had Adolf Hitler gone into art rather than politics, had he been gassed a bit more thoroughly by the British in the trenches in 1918, had he, rather than the man marching next to him, been gunned down in the Beer Hall Putsch of 1923, had he failed to survive the automobile crash he experienced in 1930, had he been denied the leadership position in Germany, or had he been removed from office at almost any time before September 1939 (and possibly even before May 1940), Europe's greatest war would most probably never have taken place."

Comment (5): In his eagerness to prove his point Pinker searches for data that supports his arguments.

The third war cycle - as well as other war cycles - have a very consistent life cycle. War data shows that the third war cycle (1815-1918) reached its tipping point in 1856 (2). From that moment, the average size of non-systemic wars started decreasing, and tensions and issues increasingly accumulated in the System.

In 1914 - the data shows - the ability to release tensions had decreased to about 'zero'; typically, the point when the network of issues and states in the System percolates the System, and the correlation length of the System consequently becomes 'one'. At that point (by definition) the System is critical, and extremely sensitive for even small disturbances. A correlation length of one, allows for the system-wide communication of 'distortions' and events (but also for system-wide communication and coordination for the design and implementation of an upgraded (system-wide) international order).

When Archduke Franz Ferdinand was murdered in Sarajevo in June 1914, this incident could - and did - reverberate through the (by then) critical System, and caused a system-wide response. Such disproportional behaviour - non-linearity - would also have been caused by another incident. A third systemic war was just a matter of time; the First World War (1914-1918) as we now know it is just one of the many versions the System could have produced and was (in the contingent domain) shaped by social developments and events of its time.

The First World War, as well as the other systemic wars, are not *flukes or just bad luck* - as Pinker argues - instead, they were unavoidable systemic tension releases, determined by physical laws that (also) apply to the System, and highly functional in regulating tensions in the System, and upgrading its organisation (international order).

The same argument applies to the fourth systemic war (the Second World War, 1939-1945), which concluded the first finite-time singularity dynamic (1495-1945), which was instrumental in a process of social integration and expansion (2), (3).

Despite, an upgraded international order was implemented by the third systemic war (1914-1918), increasing amounts of tensions were produced at an accelerating rate, the System could no longer regulate and caused its collapse in 1939.

The high amounts of tensions the System produced following the First World War, were 'used' in the contingent domain to 'shape' politics; and 'powered' totalitarian ideologies. High tensions typically 'crystallize' into extreme ideologies and result in volatile politics; this is - it seems - a typical human response in efforts to make sense of fears these tensions cause. Hitler was not responsible for the fourth systemic war - The Second World War - as such: A fourth systemic war and the European System's collapse was unavoidable. Hitler was responsible for the shaping of tensions - including the ideology he used to harness tensions, and mobilise the

German state and its society, - and how these tensions were used to cause large-scale suffering and destruction. If not Hitler, somebody else would have grabbed the opportunity to make his or her point.

Pinker and other historians failed to identify the deterministic laws and mechanisms that underlie - and shape - social dynamics and historical processes. In efforts to make sense of historical processes and events historians connect 'dots' that sometimes do not exist, or are wrongly connected - suggesting a causality that in fact not exists - to be able to present a 'consistent' story-line that satisfies our human need for sense-making.

Quote (6): *"So, too, the Nazi genocide. As we shall see in the next chapter, most historians of genocide agree with the title of a 1984 essay by the sociologist Milton Himmelfarb: "No Hitler, no Holocaust." Probability is a matter of perspective. Viewed at sufficiently close range, individual events have determinate causes. Even a coin flip can be predicted from the starting conditions and the laws of physics, and a skilled magician can exploit those laws to throw heads every time. Yet when we zoom out to take a wide-angle view of a large number of these events, we are seeing the sum of a vast number of causes that sometimes cancel each other out and sometimes align in the same direction. The physicist and philosopher Henri Poincaré explained that we see the operation of chance in a deterministic world either when a large number of puny causes add up to a formidable effect, or when a small cause that escapes our notice determines a large effect that we cannot miss. In the case of organized violence, someone may want to start a war; he waits for the opportune moment, which may or may not come; his enemy decides to engage or retreat; bullets fly; bombs burst; people die. Every event may be determined by the laws of neuroscience and physics and physiology. But in the aggregate, the many causes that go into this matrix can sometimes be shuffled into extreme combinations. Together with whatever ideological, political, and social currents put the world at risk in the first half of the 20th century, those decades were also hit with a run of extremely bad luck."*

Comment (6): Pinker's observation "No Hitler, no Holocaust", is probably correct, but for the wrong reasons. The fourth systemic war - a Second World War - was unavoidable; its timing duration and severity, are the deterministic 'outcome' of physical laws that apply to the System's dynamics. For *what reasons* we fought the fourth systemic war - 'our' Second World War - *how* and *its outcome* however, were determined by the social issues that characterised the 'Zeitgeist' and by the probabilistic events 'of the day'.

Historical processes and social dynamics, including the appearance of the fourth systemic war - how this war 'unfolded' in what would become the Second World War as we know it - were at least to a degree - probabilistic (contingent) in nature. But as I explained, the fourth systemic war as such - as well as the other three systemic wars the System produced until now - was a highly deterministic event (dynamic): its start- and end time, duration, and severity were highly regular and predictable.

Pinker obviously ignored or is not aware of the intrinsic unpredictability of chaotic dynamics. These type of dynamics - despite their deterministic nature - seem random. I argue that non-systemic war dynamics are chaotic in nature (2). Pinker quotes Poincaré instead, to make his point: *"The physicist and philosopher Henri Poincaré explained that we see the operation of chance in a deterministic world either when a large number of puny causes add up to a formidable effect, or when a small cause that escapes our notice determines a large effect that we cannot miss."* However, we also "see change"- and randomness - in chaotic dynamics, despite their deterministic nature. As I explain in my research: non-systemic war dynamics are to a high degree chaotic in nature, and consequently intrinsically unpredictable.

Pinker's statement that "those decades" - referring to the first half of the 20th century - "were also hit with a run of extremely bad luck", is fundamentally wrong: The First and Second World Wars - the third and fourth systemic war, respectively - were integral components of a finite-time singularity dynamic that started in 1495 and ran its deterministic and destructive course until 1939, when the European System (predictably) collapsed. Not a matter of 'bad luck', but the outcome of a highly deterministic (and predictable) dynamic.

Quote (7): *"Now to the money question: has the probability that a war will break out increased, decreased, or stayed the same over time? Richardson's dataset is biased to show an increase. It begins just after the Napoleonic Wars, slicing off one of the most destructive wars in history at one end, and finishes just after World War II, snagging history's most destructive war at the other. Richardson did not live to see the Long Peace that dominated the subsequent decades, but he was an astute enough mathematician to know that it was statistically possible, and he devised ingenious ways of testing for trends in a time series without being misled by extreme events at either end. The simplest was to separate the wars of different magnitudes and test for trends separately in each range. In none of the five ranges (3 to 7) did he find a significant trend. If anything, he found a slight decline. "There is a suggestion," he wrote, "but not a conclusive proof, that mankind has become less warlike since A.D. 1820. The best available observations show a slight decrease in the number of wars with time.... But the distinction is not great enough to show plainly among chance variations." Written at a time when the ashes of Europe and Asia were still warm, this is a testament to a great scientist's willingness to let facts and reason override casual impressions and conventional wisdom. As we shall see, analyses of the frequency of war over time from other datasets point to the same conclusion. But the frequency of war is not the whole story; magnitude matters as well. One could be forgiven for pointing out that Richardson's conjecture that mankind was getting less warlike depended on segregating the world wars into a micro-class of two, in which statistics are futile. His other analyses counted all wars alike, with World War II no different from, say, a 1952 revolution in Bolivia with a thousand deaths. Richardson's son pointed out to him that if he divided his data into large and small wars, they seemed to show opposing trends: small wars were becoming considerably less frequent, but larger wars, while fewer in number, were becoming somewhat more frequent. A different way of putting it is that between 1820 and 1953 wars became less frequent but more lethal. Richardson tested the pattern of contrast and found that it was statistically significant. The next section will show that this too was an astute conclusion: other datasets confirm that until 1945, the story of war in Europe and among major nations in general was one of fewer but more damaging wars. So does that mean that mankind got more warlike or less? There is no single answer, because "warlike" can refer to two different things. It can refer to how likely nations are to go to war, or it can refer to how many people are killed when they do. Imagine two rural counties with the same size population. One of them has a hundred teenage arsonists who delight in setting forest fires. But the forests are in isolated patches, so each fire dies out before doing much damage. The other county has just two arsonists, but its forests are connected, so that a small blaze is likely to spread, as they say, like wildfire. Which county has the worse forest fire problem? One could argue it either way. As far as the amount of reckless depravity is concerned, the first county is worse; as far as the risk of serious damage is concerned, the second is. Nor is it obvious which county will have the greater amount of overall damage, the one with a lot of little fires, or the one with a few big ones. To make sense of these questions, we have to turn from the statistics of time to the statistics of magnitude."*

Comment (7): This text of Pinker is highly suggestive; it is difficult to escape the impression that Pinker very selectively uses quotes, to make his point that violence decreases. This is not scientific reasoning. Although Richardson's "dataset is biased to show an increase", Pinker

suggests (see also quote (6)) that the three large-scale wars during the 19th and 20th centuries (the Napoleonic Wars, and the First and Second World Wars), were 'bad luck'. As explained, Pinker misses the crucial point: These three large-scale wars were 'appearances' of three systemic wars (out of four) that accompanied the four accelerating war cycles (the finite-time singularity dynamic, during the period 1495-1945), and were highly deterministic in nature.

The 'impression' that mankind had become more warlike (an observation of Richardson, Pinker refers to) is not correct. Pinker's creative argumentation that a 'Long Peace' does exist cannot make-up for a lack of a statistical proof and a theoretical framework.

The impression that a 'Long Peace' emerged following the finite-time singularity dynamic (1495-1945), is based on the fact that: (1) the (first) finite-time singularity (1495-1945) - and the accelerating war cycles that accompanied it - had run its course in 1945, (2) by means of the fourth systemic war (the Second World War, 1939-1945) the System globalised, and is now in the process of developing a second finite-time singularity dynamic (now at a global, not at an European scale) that (as did its predecessor) is starting slowly, before accelerating dramatically, and (3) the abnormal war dynamics during the period 1945/1953-1991 were highly suppressed because of the intense rivalry between the United States and the Soviet Union.

The fact that the System resumed chaotic war dynamics in 1991, is consistent with (and predicted by) the theory I present in my research (2). Data-analysis also shows that the current war cycle (1945-....) develops according to a similar life-cycle as its four predecessors: The current war cycle reached the tipping point in 2011, and is presently in its high-connectivity regime. Typically, during such a regime, tensions that build-up in the System (at an accelerating) rate can no longer be sufficiently released by means of non-systemic wars. Instead of tensions being released and issue being resolved, they accumulate in the System, and reinforce each other. The resulting high tension levels and unsolved issues explain the volatile politics and (social) dynamics of the System; The tensions search for a 'way out', however without success. It is a matter of time before these issues become (globally) connected and cause the System to become critical. At that point, a small event can trigger a massive tension release, causing a systemic war. By means of a systemic war, the accumulated tensions are used to design and implement an upgraded international order allows for a lower-energy state of the System, and a new period of relative stability.

During high-connectivity regimes, the System loses its ability - by means of the international order - to regulate the System's energy-state; consequently, the international order becomes increasingly dysfunctional, which contributes to the increase in tensions and unsolved issues. My research suggests that Pinker's question "*Does that mean (Pinker refers to its own reasoning), IP) that mankind got more warlike or less?*" cannot be answered positively; it seems that the wars the System produces are self-organized system behaviour; war cycles are emergent, self-organized properties of a sufficiently connected anarchistic System. These dynamics are deterministic in nature, and humanity until now - obediently - adjusted itself to the 'demands' of the System.

The basic problem is that Richardson and Pinker (1) failed to identify the finite-time singularity dynamic that unfolded in the System during the period 1495-1945, and was accompanied by four accelerating war cycles, (2) did consequently not use the correct unit of analysis (war cycles), and (3) were not aware of a fundamental distinction between systemic and non-systemic wars. The same time as the absolute number of non-systemic wars during successive war cycles, and the non-systemic war frequencies of these cycles decreased linearly over time, the frequency (and their amplitude in terms of severity) of systemic wars increased at an accelerating rate: See also figure: 9.

The 'extreme events' - as Pinker calls them, referring to the French Revolutionary and Napoleonic Wars, and the First and Second World Wars, respectively the second, third and fourth (final) systemic wars of the first finite time singularity dynamic - are not just extreme events: they are highly deterministic and 'coherent' dynamics of the System; systemic wars are not oversized or more extreme non-systemic wars; they have a fundamentally different origin and function.

Pinker's statement: "As we shall see, analyses of the frequency of war over time from other datasets point to the same conclusion" also is fundamentally wrong.

The interpretation and conclusions of Pinker and Richardson in the following text (see also above quote), are also a result of the three shortcomings I just mentioned: "*Richardson's son pointed out to him that if he divided his data into large and small wars, they seemed to show opposing trends: small wars were becoming considerably less frequent, but larger wars, while fewer in number, were becoming somewhat more frequent. A different way of putting it is that between 1820 and 1953 wars became less frequent but more lethal. Richardson tested the pattern of contrast and found that it was statistically significant. The next section will show that this too was an astute conclusion: other datasets confirm that until 1945, the story of war in Europe and among major nations in general was one of fewer but more damaging wars.*"

Point is that the 'opposing trends' - Pinker refers to - concern two fundamentally different types of wars: systemic and non-systemic wars. The fact that during the second half of the 20th century the war frequency and magnitude were much smaller, is not related to - to use Pinker's words - "*the better angles of our nature*", but to the fact that the first finite-time singularity reached the singularity in finite time in 1939, and the System consequently experienced a phase transition that led to the simultaneous implementation of non-anarchistic structures in Europe, and a first international order at a global scale of the System. The (now global) System, is in the high-connectivity regime of a (now global) war cycle, that could well be the first cycle of a second finite time singularity dynamic, at a global scale of the System. The periods 1495 - 1945 and 1945 - are two distinct phases in a long-term process of 'social integration and expansion' at respectively a regional (Europe) and global scale. If the System indeed produces a second finite-time singularity dynamic - and there is no reason to assume otherwise, given the similar conditions of the System - it can be expected that the frequencies and magnitudes (severities) of successive war cycles will accelerate (as was the case during the period 1495-1945).

Quote (8): *What we really need to understand is why wars distribute themselves as power laws; that is, what combination of psychology and politics and technology could generate this pattern. At present we can't be sure of the answer. Too many kinds of mechanisms can give rise to power-law distributions, and the data on wars are not precise enough to tell us which is at work. Still, the scale-free nature of the distribution of deadly quarrels gives us an insight about the drivers of war. Intuitively, it suggests that size doesn't matter. The same psychological or game-theoretic dynamics that govern whether quarreling coalitions will threaten, back down, bluff, engage, escalate, fight on, or surrender apply whether the coalitions are street gangs, militias, or armies of great powers. Presumably this is because humans are social animals who aggregate into coalitions, which amalgamate into larger coalitions, and so on. Yet at any scale these coalitions may be sent into battle by a single clique or individual, be it a gang leader, capo, warlord, king, or emperor. How can the intuition that size doesn't matter be implemented in models of armed conflict that actually generate power-law distributions? The simplest is to assume that the coalitions themselves are power-law-distributed in size, that they fight each other in proportion to their numbers, and that they suffer*

losses in proportion to their sizes. We know that some human aggregations, namely municipalities, are power-law-distributed, and we know the reason. One of the commonest generators of a power-law distribution is preferential attachment: the bigger something is, the more new members it attracts. Preferential attachment is also known as accumulated advantage, the-rich-get-richer, and the Matthew Effect, after the passage in Matthew 25:29 that Billie Holiday summarized as "Them that's got shall get, them that's not shall lose." Web sites that are popular attract more visitors, making them even more popular; bestselling books are put on bestseller lists, which lure more people into buying them; and cities with lots of people offer more professional and cultural opportunities so more people flock to them. (How are you going to keep them down on the farm after they've seen Paree?) Richardson considered this simple explanation but found that the numbers didn't add up. If deadly quarrels reflected city sizes, then for every tenfold reduction in the size of a quarrel, there should be ten times as many of them, but in fact there are fewer than four times as many. Also, in recent centuries wars have been fought by states, not cities, and states follow a log-normal distribution (a warped bell curve) rather than a power law.

Another kind of mechanism has been suggested by the science of complex systems, which looks for laws that govern structures that are organized into similar patterns despite being made of different stuff. Many complexity theorists are intrigued by systems that display a pattern called self-organized criticality. You can think of "criticality" as the straw that broke the camel's back: a small input causes a sudden large output. "Self-organized" criticality would be a camel whose back healed right back to the exact strength at which straws of various sizes could break it again. A good example is a trickle of sand falling onto a sandpile, which periodically causes landslides of different sizes; the landslides are distributed according to a power law. An avalanche of sand stops at a point where the slope is just shallow enough to be stable, but the new sand trickling onto it steepens the slope and sets off a new avalanche. Earthquakes and forest fires are other examples. A fire burns a forest, which allows trees to grow back at random, forming clusters that can grow into each other and fuel another fire. Several political scientists have developed computer simulations that model wars on an analogy to forest fires. In these models, countries conquer their neighbors and create larger countries in the same way that patches of trees grow into each other and create larger patches. Just as a cigarette tossed in a forest can set off either a brushfire or a conflagration, a destabilizing event in the simulation of states can set off either a skirmish or a world war. In these simulations, the destructiveness of a war depends mainly on the territorial size of the combatants and their alliances.

But in the real world, variations in destructiveness also depend on the resolve of the two parties to keep a war going, with each hoping that the other will collapse first. Some of the bloodiest conflicts in modern history, such as the American Civil War, World War I, the Vietnam War, and the Iran-Iraq War, were wars of attrition, where both sides kept shovelling men and matériel into the maw of the war machine hoping that the other side would exhaust itself first. John Maynard Smith, the biologist who first applied game theory to evolution, modelled this kind of standoff as a War of Attrition game. Each of two contestants competes for a valuable resource by trying to outlast the other, steadily accumulating costs as he waits. In the original scenario, they might be heavily armored animals competing for a territory who stare at each other until one of them leaves; the costs are the time and energy the animals waste in the standoff, which they could otherwise use in catching food or pursuing mates. A game of attrition is mathematically equivalent to an auction in which the highest bidder wins the prize and both sides have to pay the loser's low bid. And of course it can be analogized to a war in which the expenditure is reckoned in the lives of soldiers. The War of Attrition is one of those paradoxical scenarios in game theory (like the Prisoner's Dilemma, the Tragedy of the Commons, and the Dollar Auction) in which a set of rational actors pursuing their interests

end up worse off than if they had put their heads together and come to a collective and binding agreement. One might think that in an attrition game each side should do what bidders on eBay are advised to do: decide how much the contested resource is worth and bid only up to that limit. The problem is that this strategy can be gamed by another bidder. All he has to do is bid one more dollar (or wait just a bit longer, or commit another surge of soldiers), and he wins. He gets the prize for close to the amount you think it is worth, while you have to forfeit that amount too, without getting anything in return. You would be crazy to let that happen, so you are tempted to use the strategy "Always outbid him by a dollar," which he is tempted to adopt as well. You can see where this leads. Thanks to the perverse logic of an attrition game, in which the loser pays too, the bidders may keep bidding after the point at which the expenditure exceeds the value of the prize. They can no longer win, but each side hopes not to lose as much. The technical term for this outcome in game theory is "a ruinous situation." It is also called a "Pyrrhic victory"; the military analogy is profound. One strategy that can evolve in a War of Attrition game (where the expenditure, recall, is in time) is for each player to wait a random amount of time, with an average wait time that is equivalent in value to what the resource is worth to them. In the long run, each player gets good value for his expenditure, but because the waiting times are random, neither is able to predict the surrender time of the other and reliably outlast him. In other words, they follow the rule: At every instant throw a pair of dice, and if they come up (say) 4, concede; if not, throw them again. This is, of course, like a Poisson process, and by now you know that it leads to an exponential distribution of wait times (since a longer and longer wait depends on a less and less probable run of tosses). Since the contest ends when the first side throws in the towel, the contest durations will also be exponentially distributed. Returning to our model where the expenditures are in soldiers rather than seconds, if real wars of attrition were like the "War of Attrition" modeled in game theory, and if all else were equal, then wars of attrition would fall into an exponential distribution of magnitudes. Of course, real wars fall into a power-law distribution, which has a thicker tail than an exponential (in this case, a greater number of severe wars). But an exponential can be transformed into a power law if the values are modulated by a second exponential process pushing in the opposite direction. And attrition games have a twist that might do just that. If one side in an attrition game were to leak its intention to concede in the next instant by, say, twitching or blanching or showing some other sign of nervousness, its opponent could capitalize on the "tell" by waiting just a bit longer, and it would win the prize every time. As Richard Dawkins has put it, in a species that often takes part in wars of attrition, one expects the evolution of a poker face. Now, one also might have guessed that organisms would capitalize on the opposite kind of signal, a sign of continuing resolve rather than impending surrender. If a contestant could adopt some defiant posture that means "I'll stand my ground; I won't back down," that would make it rational for his opposite number to give up and cut its losses rather than escalate to mutual ruin. But there's a reason we call it "posturing." Any coward can cross his arms and glower, but the other side can simply call his bluff. Only if a signal is costly—if the defiant party holds his hand over a candle, or cuts his arm with a knife—can he show that he means business. (Of course, paying a self-imposed cost would be worthwhile only if the prize is especially valuable to him, or if he had reason to believe that he could prevail over his opponent if the contest escalated.) In the case of a war of attrition, one can imagine a leader who has a changing willingness to suffer a cost over time, increasing as the conflict proceeds and his resolve toughens. His motto would be: "We fight on so that our boys shall not have died in vain." This mindset, known as loss aversion, the sunk-cost fallacy, and throwing good money after bad, is patently irrational, but it is surprisingly pervasive in human decision-making. People stay in an abusive marriage because of the years they have already put into it, or sit through a bad movie because they have already paid for the ticket, or try to reverse a gambling loss by doubling their next bet, or pour money into a boondoggle because they've already poured so much money into it. Though psychologists don't fully understand why people are suckers for sunk costs, a common explanation is that it signals a

public commitment. The person is announcing: "When I make a decision, I'm not so weak, stupid, or indecisive that I can be easily talked out of it." In a contest of resolve like an attrition game, loss aversion could serve as a costly and hence credible signal that the contestant is not about to concede, preempting his opponent's strategy of outlasting him just one more round. I already mentioned some evidence from Richardson's dataset which suggests that combatants do fight longer when a war is more lethal: small wars show a higher probability of coming to an end with each succeeding year than do large wars. 66 The magnitude numbers in the Correlates of War Dataset also show signs of escalating commitment: wars that are longer in duration are not just costlier in fatalities; they are costlier than one would expect from their durations alone. 67 If we pop back from the statistics of war to the conduct of actual wars, we can see the mechanism at work. Many of the bloodiest wars in history owe their destructiveness to leaders on one or both sides pursuing a blatantly irrational loss-aversion strategy. Hitler fought the last months of World War II with a maniacal fury well past the point when defeat was all but certain, as did Japan. Lyndon Johnson's repeated escalations of the Vietnam War inspired a protest song that has served as a summary of people's understanding of that destructive war: "We were waist-deep in the Big Muddy; The big fool said to push on." The systems biologist Jean-Baptiste Michel has pointed out to me how escalating commitments in a war of attrition could produce a power-law distribution. All we need to assume is that leaders keep escalating as a constant proportion of their past commitment—the size of each surge is, say, 10 percent of the number of soldiers that have fought so far. A constant proportional increase would be consistent with the well-known discovery in psychology called Weber's Law: for an increase in intensity to be noticeable, it must be a constant proportion of the existing intensity. (If a room is illuminated by ten lightbulbs, you'll notice a brightening when an eleventh is switched on, but if it is illuminated by a hundred lightbulbs, you won't notice the hundred and first; someone would have to switch on another ten bulbs before you noticed the brightening.) Richardson observed that people perceive lost lives in the same way: "Contrast for example the many days of newspaper-sympathy over the loss of the British submarine *Thetis* in time of peace with the terse announcement of similar losses during the war. This contrast may be regarded as an example of the Weber-Fechner doctrine that an increment is judged relative to the previous amount." The psychologist Paul Slovic has recently reviewed several experiments that support this observation. The quotation falsely attributed to Stalin, "One death is a tragedy; a million deaths is a statistic," gets the numbers wrong but captures a real fact about human psychology. If escalations are proportional to past commitments (and a constant proportion of soldiers sent to the battlefield are killed in battle), then losses will increase exponentially as a war drags on, like compound interest. And if wars are attrition games, their durations will also be distributed exponentially. Recall the mathematical law that a variable will fall into a power-law distribution if it is an exponential function of a second variable that is distributed exponentially. My own guess is that the combination of escalation and attrition is the best explanation for the power-law distribution of war magnitudes. Though we may not know exactly why wars fall into a power-law distribution, the nature of that distribution—scale-free, thick-tailed—suggests that it involves a set of underlying processes in which size doesn't matter. Armed coalitions can always get a bit larger, wars can always last a bit longer, and losses can always get a bit heavier, with the same likelihood regardless of how large, long, or heavy they were to start with.

Comment (8): In the chapter "The statistics of deadly quarrels, Part 2: The magnitude of wars". Pinker discusses Richardson's observation that the 'number of deaths in each quarrel' and the 'number of deadly quarrels' obey a power-law distribution. In this chapter Pinker, tries to make sense out of this typical regularity.

A similar - and related - regularity, a power-law distribution of 'the size of Great Power wars defined in terms of fraction' and their respective numbers during the period 1495-1945, as I show in my research, also qualifies as a power-law distribution (2). The measure 'fraction' for

the size of Great Power wars, allows for the application of insights related to critical phenomena. *Fraction*, I have defined as: 'the number of Great Powers that participate in a Great Power war, as a proportion of the total number of Great Powers in the System, at that moment in time'. It is a relative measure. Systemic wars ('by definition') have a fraction of 'one', meaning that all Great Powers in the System (at that point in time), participate in a Systemic war. Systemic wars are a manifestation of criticality of the System (2). The fact that the fraction is 'one' is consistent with the phenomenon that critical systems typically have a correlation length of one³.

The function of systemic wars is to 'design' and implement upgraded international orders, by putting the tensions to use that have accumulated in the System. This - designing and implementing upgraded international orders that again allow for new periods of relative stability, and (consequently) further growth and development - requires the participation of all Great Powers in the System; otherwise relative stability would not be achieved; all Great Powers need to be aligned and 'committed' to the new order.

In this quote ('quote (9)'), Pinker again - with great creativity, - weaves together his argumentation to support his statement that violence is declining. His reasoning is inconsistent, and his arguments are incorrect (see also previous comments).

Again, these 'shortcomings' can be attributed to Pinker's (and Richardson's) failure to (1) identify the finite-time singularity dynamic that unfolded in the System during the period 1495-1945, and was accompanied by four accelerating war cycles, to (2) use the correct unit of analysis (war cycles), and (3) to the fact that both did not recognize the fundamental distinction between systemic and non-systemic wars.

The power-law distribution that can be observed concerning the size-distribution of Great Power wars (defined in terms of fraction), can be attributed to the fact that the System operates closely to its critical point, and/or the fact that non-systemic war dynamics are chaotic in nature (further research is required). Power-laws are (also) related to critical phenomena, and to chaotic dynamics (2).

In my research, I also address the question if the System qualifies as a *self-organized critical system* (SOC-system in short). I argue that this is not the case, because the critical point - I assume - is not the attractor of the System (2).

The war dynamics and development of the System - including the unfolding of the finite-time singularity dynamic that was accompanied by four accelerating war cycles (1495-1945) - are *powered* by tensions (= energy) that are produced in anarchistic systems because of the intrinsic incompatibility between connectivity and anarchy. The 'underlying' *drivers* are population growth and rivalries between states. These '*energy dynamics*' of the System obey simple '*energy laws*' (related to for example the second law of thermodynamics): Free energy in a system will be used to implement a 'new' order that allows for a lower energy state of the system in question. Tensions can be considered free energy; an upgraded international law ensures a lower energy-state of the System.

³ During criticality - that is during systemic wars - the collective information processing capability of the System and its ability to adjust/realign its configuration are optimized. Upgrades that are accomplished through systemic wars, concern a realignment of the rule-set of the System (which include certain privileges for powerful/influential states), and the actual positions of power and influence of states in the System. From a network perspective, power (potential influence) and influence (the ability to change the behaviour of other actors to serve one's own interests) are a function of (determined by) the centrality of states (nodes), and their ability to use and mobilise hard and soft power.

These deterministic laws in combination with certain effects (like the network effect, that produces a tipping point, and enables accumulation) determine and shape the war dynamics of the System, which deterministic in nature.

It shows our *arrogance* that we always assumed - and still assume - that physical laws do not apply to social systems and its dynamics. We are '*in control*' is the assumption. However, as my research shows, our '*free will*' is much more limited than we assume, and as far as it exists, we do not use it wisely in promoting humanity's interests.

These deterministic laws determine when accumulated tensions (energy) must and will be released, and will be used to implement upgraded orders that allow for a lower energy-state of the System. These laws explain the highly consistent and regular patterns that can be observed in the war dynamics of the System.

We have never realized - and now have difficulty to accept - that our social dynamics are shaped by these deterministic 'underlying' energy dynamics.

The tensions we produce in the System, shape social issues that unfold and develop within the framework the energy laws 'provide' - grant - us. These social issues have their own dynamics, and momentum.

What we do with these tensions - and for example what we fight for - is our decision, when we fight, for how long, etc. is however determined by the underlying deterministic laws.

A third and fourth systemic war (for example), would have happened anyway (it is not '*bad luck*' as Pinker argues), what we 'made of it' and who were the protagonists, was up to us. The war dynamics are forced on the System, but our leaders - Napoleon, Hitler, but also Churchill and Roosevelt, Trump, May and Erdogan, etc. - are our choices.

In the current set-up of the anarchistic System, war-cycles - systemic and non-systemic tension releases tension releases - are emergent (self-organized) dynamics of the System to regulate its energy-state. Systemic wars are unavoidable; only their 'appearance' - including the issues we fight for, and the protagonists we chose to be our 'leaders' - are the outcome of the application of our so-called 'free will'.

This also means that a next systemic war also is a product of the underlying deterministic laws and mechanisms, and is unavoidable if we do not recognize and better understand the workings of the System, and take appropriate action.

Trump, but also Brexit - to name two examples - are the products of the high-tension levels in the System. The present high tensions levels, are a product of the high-connectivity regime of the current war cycle that is now unfolding. At this stage, tensions and issues *accumulate* in the system, and cannot be released and solved. The System is now *charging* for a next critical period (systemic war).

Human beings and societies have difficulty in dealing with these tensions, and in efforts to reduce these tensions, look for (1) radical solutions (because moderate solutions did not work, and populist politicians will explain that these moderate solutions of the 'establishment', are in fact the cause of the deplorable situation we are now in), and (2) look for '*enemies*' that allow these tensions to crystallize; then at least the tensions get a 'face', and can be focused. Minorities typically are used for this purpose.

Current leaders - products of the dynamics of the System, and social developments - determine how tensions will be used to (further) shape social issues and international controversies. Their moral values are crucial, and define the next fight. Although Trump and Brexit are products of high tensions, they and their respective societies are indeed responsible how these tensions are used.

The energy laws determine that we will fight, but do not determine the outcome of the fight; that is, the values that will underpin a next international order. If the requirements of the *energy laws* are met, 'anything' - fascism, communism, liberal-democracy - will do; the System is indifferent.

We must better understand our limitations - including our limited understanding of the System's dynamics - and put our free will to better use, to avoid a new series of potentially self-destructive war cycles.

In the chapter "The Trajectory of Great Power War" Pinker discusses the frequency of wars, and the amount of damage they cause over time. In this chapter, Pinker makes also use of the dataset of Jack Levy; the same dataset I (mainly) used for my research. This chapter gives a good opportunity to 'compare' his research and conclusions, with my research.

I present in below quotes the full text of this chapter.

Quote (9): "Richardson reached two broad conclusions about the statistics of war: their timing is random, and their magnitudes are distributed according to a power law. But he was unable to say much about how the two key parameters—the probability of wars, and the amount of damage they cause—change over time. His suggestion that wars were becoming less frequent but more lethal was restricted to the interval between 1820 and 1950 and limited by the spotty list of wars in his dataset. How much more do we know about the long-term trajectory of war today? There is no good dataset for all wars throughout the world since the start of recorded history, and we wouldn't know how to interpret it if there were. Societies have undergone such radical and uneven changes over the centuries that a single death toll for the entire world would sum over too many different kinds of societies. But the political scientist Jack Levy has assembled a dataset that gives us a clear view of the trajectory of war in a particularly important slice of space and time."

"The time span is the era that began in the late 1400s, when gunpowder, ocean navigation, and the printing press are said to have inaugurated the modern age (using one of the many definitions of the word modern). That is also the time at which sovereign states began to emerge from the medieval quilt of baronies and duchies."

"The countries that Levy focused on are the ones that belong to the great power system the handful of states in a given epoch that can throw their weight around the world. Levy found that at any time a small number of eighthundred-pound gorillas are responsible for a majority of the mayhem. The great powers participated in about 70 percent of all the wars that Wright included in his half-millennium database for the entire world, and four of them have the dubious honor of having participated in at least a fifth of all European wars. (This remains true today: France, the U.K., the United States, and the USSR/Russia have been involved in more international conflicts since World War II than any other countries.)" (IP: This observation is inaccurate, but I will not comment on in the comment that follows).

"Countries that slip in or out of the great power league fight far more wars when they are in than when they are out. One more advantage of focusing on great powers is that with footprints that large, it's unlikely that any war they fought would have been missed by the scribblers of the day."

"As we might predict from the lopsided power-law distribution of war magnitudes, the wars among great powers (especially the wars that embroiled several great powers at a time) account for a substantial proportion of all recorded war deaths. According to the African proverb (like most African proverbs, attributed to many different tribes), when elephants fight, it is the grass that suffers. And these elephants have a habit of getting into fights with one

another because they are not leashed by some larger suzerain but constantly eye each other in a state of nervous Hobbesian anarchy.”

“Levy set out technical criteria for being a great power and listed the countries that met them between 1495 and 1975. Most of them are large European states: France and England/Great Britain/U.K. for the entire period; the entities ruled by the Habsburg dynasty through 1918; Spain until 1808; the Netherlands and Sweden in the 17th and early 18th centuries; Russia/USSR from 1721 on; Prussia/ Germany from 1740 on; and Italy from 1861 to 1943. But the system also includes a few powers outside Europe: the Ottoman Empire until 1699; the United States from 1898 on; Japan from 1905 to 1945; and China from 1949. Levy assembled a dataset of wars that had at least a thousand battle deaths a year (a conventional cutoff for a “war” in many datasets, such as the Correlates of War Project), that had a great power on at least one side, and that had a state on the other side. He excluded colonial wars and civil wars unless a great power was butting into a civil war on the side of the insurgency, which would mean that the war had pitted a great power against a foreign government. Using the Correlates of War Dataset, and in consultation with Levy, I have extended his data through the quarter-century ending in 2000.”

“Let’s start with the clashes of the titans—the wars with at least one great power on each side. Among them are what Levy called “general wars” but which could also be called “world wars,” at least in the sense that World War I deserves that name—not that the fighting spanned the globe, but that it embroiled most of the world’s great powers. These include the Thirty Years’ War (1618–48; six of the seven great powers), the Dutch War of Louis XIV (1672–78; six of seven), the War of the League of Augsburg (1688–97; five of seven), the War of the Spanish Succession (1701–13; five of six), the War of the Austrian Succession (1739–48; six of six), the Seven Years’ War (1755–63; six of six), and the French Revolutionary and Napoleonic Wars (1792–1815; six of six), together with the two world wars. There are more than fifty other wars in which two or more great powers faced off.”

Comment (9): The definitions for “general wars” and “world wars” used by Pinker and Levy are inaccurate, and cause confusion. It is essential to distinguish between systemic wars and non-systemic wars (see also table 1). In case of systemic wars, all Great Powers in the System participate; systemic wars typically produce new relatively stable periods (upgraded international orders), and systemic wars typically are - a closer look reveals - preceded by periods (high-connectivity regimes of relatively stable periods (2)) in which the average size of (non-systemic) wars decreases; the System is (consequently) accumulating tensions and issues, charging for a next systemic war. If these criteria are used, it is possible to identify four systemic wars: (1) the *Thirty Years’ War* (1618-1648), (2) the *French Revolutionary and Napoleonic Wars* (1792-1815), (3) the *First World War* (1914-1918), and (4) the *Second World War* (1939-1945); these four wars are respectively the first until fourth systemic wars the System produced during the period 1495-1945. Identification of these four systemic wars reveals that during the period 1495-1945, the System produced a finite-time singularity dynamic that was accompanied by four accelerating war cycles; each war cycle consisting of a relatively stable period, followed by a systemic war. These four war cycles have very consistent properties.

This *framework* raises two questions: (1) Why not all Great Powers participated in the Thirty Years’ War? and (2) Why did the System produce three non-systemic wars during the period 1657-1763, in which all Great Powers participated, and do these wars not qualify as systemic wars?

In answer to the first question: The Ottoman Empire (Turkey) was absent. Levy observes that Turkey's status as an European Great Power was (and still is) not always clear; Turkey periodically shifted its orientation, and must - depending on its orientation - be considered a Great Power in the European System, or should be 'ignored' as such. Until today, Turkey - located in between two 'spheres' - is not always an integral part of the European System. I argue that this was also the case during the Thirty Years' War. For that reason, Turkey was not required for the design and implementation of an upgraded order that could effectively regulate the 'new' status quo the Thirty Years' War resulted in.

In answer to the second question: As I show in my research, during the period 1657-1763, the non-systemic war dynamics were not chaotic but periodic in nature: Because of the intense rivalry between Great Britain and France the number of degrees of freedom of the System were consequently reduced to two. As a result, the non-systemic war dynamics became more extreme (less restrained), and less balanced (see also figures: 2-4).

Below figures show regularities that can be identified in the chaotic non-systemic war dynamics, during the period 1495-1618: their more restrained nature is evident and can be attributed to a third degree of freedom.

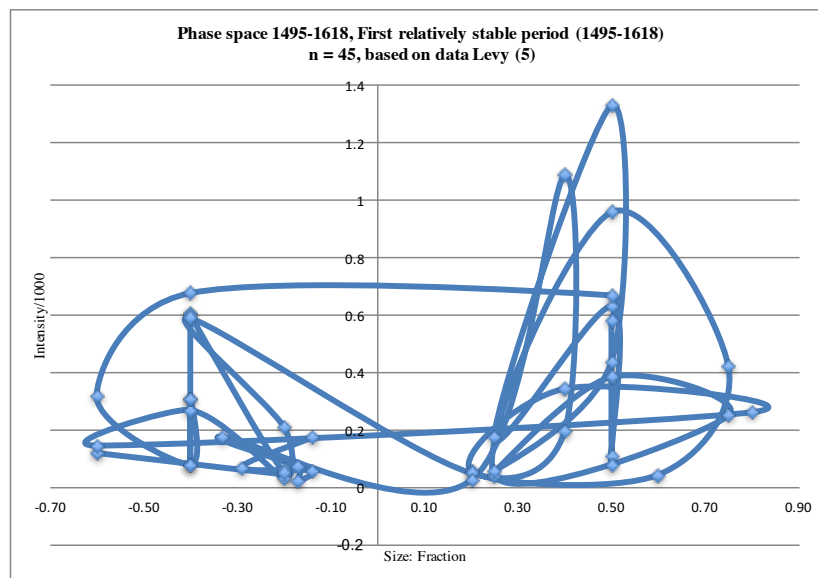


Figure 10: This figure shows the typical circular trajectories in phase space of the chaotic non-systemic war dynamics of the System during the first relatively stable period (1495-1618). It is possible to distinguish nine circular trajectories. The five right-hand trajectories are projected in the left (second) quadrant. Closer analysis shows that the average size of non-systemic wars that are part of the circular trajectories during the period 1495-1618, developed very regular (see below figure). Data from Levy (7).

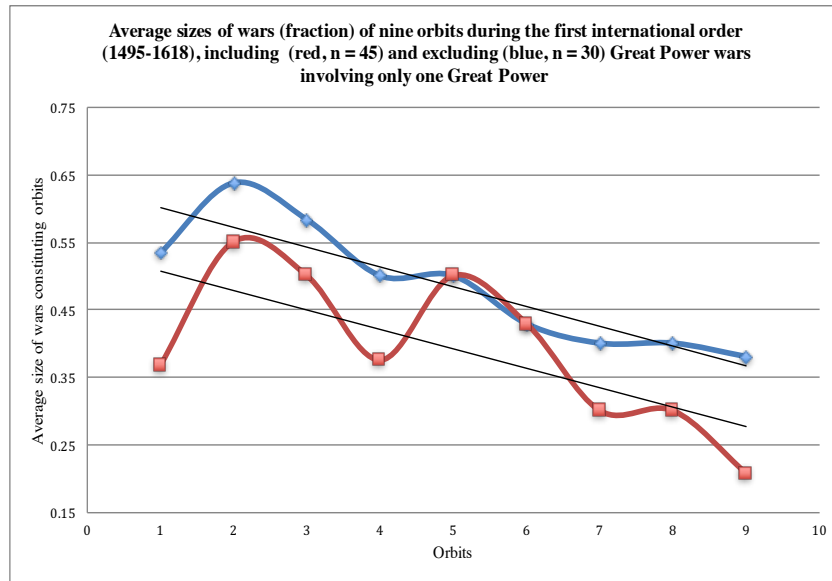


Figure 11: In this figure, the development of the average size of non-systemic wars making-up nine successive orbits during the first relatively stable period (1495-1618) are shown. The first international order developed the first orbit during the low-connectivity regime (before the tipping point was reached in 1514); the other eight orbits - constituting a damped-oscillator - were produced once the tipping point was reached in 1514, during the high-connectivity regime of the relatively stable period. Once the damped oscillator was completely damped, the international order was 'stable' and unable to release tensions by means of non-systemic wars, and consequently collapsed. The increasing damping can be attributed to the network-effect

Because of the abnormal nature of non-systemic war dynamics during the period 1657-1763, I refer to this period as the first exceptional period (the Cold War, 1945-1991, is the second exceptional period). I argue that the abnormal non-systemic war dynamics not only produced a series of 'extreme' non-systemic wars - and consequently distorted the energy 'balance' of war dynamics during the second cycle - but also caused a delay in the development of the second cycle (of the System) of circa 15 years (2).

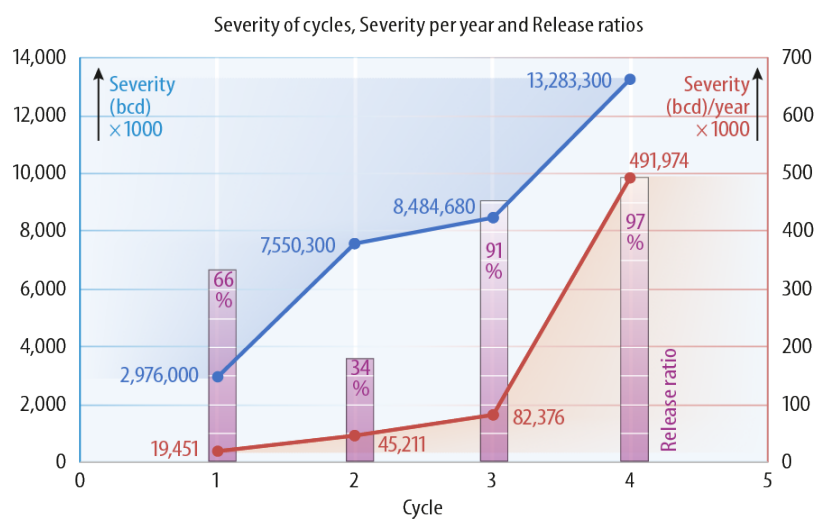


Figure 12: This figure shows the total severities, the severity/year, and release ratios of successive cycles during the period 1495-1945, basic data from Levy (7). This figure shows that the abnormal war dynamics during the first exceptional period (1657-1763), distorted the regular development of the

release ratios of the four successive cycles. The release ratio of a cycle specifies what percentage of the total severity of the cycle (the sum of the severities of all non-systemic wars during the relatively stable period of the cycle and of its systemic war) is contributed by the systemic war of the cycle. I consider the release ratio a measure - an indication - of the amount of tensions that are released through systemic war activity during a cycle. The analysis not only shows that the System produced increasingly more tensions during increasingly shorter war cycles, but also that the release of tensions - because of the increasing robustness of successive international orders - increasingly occurred - had to occur - during systemic wars. The moment the System lost the ability to release tensions through non-systemic wars (to produce non-systemic wars), the international order - the status quo - could no longer be regulated (balanced) and the System consequently collapsed: In 1939, not only the international order that was in place since 1918 collapsed, but also the anarchistic System as such in Europe had become obsolete. The collapse of the ‘European System’ is the manifestation of the singularity in finite-time, and was ‘programmed’ in - imposed upon - the System the moment the finite-time singularity dynamic in 1495 started to unfold. Data from Levy (7).

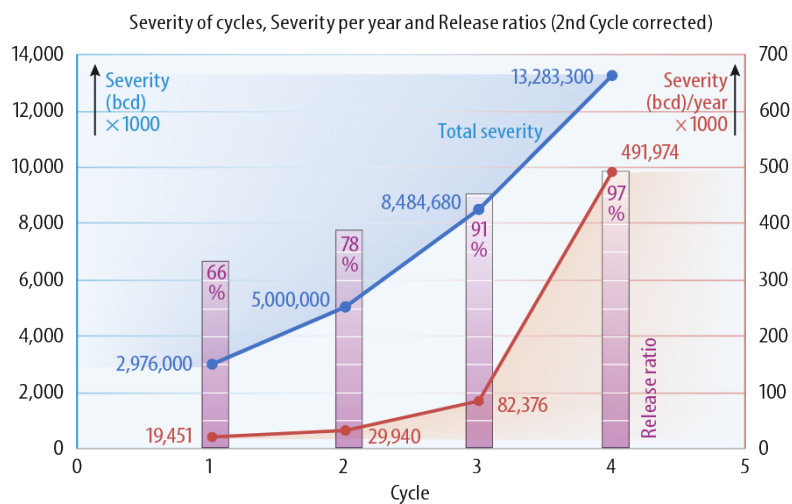


Figure 13: This figure shows the total severities, the severity per year, and release ratios of successive cycles during the period 1495-1945, data from Levy (7). However, in this figure (contrary to above figure), the total severity and release ratio of the second cycle are ‘corrected’, assuming a regular trend.

Quote (10): “One indication of the impact of war in different eras is the percentage of time that people had to endure wars between great powers, with their disruptions, sacrifices, and changes in priorities.”

Comment (10): Pinker is not aware of the accelerating pace of life of the System. I assume that the pace of life of the System is a function of population growth and connectivity of the System (2). The life-span of the four successive war cycles (except for the second cycle, see above) shorten very regularly. It is no coincidence that the four systemic wars - integral components of the four war cycles) - shorten with the same factor: The pace of life of the system accelerates consistently.

Quote (11): “Figure 5–12 (IP: I use Pinker’s numbers, for the figures from his study) shows the percentage of years in each quarter-century that saw the great powers of the day at war. In two of the early quarter-centuries (1550–75 and 1625–50), the line bumps up against the ceiling: great powers fought each other in all 25 of the 25 years. These periods were saturated with the horrendous European Wars of Religion, including the First Huguenot War

and the Thirty Years' War. From there the trend is unmistakably downward. Great powers fought each other for less of the time as the centuries proceeded, though with a few partial reversals, including the quarters with the French Revolutionary and Napoleonic Wars and with the two world wars. At the toe of the graph on the right one can see the first signs of the Long Peace. The quarter-century from 1950 to 1975 had one war between the great powers (the Korean War, from 1950 to 1953, with the United States and China on opposite sides), and there has not been once since."

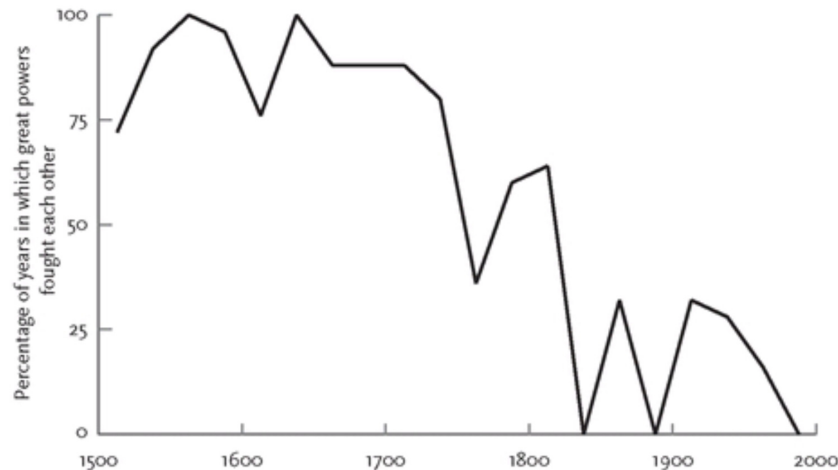


FIGURE 5–12. Percentage of years in which the great powers fought one another, 1500–2000 Source: Graph adapted from Levy & Thompson, 2011. Data are aggregated over 25-year periods.

Comment (11): Pinker and Levy cannot identify the underlying ‘structure’ of the war dynamics of the System if the fundamental distinction between systemic and non-systemic wars is not recognized. Data-aggregation in periods of 25 years also is not helpful: The unit of analysis should be the life-span of war cycles. A so-called “Long Peace” - as Pinker argues - does simply not exist: It is the outcome of the limited analysis of Pinker, which lacks a consistent framework/theory. The Second World War (1939-1945) - the fourth and (predictably) last systemic war of the first finite-time singularity dynamic - constituted a phase transition of the System that had two effects: (1) the implementation of two non-anarchistic structures in Europe, and (2) the simultaneous implementation of a first international order at a global scale of the System. The implementation of the non-anarchistic structures in Europe was a logical next step in a long-term process of social integration and expansion that was (and still is) unfolding in Europe. The anarchistic structures were controlled by the United States and the Soviet Union (respectively West and East Europe), who functioned as lynchpins between the upgraded ‘European order’, and the first global International order (the United Nations). By means of the Second World War, the System globalised.

Analysis of war data show that the System is now producing a fifth - a first global - war cycle. The development of this war cycle is probably also (as is the case with the second cycle, because of the first exceptional period) distorted, and probably delayed. Because of the intense rivalry between the United States and the Soviet Union, the number of degrees of freedom of the System was temporarily reduced to two, during the period 1945-1991. Because of the dysfunctionality of war as rational instrument of policy during that period, non-systemic war dynamics were highly suppressed during the second exceptional period: The System (except for the Korean War, 1950-1953) only produced a small number of small wars, that mainly took

place outside of Europe (where both rivals confronted each other directly) (2), (3). The moment in 1991 the Soviet Union collapsed, the System resumed its default chaotic and (thus) intrinsically unpredictable non-systemic war dynamics, as analysis of the war data clearly show. Data-analysis shows the circular trajectories of war dynamics in phase state (defined by intensity and size in terms of fraction), resumed in 1991.

Pinker’s “Long Peace” is just - I regret to say - wishful thinking.

Quote (12): “Now let’s zoom out and look at a wider view of war: the hundred-plus wars with a great power on one side and any country whatsoever, great or not, on the other. With this larger dataset we can unpack the years-at-war measure from the previous graph into two dimensions. The first is frequency. Figure 5–13 plots how many wars were fought in each quarter-century. Once again we see a decline over the five centuries: the great powers have become less and less likely to fall into wars. During the last quarter of the 20th, only four wars met Levy’s criteria: the two wars between China and Vietnam (1979 and 1987), the UNSANCTIONED war to reverse Iraq’s invasion of Kuwait (1991), and NATO’s bombing of Yugoslavia to halt its displacement of ethnic Albanians in Kosovo (1999).”



FIGURE 5–13. Frequency of wars involving the great powers, 1500–2000 Sources: Graph from Levy, 1983, except the last point, which is based on the Correlates of War InterState War Dataset, 1816–1997, Sarkees, 2000, and, for 1997–99, the PRIO Battle Deaths Dataset 1946–2008, Lacina & Gleditsch, 2005. Data are aggregated over 25-year periods.

Comment (12): Again, the same objection I mentioned before: Pinker uses the wrong unit of analysis (that should be the four accelerating war cycles during the period 1495-1945, and the still unfolding war first global war cycle), and ignores the fundamental difference between systemic and non-systemic wars. His observations and conclusions ignore these very basic facts. Pinker is not aware that the trends he observes in the war dynamics of the System, are mostly ‘statistical constructs’, and that the trends that can be identified, cannot be attributed to the - what he calls - “better nature of our angles” - but to the System’s behaviour, that to a high degree is deterministic in nature, and the outcome of underlying laws and mechanisms. Human beings and societies (still) are obedient followers in a System they still do not understand.

Quote (13): “The second dimension is duration. Figure 5–14 shows how long, on average, these wars dragged on. Once again, the trend is downward, though with a spike around the middle of the 17th century. This is not a simpleminded consequence of counting the Thirty Years’ War as lasting exactly thirty years; following the practice of other historians, Levy divided it into four more circumscribed wars. Even after that slicing, the Wars of Religion in that era were brutally long. But from then on, the great powers sought to end their wars soon after beginning them, culminating in the last quarter of the 20th century, when the four wars involving great powers lasted an average of 97 days.”



FIGURE 5–14. Duration of wars involving the great powers, 1500–2000 Sources: Graph from Levy, 1983, except the last point, which is based on the Correlates of War InterState War Dataset, 1816–1997, Sarkees, 2000, and, for 1997–99, the PRIO Battle Deaths Dataset 1946–2008, Lacina & Gleditsch, 2005. Data are aggregated over 25-year periods.

Comment (13): Again, Pinker is comparing apples and oranges, ignores the fundamental difference between the two types of wars, and ignores the existence of accelerating war cycles. The shortening duration of wars can be attributed to the increasing pace of life in the System.

Quote (14): “What about destructiveness? Figure 5–15 plots the log of the number of battle deaths in the wars fought by at least one great power. The loss of life rises from 1500 through the beginning of the 19th century, bounces downward in the rest of that century, resumes its climb through the two world wars, and then plunges precipitously during the second half of the 20th century. One gets an impression that over most of the half-millennium, the wars that did take place were getting more destructive, presumably because of advances in military technology and organization.”



FIGURE 5-15. Deaths in wars involving the great powers, 1500–2000 Sources: Graph from Levy, 1983, except the last point, which is based on the Correlates of War InterState War Dataset, 1816–1997, Sarkees, 2000, and, for 1997–99, the PRIO Battle Deaths Dataset 1946–2008, Lacina & Gleditsch, 2005. Data are aggregated over 25-year periods.

Comment (14): The total destructiveness (defined as the sum of the battle casualties (severities) of non-systemic wars and the systemic war that make up a cycle) of successive cycles increased very regularly. Again, the abnormal and exceptionally severe non-systemic wars during the first exceptional period (1657-1763) caused a distortion of this otherwise very regular development of the total severity of successive cycles, as I explain in comment (9). The series of 'extreme' wars the System produced during the period 1657-1763 because of the intense rivalry between Great Britain and France, also influenced the - what I name - release ratio of the second cycle. The release ratio of a cycle specifies what percentage of the total severity of the cycle (the sum of the severities of all non-systemic wars during the relatively stable period of the cycle and of its systemic war) is contributed by the systemic war of the cycle. During the second cycle, not only more tensions were produced and released than the trend 'predicted', but an abnormal proportion of the tensions that were produced during the second cycle, were released by means of non-systemic wars: The abnormal war dynamics during the first exceptional period (1657-1763) distorted the energy distribution of the second war cycle. Advances in technology and organization were not the cause of the increasing destructiveness of wars: The cause of the increasing destructiveness in these wars must be attributed to the increasing connectivity of the System, and the increasing robustness and stability of successive international orders (relatively stable periods). Advances in technology and organization 'only' enabled the unfolding of the finite-time singularity dynamic.

The (ultimately) unsustainability of the accelerating war dynamics of the System during the period 1495-1945, resulting in the System's collapse in 1939, can be attributed to the accelerating amounts of tensions the System produced during that period, and were - and had to be - put to work to implement upgraded orders to achieve a lower-energy state of the System. Wars can be considered tensions releases of the System. These tensions are released through the deployment of destructive energy. I consider the severity of wars indicative for the destructive energy that is deployed, and the tensions that were produced. The accelerating growth of the severity/year of successive cycles (see also figures 12 and 13) during successive cycles - indicative for the production of tensions - became at a certain point

unsustainable. The development of this ratio is indicative for the driving effect of the finite-time singularity dynamic.

Quote (15): *"If so, the crossing trends—fewer wars, but more destructive wars—would be consistent with Richardson's conjecture, though stretched out over a fivefold greater time span. We can't prove that this is what we're seeing, because figure 5–15 folds together the frequency of wars and their magnitudes, but Levy suggests that pure destructiveness can be separated out in a measure he calls "concentration," namely the damage a conflict causes per nation per year of war. Figure 5–16 plots this measure. In this graph the steady increase in the deadliness of great power wars through World War II is more apparent, because it is not hidden by the paucity of those wars in the later 19th century. What is striking about the latter half of the 20th century is the sudden reversal of the crisscrossing trends of the 450 years preceding it. The late 20th century was unique in seeing declines both in the number of great power wars and in the killing power of each one—a pair of downslopes that captures the war-aversion of the Long Peace. Before we turn from statistics to narratives in order to understand the events behind these trends, let's be sure they can be seen in a wider view of the trajectory of war.*

Comment (15): Again, the so-called 'Long Peace' Pinker refers to, is regrettably based on a misinterpretation of the data, and the absence of a coherent framework to understand the war dynamics of the System. As I explained, the four accelerating war cycles the System produced during the period 1495-1945, constitute a finite-time singularity dynamic, that reached the singularity in finite time - the critical connectivity threshold of the anarchistic European System - in 1939, and consequently collapsed. The fourth systemic war (the Second World War, 1939-1945) that subsequently followed, constituted a phase transition that had two closely related effects: (1) the implementation of non-anarchistic structures in Europe, controlled by the United States and the Soviet Union (respectively Western and Eastern Europe), that is, a next step in the process of social integration in Europe, and (2) the simultaneous implementation of a first international order (the United Nations) at a global scale of the System. The embedding of the new European order in the now globalised international System, was accomplished by the United States and the Soviet Union, that functioned as *lynchpins* between both orders. Analysis of war data shows that the global System is now producing a fifth - and first global - war cycle (1945-....), that seems to follow the same typical pattern as the four preceding (European) war cycles.

The fact that the war dynamics were suppressed during the period 1945-1991 (except for the Korean war, 1950-1953), also contributes to Pinker's wrong interpretation of war data.

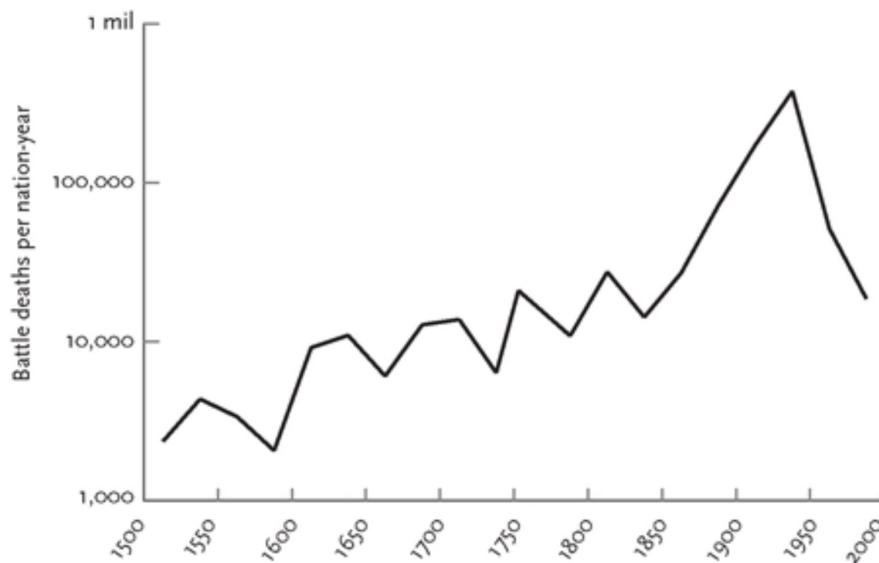


FIGURE 5–16. Concentration of deaths in wars involving the great powers, 1500–2000 Sources: Graph from Levy, 1983, except the last point, which is based on the Correlates of War InterState War Dataset, 1816–1997, Sarkees, 2000, and, for 1997–99, the PRIO Battle Deaths Dataset 1946–2008, Lacina & Gleditsch, 2005. Data are aggregated over 25-year periods.

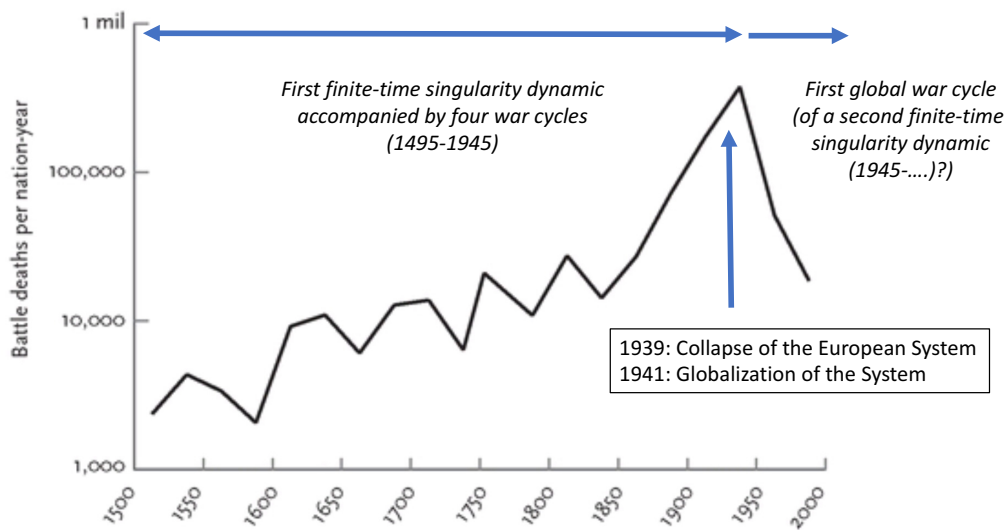


Figure 14: This is figure (5-16), with some comments added.

Quote (16): (Quotes from chapter with the title: The Trajectory of European War): “Wars involving great powers offer a circumscribed but consequential theater in which we can look at historical trends in war. Another such theater is Europe. Not only is it the continent with the most extensive data on wartime fatalities, but it has had an outsize influence on the world as a whole. During the past half-millennium, much of the world has been part of a European empire, and the remaining parts have fought wars with those empires. And trends in war and peace, no less than in other spheres of human activity such as technology, fashion, and ideas,

often originated in Europe and spilled out to the rest of the world. The extensive historical data from Europe also give us an opportunity to broaden our view of organized conflict from interstate wars involving the great powers to wars between less powerful nations, conflicts that miss the thousand-death cutoff, civil wars, and genocides, together with deaths of civilians from famine and disease. What kind of picture do we get if we aggregate these other forms of violence—the tall spine of little conflicts as well as the long tail of big ones? The political scientist Peter Brecke is compiling the ultimate inventory of deadly quarrels, which he calls the Conflict Catalog. His goal is to amalgamate every scrap of information on armed conflict in the entire corpus of recorded history since 1400. Brecke began by merging the lists of wars assembled by Richardson, Wright, Sorokin, Eckhardt, the Correlates of War Project, the historian Evan Luard, and the political scientist Kalevi Holsti. Most have a high threshold for including a conflict and legalistic criteria for what counts as a state. Brecke loosened the criteria to include any recorded conflict that had as few as thirty-two fatalities in a year (magnitude 1.5 on the Richardson scale) and that involved any political unit that exercised effective sovereignty over a territory. He then went to the library and scoured the histories and atlases, including many published in other countries and languages. As we would expect from the power-law distribution, loosening the criteria brought in not just a few cases at the margins but a flood of them: Brecke discovered at least three times as many conflicts as had been listed in all the previous datasets combined. The Conflict Catalog so far contains 4,560 conflicts that took place between 1400 CE and 2000 CE (3,700 of which have been entered into a spreadsheet), and it will eventually contain 6,000. About a third of them have estimates of the number of fatalities, which Brecke divides into military deaths (soldiers killed in battle) and total deaths (which includes the indirect deaths of civilians from war-caused starvation and disease). Brecke kindly provided me with the dataset as it stood in 2010. Let's start by simply counting the conflicts—not just the wars embroiling great powers, but deadly quarrels great and small. These tallies, plotted in figure 5–17, offer an independent view of the history of war in Europe.”

Comment (16): Again, Pinker misinterprets the data, and is comparing apples and oranges. The above-mentioned critique, also applies to these observations and conclusions of Pinker. Furthermore, it not only is important to distinguish between systemic and non-systemic wars, and to use war cycles as the unit of analysis, but also to be aware that the wars the System produced were (and still are) instrumental in a long-term process of social integration and expansion in Europe: Europe developed from a loose collection of circa 300 diverse ‘communities’ with a total population of 83 million in 1495 (the start of the finite-time singularity dynamic), into a tightly coupled system of circa 25 standardized state structures with a total population of 544 million in 1939. Next Europe was structured as a ‘community’ consisting of two non-anarchistic structures (1945-1991), that were controlled by the United States and the Soviet Union. In 1991, when the Soviet-Union collapsed, the intense rivalry between both superpowers - which had ossified the System - was resolved, and both superpowers ‘distanced’ themselves from Europe to focus on the consolidation of its basic structure (in case of Russia), and on the economic opportunities that presented themselves at a global scale of the System (in case of the United States, and Europe). In 1991, both non-anarchistic structures merged into a single political ‘unit’ the European Union, a process of consolidation that still is developing/unfolding, and is now confronted with challenges that threaten to undo the integration that has been accomplished so far.

Quote (17): “Once again we see a decline in one of the dimensions of armed conflict: how often they break out. When the story begins in 1400, European states were starting conflicts at a rate of more than three a year. That rate has caromed downward to virtually none in Western Europe and to less than one conflict per year in Eastern Europe. Even that bounce is a bit

misleading, because half of the conflicts were in countries that are coded in the dataset as “Europe” only because they were once part of the Ottoman or Soviet empire; today they are usually classified as Middle Eastern or Central and South Asian (for example, conflicts in Turkey, Georgia, Azerbaijan, Dagestan, and Armenia). The other Eastern European conflicts were in former republics of Yugoslavia or the Soviet Union. These regions—Yugoslavia, Russia/USSR, and Turkey—were also responsible for the spike of European conflicts in the first quarter of the 20th century. What about the human toll of the conflicts? Here is where the capaciousness of the Conflict Catalog comes in handy. The power-law distribution tells us that the biggest of the great power wars should account for the lion’s share of the deaths from all wars—at least, from all wars that exceed the thousand-death cutoff, which make up the data I have plotted so far. But Richardson alerted us to the possibility that a large number of smaller conflicts missed by traditional histories and datasets could, in theory, pile up into a substantial number of additional deaths (the gray bars in figure 5–11). The Conflict Catalog is the first long-term dataset that reaches down into that gray area and tries to list the skirmishes, riots, and massacres that fall beneath the traditional military horizon (though of course many more in the earlier centuries may never have been recorded). Unfortunately the catalog is a work in progress, and at present fewer than half the conflicts have fatality figures attached to them. Until it is completed, we can get a crude glimpse of the trajectory of conflict deaths in Europe by filling in the missing values using the median of the death tolls from that quarter-century. Brian Atwood and I have interpolated these values, added up the direct and indirect deaths from conflicts of all types and sizes, divided them by the population of Europe in each period, and plotted them on a linear scale. Figure 5–18 presents this maximalist (albeit tentative) picture of the history of violent conflict in Europe:

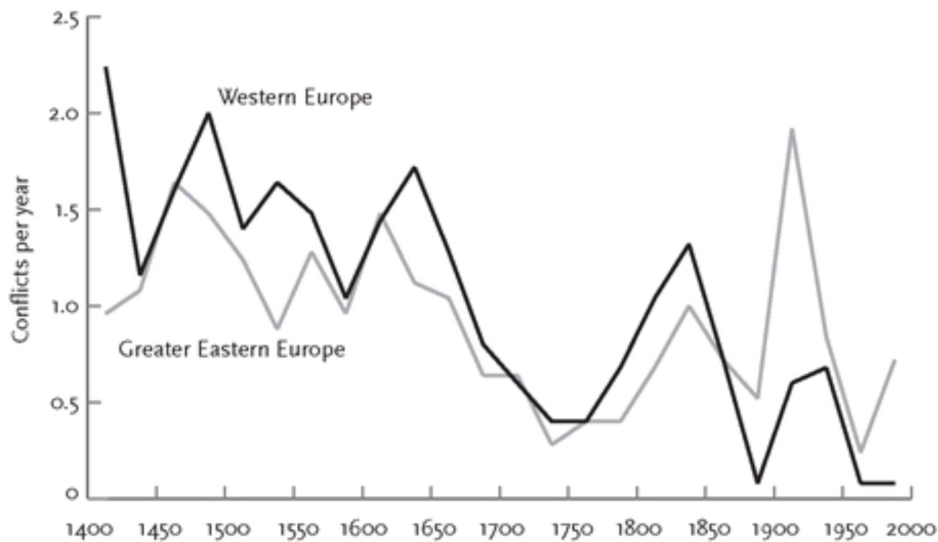


FIGURE 5–17. Conflicts per year in greater Europe, 1400–2000 Sources: Conflict Catalog, Brecke, 1999; Long & Brecke, 2003. The conflicts are aggregated over 25-year periods and include interstate and civil wars, genocides, insurrections, and riots. “Western Europe” includes the territories of the present-day U.K., Ireland, Denmark, Sweden, Norway, France, Belgium, Luxembourg, Netherlands, Germany, Switzerland, Austria, Spain, Portugal, and Italy. “Eastern Europe” includes the territories of the present-day Cyprus, Finland, Poland, Czech Republic, Slovakia, Hungary, Romania, the republics formerly making up Yugoslavia, Albania, Greece, Bulgaria, Turkey (both Europe and Asia), Russia (Europe), Georgia, Armenia, Azerbaijan, and other Caucasus republics.

The scaling by population size did not eliminate an overall upward trend through 1950, which shows that Europe's ability to kill people outpaced its ability to breed more of them. But what really pops out of the graph are three hemoclysms. Other than the quarter-century containing World War II, the most deadly time to have been alive in Europe was during the Wars of Religion in the early 17th century, followed by the quarter with World War I, then the period of the French Revolutionary and Napoleonic Wars.

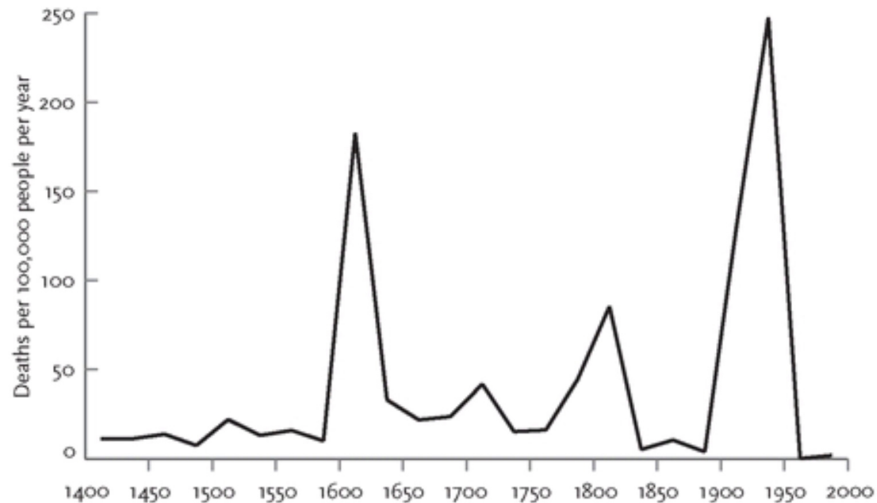


FIGURE 5-18. Rate of death in conflicts in greater Europe, 1400–2000 Sources: Conflict Catalog, Brecke, 1999; Long & Brecke, 2003. Figures are from the “Total Fatalities” column, aggregated over 25-year periods. Redundant entries were eliminated. Missing entries were filled in with the median for that quarter-century. Historical population estimates are from McEvedy & Jones, 1978, taken at the end of the quarter-century. “Europe” is defined as in figure 5-17.

The career of organized violence in Europe, then, looks something like this. There was a low but steady baseline of conflicts from 1400 to 1600, followed by the bloodbath of the Wars of Religion, a bumpy decline through 1775 followed by the French troubles, a noticeable lull in the middle and late 19th century, and then, after the 20th-century Hemoclysm, the unprecedented ground-hugging levels of the Long Peace. How can we make sense of the various slow drifts and sudden lurches in violence during the past half-millennium among the great powers and in Europe?”

Comment (17): Pinker’s interpretation and conclusions are - as I already explained - not correct. The “sudden lurches in violence during the past half-millennium among the great powers in Europe”, can be attributed to a finite-time singularity dynamic the System - Europe - produced during the period 1495-1945, that was accompanied by four accelerating war cycles. The - what Pinker calls - “sudden lurches”, were not ‘sudden’ and no ‘lurches’: They were highly predictable and consistent systemic wars, the System produced at the end of respectively the third and fourth war cycle, of the first finite-time singularity dynamic (1495-1945). In 1495, circa 300 communities that at that point constituted ‘Europe’ became sufficiently connected to produce system-behaviour; in 1495 Europe had sufficient critical mass to sustain - power - a finite-time singularity dynamic that unfolded during the period 1495-1945 (5). The finite-time singularity dynamic was powered by population growth and the intensifying rivalries between communities in the System. The finite-time singularity dynamic - the four accelerating war cycles - functioned as a self-regulating dynamic (mechanism) that ensured the collective survival of a growing population, that organised itself in competing communities. By means of systemic wars, the System periodically put tensions to work to upgrade the organisation of the anarchistic system. These *upgrades* ensured relative stability that (again) allowed for

further population growth and development. In short, the self-regulating dynamic worked as follows: Population growth and rivalries between communities resulted in tensions that were periodically used to upgrade the order of the System, which then allowed for more population growth, etc.

During the period 1495-1945, this regulatory dynamic - of which the finite-time singularity is a manifestation - repeated itself four times. Ultimately in 1939, when the System reached the critical connectivity threshold and produced infinite amounts of tensions, the System collapsed, and self-organized regulation was replaced by deliberate control through expanded integrative structures.

By means of the fourth systemic war (The Second World War, 1939-1945), Europe not only made a next step in a long-term process of social integration, but at the same time, a first international order at a global scale of the System was implemented.

Analysis of war data shows that the - now global - System is producing a fifth (first global) war cycle (1945-....), that could well be the first war cycle of a second (now global) finite time singularity dynamic, that is now unfolding. Population growth - at a global scale of the System - and rivalries between states and communities will also power the global finite-time singularity dynamic. If we - humanity - do not take control of this emergent self-organized dynamic and leave the regulation of the System (of its energy-state) to the finite-time singularity dynamic with its own destructive momentum, it could well be self-destructive for humanity: the war cycles that follow, will have an increasing frequency and severity.

The 'Long Peace' Pinker (wrongly) refers to does not exist. The "better angels of our nature" still let us down: The war dynamics of the System are the product of system behaviour; system behaviour we unknowingly produce through our urge to survive and the multitude of interactions this results in; until now humanity was prepared to willingly obey this dynamic and the underlying deterministic laws and mechanisms that shape these dynamics.

Quote (18): *We have reached the point at which statistics must hand the baton over to narrative history. In the next sections, I'll tell the story behind the graphs by combining the numbers from the conflict-counters with the narratives from historians and political scientists such as David Bell, Niall Ferguson, Azar Gat, Michael Howard, John Keegan, Evan Luard, John Mueller, James Payne, and James Sheehan. Here is a preview. Think of the zigzags in figure 5–18 as a composite of four currents. Modern Europe began in a Hobbesian state of frequent but small wars. The wars became fewer in number as political units became consolidated into larger states. At the same time the wars that did occur were becoming more lethal, because of a military revolution that created larger and more effective armies. Finally, in different periods European countries veered between totalizing ideologies that subordinated individual people's interests to a utopian vision and an Enlightenment humanism that elevated those interests as the ultimate value.*

Comment (18): To make sense of historical processes and acquire a better understanding of the (direction of development of the) System, awareness of the existence and impact of the 'deterministic domain' - a set of laws and mechanisms that determine and shape the 'contingent' dynamics of the System - is indispensable (see figure 5). Tensions can be considered (free) energy, to which physical laws apply. It is a matter of time before this energy is used, to implement an upgraded order that allows for a lower energy-state of the System. A network-effect plays a decisive role in the war dynamics of the System: At a certain point - the analysis shows - a tipping point is reached during the life span of a relatively stable period, when tensions and unresolved issues start accumulating in the System, because they can no longer be (sufficiently) released: The network-effect causes the System to become critical. At that point, the accumulated tensions - energy - are released and put to use.

The 'underlying' highly deterministic dynamics - the deterministic domain of the System - determines the latitude there is for contingent and probabilistic dynamics. Until now, historians and policy advisors were only aware of the existence of (what I name) the contingent domain, and not of the underlying domain and its impact. In their efforts to make sense of the dynamics of the System they connected dots that did not exist, or ignored dots they could not make sense of.

The deterministic domain - physical laws and the network-effect - determines when the System becomes critical, in other words when the System produces a systemic war. Contingent dynamics - social developments and issues - are instrumental in this dynamic. Both domains - the deterministic and contingent domain interact - our free will is much more restricted than we are aware of. We are quite willing servants of these laws.

REFERENCES

- (1) Pinker S (2011) *The Better Angels of our Nature, A History of Violence and Humanity*, Penguin Books.
- (2) Piepers I (2016) Social integration and expansion in anarchistic systems: How connectivity and our urge to survive determine and shape the war dynamics and development of the System, *IP-Publications*.
- (3) Piepers I (2017) Patterns in war dynamics, *Global4cast.org*.
- (4) Fukuyama F (2006) *The End of History and the Last Man*, Free Press.
- (5) Piepers I (2017) Emergence of self-regulation, *Global4cast.org*.
- (6) Tilly C (1992) *Coercion, Capital and European States, AD 990-1992*, Blackwell Publishing.
- (7) Gilpin R (1981) *War and Change in World Politics*, Cambridge University Press.
- (8) Clausewitz C Von (1976) *On War*, Princeton University Press, Princeton, New Jersey.
- (9) Morgenthau HJ (2006) *Politics Among Nations. The Struggle for Power and Peace*, McGraw Hill, Seventh Edition.
- (10) Carr EH (1939) *The Twenty Years Crisis, 1919-1939*, Perennial, 2001.
- (11) Clark C (2013) *The Sleepwalkers: How Europe went to War in 1914*, Harper.