Manuel DeLanda: *War in the Age of Intelligent Machines*
Chapter2

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I. Introduction
  A. Military discipline always tries to eliminate judgment; predatory machines are latest stage
  B. Forecast of Ch. 2: trace relations btw info technology & dream of military w/o soldiers
II. Allan Turing
  A. Turing's universal machine: reduction of machine states to descriptions on a mathematical table
    1. modern word processor is an abstract machine that simulates a typewriter
    2. Turing machine can simulate itself &, therefore, run itself [form of limited autonomy]
  B. Miniaturization (transistor & chip)
    1. Key to making Turing machine flexible & practical.
    2. Made special-purpose computers obsolete & created true Turing machines
  C. Military research subvention & control of research directions
    1. Transistor & chop technology were nurtured by military:
      a. the technology was too expensive to be sustained by market alone
      b. when this technology entered the market, military lost control of it
    2. Military is monopolizing VHSIC to develop predatory machines
III. Application of Artificial Intelligence (AI) to War Machines
  A. 1970s: large, discrete domains background knowledge programs enable computers to execute "thinking" applications
  B. The Information-processing/Self-organizing Relationship
    1. Machinic phylum singularities are independent abstract machines that trigger self-organization
    2. Priogine's Thesis :
      a. Priogine: singularities can exist as "far-from-equilibrium" points that trigger self-organization
      b. Structures near singularities are information-processing machines like DNA that organize organic life.
        i. DNA resembles abstract symbol-manipulating machines analogous to computer software.
        ii. Jerry Campbell: DNA uses its symbolic text code to switch protein-construction codes
        iii. Howard Patee: genes and gene products constrain self-organizing material processes
  C. Machines that reach thresholds of organized complexity can reproduce themselves.
      1. Weapons of such complexity may become independent of humans & reproduce themselves.
      2. VonNeumann's "univeral constructor" transformed Turing machine into abstract, artificial life.
IV. History of Computer Hardware
  A. Inventor usually develop machines empirically w/o any detailed comprehension of how they work.
    1. Concrete machines can be made abstract with the use of mathematics.
      a. Mathematics of chaos theory abstract real machines in two ways:
        i. investigations of singularity-governed behavior
        ii. investigations of abstract expressions of "essential elements of mechanism" (139)
      b. Logical calculi are "physical inscriptions" & "conveyor belts"
        i. transport truth from one form to another
        ii. transform the clockwork into the motor. (140)
    2. Serres: abstract machine of heat engine separated from any physical actualization
      a. reservoirs
      b. forms of exploitable difference
  B. How Clockworks or Motors Become Abstract Machines
    1. Physical machines become abstract when men conceive of them as mechanism-independent
      a. Carnot reduced steam engine to abstract diagram
      b. Maximum efficiency lay in keeping components of different temperatures apart
    2. Carnot proves Serres notion of the shift from a mechanical to abstract paradigm.
  C. Deductive vs. Inductive Logic
    1. Aristotelian deductive syllogisms (general to specific) did little to advance knowledge.
    2. Scientific deduction (specific to general) continues to advance knowledge.
    3. Deductive logic and be mechanized; inductive logic cannot, but is capable of learning empirically.
      a. Japanese Fifth Generation computer research (inductive reasoning machines)
      b. Inductive reasoning has not been mechanized because:

i. inability to translate axioms into theorems
ii. inability to integrate instructions into motive-force assemblages
iii. Boole
aa. deconstructed syllogisms into component operators
bb. reassembling these to recapitulate the original syllogisms and other relationships. (145)
cca. Insertion of And and Or into flexible calculus is computer hardware.
dd. Shannon wedded Boolean deductive logic & electrical engineering to make circuits into Boolean motor.

V. Minaturization
A. Computers: migration of logical, heuristic structures
1. from brain to Turing machine
2. via Aristotelian syllogisms and Boolean strings.
B. Command & control: military pushed to miniaturize machinic body (computer hardware) of Boolean strings.
C. 1948: F. C. Williams builds the first computer.
1. Computer's history is the making its And / Or cells smaller & faster.
2. WW II, Vannevar Bush (OSRD): electronic calculators to control weapons systems.
D. Cold War: US military as "entrepreneur": funded basic research & connected military needs and science. (150)
1. Miniaturization first developed in communication systems to prevent WW I-style carnage.
a. 1940s: miniaturization develops in radio communication technololgy.
b. 1953: Army Signal Corps funded half of transistor technololgy.
2. Civilian labs developed assembly methods for small electronics, the chip:
a. Crystals given regions of + or – (P-and N-type conduction).
b. Metallic interconnections among crystals stamped on them.
E. The Command and Control Imperative
1. Military: shorten command chain war production: Numerical Control System (centralized production from above).
2. Miltary's command structure defined the contours of the machinic phylum.

VI. Software
A. History:
1. 1805: Jocard stores weaving instructions on punch cards.
2. Mid-20th C: Turing machines verge on self-direction.
3. Late-20th C: AI computer sensors pick up on environment changes to trigger own internal processes.
B. Humans interact w/ AI and typically ascribe intentionality to machines:
1. to predict future behavior of the machine
2. as we anthropomorphize AI machines that can interact in real time
a. Above "clash of wills" on battlefield as AI machines view humans as Prey. (157)
b. AI is subject to human control through human validation of the data they collect.
3. AI of "autonomous" weapon systems represent the migration of control from humans to machines.
a. Boolean machines can produce new truths through calculation.
b. Conditional branching: Turing machine's ability to translate And / Or statements into "if, then" statements. (158)
c. Blitzkrieg: radio information flow supercedes the flow of energy in importance.
i. Communicating parts of the machine need not be physically connected any longer.
ii. Next, Turing machines calculate multiple outcomes (parallelism) to interpret their environments.
C. Humans lose control: AI anticipates actions necessary to respond environment.
1. Charles Babbage: punch cards taken from realm of "abstract worker" to that of "abstract manager." (159)
2. Babbage: branching realizes programs that self-change.
3. Creation of inference engines is the essence of robotics:
a. Theses engines "pump" (infer) truth from specific evidence. (164)
b. PROLOG (Fifth Generation computer) move truth from theorem to axiom.
4. Parallel software: the nature of the problem triggers machine's responses.

VII. Experience
A. Foucault (D&P): for efficiency, control has transferred from human body to machine.
1. Machines de-skill the human body.
2. Mid-twentieth century command chain shortens:
a. Industrial production in USA sees complete centralized control.
b. [Cahplain's man as appendage of machine becomes] man a prey of machine.
B. Battle Fields without Soldiers
1. Sputnik and Fifth Generation: US military focuses on cyberneticizing war.

a. DARPA and “Strategic Computing Programs”:
i. machines manage the battle field
ii. machines become predatory
b. Strategic Computing’s method is the integration of three parts:
i. knowledge base
ii. inference engine
iii. user interface to facilitate human interaction with machine [to preclude pedation?]
2. [Political problem: who attempts to control the war machine, and to what purposes will it be “controlled”?]

C. Fork in the road at the level of interface between man and war machine:
1. Take man out of the control loop.
2. Leave man actively in the control loop.

D. In military’s hands, AI has taken humans out of the picture and granted machines autonomy.