# Manuel DeLanda: *War in the Age of Intelligent Machines*
## Introduction and Part 1

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Introduction

I. Introductory concepts (1-6)
A. Machinic paradigms: clockwork, motor, network
B. Techno development and centralized control
C. Computers as incarnating heuristics in algorithms
D. Levels of military machines
1. Weapons / defenses
2. Tactics
3. Strategy
4. Logistics
E. Displacement of military structures of command / control onto society / industry
II. Creative processes of nature (6-10)
A. Self-organization and machinic phylum
1. Singularities / thresholds / critical points in flow intensity
2. Human production as tapping into machinic phylum by pushing system to threshold
3. MP not a Platonic realm, for it is itself produced by growing actual complexity
B. DeLanda admits his extension of self-organization into social realm is still analogical
C. Military singularities (affecting all levels: logistics, strategies, tactics, weapons)
1. Physical / metallic
2. Meteorological / micro-geographic
3. Climatological / macro-geographic / political
4. Sociological / economic

Chapter One: Collision Course

I. Introductory concepts (10-13)
A. Two traditional methods of warfare
1. War machine of nomads:
a. Psychological shock and physical speed
b. Loose calvary formations and missiles
c. Flexible tactics
2. Armies of sedentary cities / empires
a. Heavy infantry phalanx
b. Holding terrain
c. No tactics possible after order to engage
B. Nomad supremacy until: late 15th C: gunpowder-based mobile artillery
1. Rapid fire drills
a. leads to better tactical integration of man and machine in sedentary armies
b. requires new defense technology (in-depth vs thick walls)
2. Capital-intensive production
a. Positive feedback loop with state domination (against cities as well)
b. Need money for new armies, but new armies let states conquer new territory
C. Integration of some elements of nomad war-machine into state armies
1. Colonial troops “going native”
2. Dispersal of battlefield formations due to kill power of conoidal bullets
II. Self-organization (13-25)
A. Turbulence not chaotic, but complex self-organization at singularity in flow intensity
B. Sketch of self-organization theory in general
1. Singularities and abstract machines
2. Singularities not causal, but intrinsic features of global dynamics
3. Levels of self-organization
a. Physical

b. Chemical (temporal clocks; spatial waves)
c. Biological (morphogenetic processes)
C. Artisanal production
1. “Following” traits of expression (actual properties)
2. Allows “tracking” machinic phylum (virtual thresholds / singularities)
3. To isolate “operations” (ways of inducing systems to reach thresholds)
4. And thus production of new “phylogenetic lineages” (new patterns linked to old)
D. Two uses of term “machinic phylum”
1. Onset of any process of self-organization
2. Point of becoming systematic of particular assemblages (integration point)
E. Nonlinear human history (20-25)
1. Acknowledgment of controversy in applying nonlinear dynamics to human history
a. Examples of various metaphors
b. Iberall’s theory
2. Commanders as artisans:
a. Tracking MP in interplay of weapons, tactics, strategy, logistics
b. And thus finding integration points in war assemblages (NOT “eternal laws of war”)
3. Sketch of the four levels
III. [Physics and Chemistry: Weapons and Defense] (25-56)
A. Propulsion (25-35)
1. Three factors
a. Fueling
b. Ignition
c. Guidance
2. Heterogenous (transversal) evolution:
a. Hunting rifles vs dueling pistols
b. Convergence on a new self-contained system
3. Allows development of conoidal bullet
a. New tactics
b. New logistics (artisanal vs engineered industrial production)
(1) artisanal metallurgy
(2) mechanized production / scientific management
(a) engineering of material pre-production
(b) transfer of skills from artisanal bodies to machines (Taylorism)
(c) thus transfer of military industrial processes to civilian sector
(d) size of military purchases creates selection pressure for
i) capital intensive methods (economies of scale)
ii) centralized decision-making (hierarchical command)
iii) close monitoring of work (discipline)
4. Military control of logistics blocking new computer networking society
B. Flight (35-47)
1. Rendering flight linear by disregarding air resistance and friction
2. Translators between science and war
3. Reynolds numbers:
a. Ratio of inertia of projectile and viscosity of medium
b. Relative speed is what counts in war:
(1) arms races / predator - prey systems
(2) military use of the horse:
(a) tool becomes weapon
(b) tapping results of natural arms races in which horse was involved
4. Transversal communication
a. Propulsion: cartridge and barrell: fireworks and bell-casting lineages
b. Ballistics / bullets: projectile lineage to which man-horse assemblage belongs
5. Computation of trajectories
a. Galileo: simplification of dynamic flight to allow linear calculations
b. Newton and differential calculus:
(1) integration = finding line (representing a trajectory) for group of points
(2) differentiation = finding a point on a line (trajectory)
c. Military need for embodiment of differentiation and integration in physical devices

(1) simple example of math embodiment: mechanical adding machines
(2) “computer” first meant group of women using adding machines
(3) mapping of calculus onto wheels and shafts: Vannevar Bush
(4) transferring gunner’s skill into launch platform
(5) eventual connection to radar systems

d. Cybernetics: Norbert Weiner
(1) creation of negative feedback correction assemblages
(2) cyborg: human-machine integrated system

e. Smart bombs and integrated circuits built into projectiles

C. Impact (47-56)

1. Wounds

2. Defense technology

a. Walls

b. Depth landscaping (“bastion system”)

c. Radar
(1) early forms
(2) linkage with computers
(3) further linkage with nuclear umbrella

3. Forecast: technocrats and Systems Analysis (RAND Corporation)

IV. Tactics (57-83)

A. Introductory concepts

1. Levels of organization in MP

a. Physical: thresholds in flow intensities

b. Chemical: autocatalysis

c. Biology: potentials in chemical or electrical gradients

d. Social?

2. [Hierarchies and consistencies]

a. Hierarchies: amoeba / insect colonies

b. Consistencies (“co-operatives”): phase entrainment

B. Self-organization and unit tactics

1. Higher level phenomena: unit cohesion from drill: entrainment:

2. Lower level phenomena:

a. Conflict emergence and turbulence onset:

b. Requires interchangeability of people
(1) chaos of war outbreak
(2) rationalization of labor processes

3. Tactical units as information processing units

a. Dissipative structures: coherence inside chaos by dispersing friction

b. “Friction” in war = anything that disrupts intentions
(1) weather changes
(2) loss of morale
(3) enemy action
(4) bad luck

c. Dispersion of uncertainty
(1) centralization: uncertainty increased overall:
(a) need for explicit orders
(b) information explosions
(2) decentralization and mission-oriented tactics: dispersed uncertainty at all levels

C. Social conditions behind clockwork, motor, and network paradigms

1. Hans Delbruck and rational reconstruction of military history: study of social conditions

2. Clockwork armies

a. Conditions:
(1) military proletariat from social wreckage caused by demographic turbulence
(2) beggars, wanderers, displaced peasants, convicts, etc.

b. Methods of tapping machinic phylum
(1) Creation of an esprit de corps by drill (use effects of entrainment singularity)
(2) Hierarchical chain of command over solid block of manpower

c. Problems
(1) No new information (= cannot react to incoming data to change tactics)

(2) Could not instill loyalty
d. Relation to command system problems
(1) simplification of command to extreme by concentration at top
(2) could not disperse authority because couldn't trust aristocrats
(a) aristos had own agendas
(b) had not gone through meritocratic selection process
3. Motorized armies
a. Conditions: French take advantage of revolutionary social turbulence
b. Methods of tapping machinic phylum
(1) creation of an "abstract" soldier capable of teamwork in multiple formations
(2) capture of difference in energy in reservoir to produce work:
(a) reservoir of citizen loyalty
(b) producing xenophobic national differences
c. Results: new tactics now possible ("circulation diagram" of motor)
(1) battles of annihilation
(2) dispersed search and destroy missions: trust field commanders
d. Relation to command system problems
(1) intensification of data flow: written orders now necessary
(2) scouting and reconnaissance now important
(3) organization to funnel info to Napoleon
e. Conditions for later non-revolutionary motorized armies
(1) telegraph / railroad
(2) loyal citizen army
(3) forced meritocracy from above
4. Intermediate stages (1820-1940)
a. Indirect fire
b. Concentration of firepower on target
c. Creation of storm trooper: team member or individual depending on circumstances
5. Network armies
a. Social conditions
(1) institutional barriers: class background of armed services
(2) Germans break this by Depression era turbulence
b. Methods for tapping machinic phylum (Blitzkrieg)
(1) radio communication: integration of air, tanks, mobile artillery, infantry
(2) dispersal of command initiatives down the ranks
(3) TRUST in morale and effectiveness of human component is key
c. Forecast: Revenge of the general staff: centralization of C3 networks in tactics
(1) miniaturization and expert systems lead to information explosion
(2) commanders become managers of information flows
(3) temptation then to replace human commanders w/ expert systems
(4) threshold: expert system w/ executive rather than merely advisory role
d. Problems
(1) "fog of war" is insurmountable: fear and "friction"
(2) must distribute uncertainty by decentralization
(3) self-destruction of war systems too risking in nuclear age
e. Forecast
(1) new military intellectual unlikely to heed this advice
(2) generalization of OR disregarding human element

V. Strategy (83-105)
A. Introductory concepts
1. Strategy is linking battles together and then linking war w/ politics - diplomacy
2. War - strategy is interface of conflict and co-operation
a. Find the singularities that lead to one or the other
b. Must always leave open option for diplomacy and end of war
3. War games
a. Prisoner's Dilemma (conflict vs co-operation)
(1) Simple vs iterated versions (w/ multiple players)
(2) Axelrod and genesis of co-operation
(3) Choice of model biases results to conflict or co-operation

b. Inclusion or reduction of friction in war games
B. Prussian war games:
1. Key figures
a. Clausewitz:
(1) War and politics linked
(2) “Fog of war”: panic, fear, friction, bad luck, mis-communication ...
b. Jomini:
(1) Platonic essences: laws of war: reduction of friction in modeling
(2) Clockwork strategy embedded in motorized tactical army
c. Von Moltke was Clausewitzian
d. Schlieffen was Jominian
2. War games: hardware = maps; software = rules
a. Delbruck and realistic recreations of battles
b. Lanchester and mathematization of principle of concentration of force
c. Operations Research (OR):
(1) success in modeling of tactics & logistics in simple cases
(2) disaster when applied to strategy
d. RAND Corporation
(1) paranoid bias in modeling enemy
(2) Prisoner’s Dilemma and Cold War
(a) singularity bifurcating rationality into individual and collective
(b) difference between zero-sum and non-zero-sum games
(c) landscapes and Nash equilibria
(3) division between social scientists and mathematicians
(a) political games:
i) looked for co-operation
ii) refused to launch nuclear war
(b) computerized games:
e. Dangers in war-gaming
(1) blurring differences between simulation and reality
(2) corruption of data
(3) creeping move from insight to prediction
f. Evolution of OR into SA
(1) linear math unable to model friction
(2) Trevor Dupuy: computer simulations of real battles
(a) rules of thumb rather than eternal laws
(b) thematizes emergence

VI. Logistics (105-125)
A. Introductory concepts (105-108)
1. Logistics = assembling war and agricultural / economic / industrial resources
2. “Fuel”
a. Men and horses
b. Aluminum and POL: petrol, oil, lubricant
c. Plutonium and microchips
3. Rationalization of labor: implantation of military command structures in production
4. Logistics as network management problem
a. Information / uncertainty buildup in centralized networks
b. Local intelligence and decentralized networks
(1) Past a threshold of connectivity, networks engage in “market” behavior
(2) Collective rationality able to disperse uncertainty and thus handle pressure
B. Genesis of the military - industrial complex (108-112)
1. Ambiguity of military - industrial capitalist origin
a. Productivity creates taxable base (national debt here too)
(1) hiring of mercenaries who become consumers
(2) military protection of trade routes
b. [DG would point here to arms races as anti-production
(1) in capitalism, fed back into system as means of realizing surplus value
(2) and hence reproducing lack in workers and thus labor supply]
c. Social changes

(1) Military proletarianization
(2) Calculating rationality of merchant classes fed into military technocracy
2. State forms
a. Mercantilist state (18th C: national unification {and colonies} thru military power
b. 19th C “Industrial Revolutions”
(1) “Industry-building industries”: metallurgy, textiles, etc.
(2) for ex-colonies, “import-substitution”requires national independence
3. Military as “institutional entrepreneur”
a. WWI: Mechanized naval power as new threshold
b. WWII: OR and then SA (RAND Corporation)
C. Wartime logistics: diffusion of friction(112-
1. Traditional predatory armies: logistics as plunder
a. Breakdown of supply train
b. Past a threshold, army must keep moving
2. Clockwork armies had few logistical options
3. Le Tellier and Louvois developed elements of a true “supply-from-base” system, but it was still basically predatory
4. Basic problems of logistics
a. Traffic control
b. Decision-making w/ insufficient information
c. Congested circuits and bottlenecks
d. Estimation of demand (which is dependent on changing local information)
D. Dynamic systems approach to logistics (116-122)
1. Patton vs OR example: local initiative only way to diffuse friction
2. Analogy of logistics and tactics:
a. Information / uncertainty:
b. Find singularity that allows emergent effects
(1) compromise between autonomy and integration
(2) i.e, mixture of unified strategic plan and decentralized tactical implementation
3. Survivability of networks
a. Main source of friction is enemy action: disruption of networks
b. Thus stability / resilience of (decentralized) networks are key
c. Example: ARPANET: decentralized computer network (1969)
(1) must allow network to self-organize (i.e., no central control)
(2) messages contain “local intelligence” needed to find own destination
4. “Demons” = independent software objects allowing self-organizing network
a. Difficult to control by military command?
b. Formation of “computational societies” resembling ecosystems or markets
c. “Problems” of such a “computer market society”
(1) ownership and trade of resources
(2) currency and trademarks
(3) inhibiting theft, forgery, and parasite / cancer attacks (viruses)
(4) attesting to “honesty”
E. Human machine interface (122-125)
1. Forecast of rest of book
a. Ch 2: robotic intelligence only through demons (“data/event-driven” robots)
b. Ch 3: cyborg synergy through demons
2. Humans out of loop (autonomous robots) or at center (user-friendly machines)
3. Indeterminacy of technological development
a. Deskilling and “freezing” technological lineages
b. But computers as abstract machines that allow multiple uses and transversality
c. For example, microcomputer networks might
(1) decentralizing society
(2) creation of a “collective mind”
(3) symbiotic cyborg evolution
4. Transition to Ch 2: evocation of Iberall and Prigogine: “dangerous ideas”