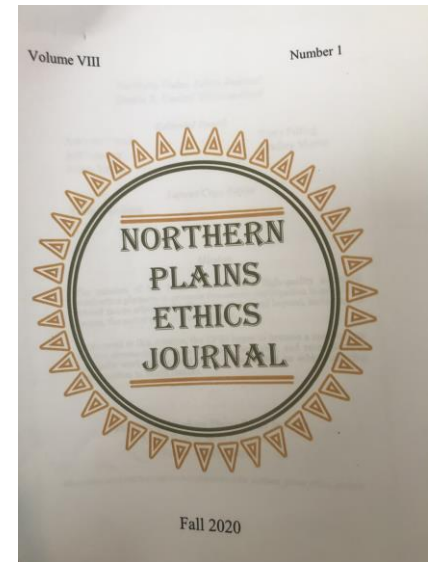

Accelerating Digitization, Societal Disruption, COVID19: a Discussion of the Future and Pondering What to Do

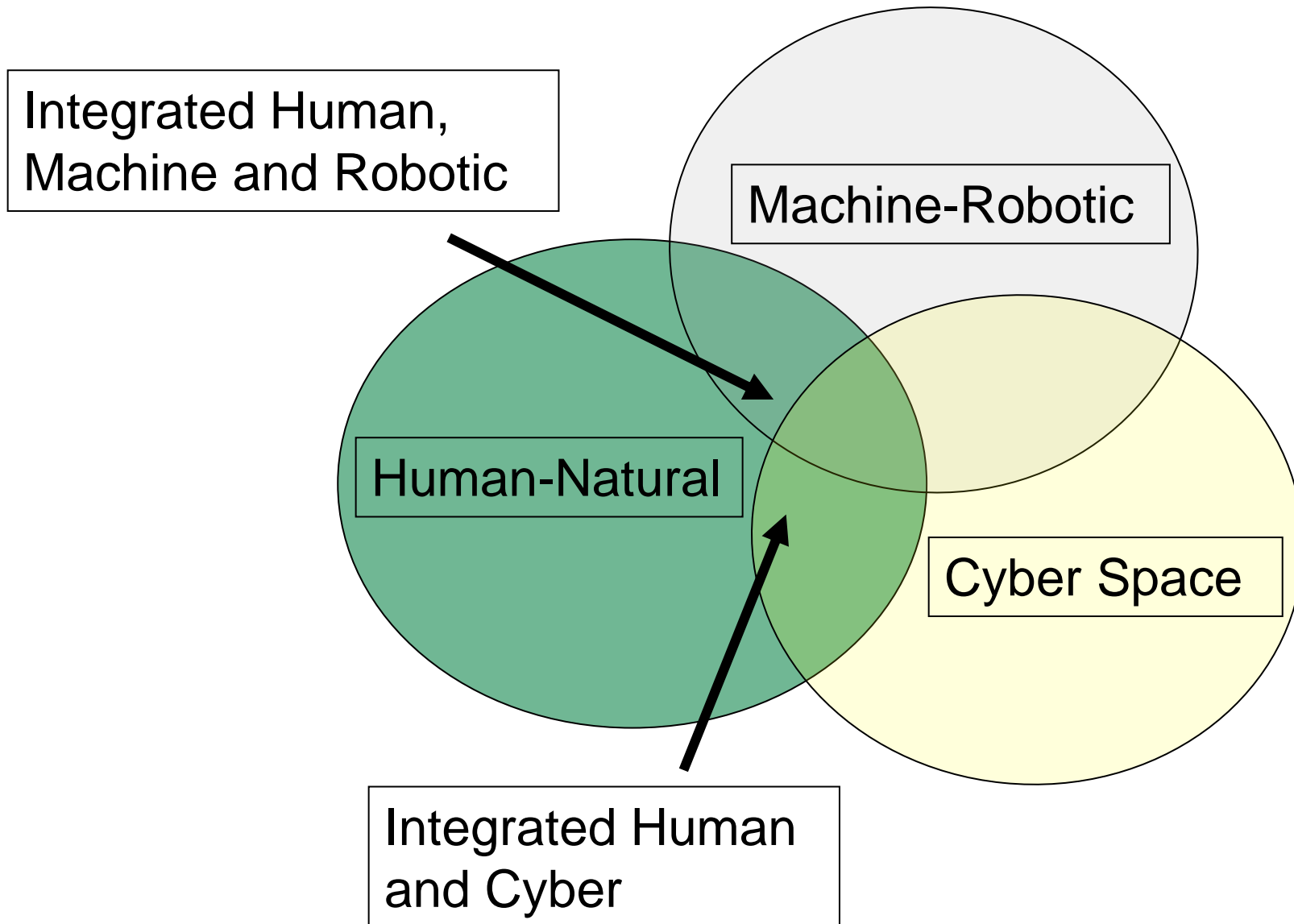
**Task Force on the Future of Education
University of North Dakota
February 2021**

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□Note: The views and opinions are the author's and do not necessarily state or reflect those of the U.S Government or the State of North Dakota

Situating Educators and Leaders to Meet the Digital Challenge....but has Covid Accelerated Speed of Change beyond our ability to adapt?



The Challenge of our Generations (students, faculty, staff, business and Gov't and Legislative Partners)

- Those of us alive today have the challenge: C^3R
 - Create the Technology, a competitive race (e.g., robots, code, businesses, services)
 - Control the Technology for safety, security.
 - Civilize the Technology (eg., law, policy, ethics, norms, art, history....)
 - Regenerate the learning mechanisms and educate the next generations to meet the continuing challenges of creation, control, and civilizing...

Recent Evidence of Rapid and Unprecedented Changes connected with Digital Technologies...

- ❑ Electronic/Computer systems under siege
 - Only 12 computer viruses in 1988...after 2015, approximately 200,000,000 (200 million)
- ❑ Robotic Revolution
 - Countries producing or designing unmanned systems: 2001, <10, now 80+
- ❑ Social Media a Disruptive Force
 - Middle East turmoil following a “Twittered” Arab Spring 2011... 2016 US election affected... 2020?
- ❑ Big Data/High Performance computing/AI
 - “Watson” wins Jeopardy 2011; AI self-teaches itself to play and win championship in “GO” in 2017

Theory 1: Human Impulse to “Sense/Think/Act” is integrating with cyberspace and Intelligent machines...



□ Sensing

- Human senses (sight, hearing, taste, feel, smell)
- Machine sensing: (glasses, telescope, radio, radar, **perception at a distance?**)



(COMMUNICATION LINKS)

□ Thinking

- Human thinking (brain)... **with values, ethics, morals**
- Machine thinking (early analog, now digital, AI/Cloud, **thinking at a distance combined with Machine Learning?**)... **with encoded values, ethics, morals.**



(COMMUNICATION LINKS)

□ Acting

- Human acting (limbs...walking, holding, etc)
- Machine acting (cars, planes, ships, unmanned systems, robots, acting in cyberspace, **machine acting at a distance?**)



Unclassified *But Taken all Together.... at the Macro Level*

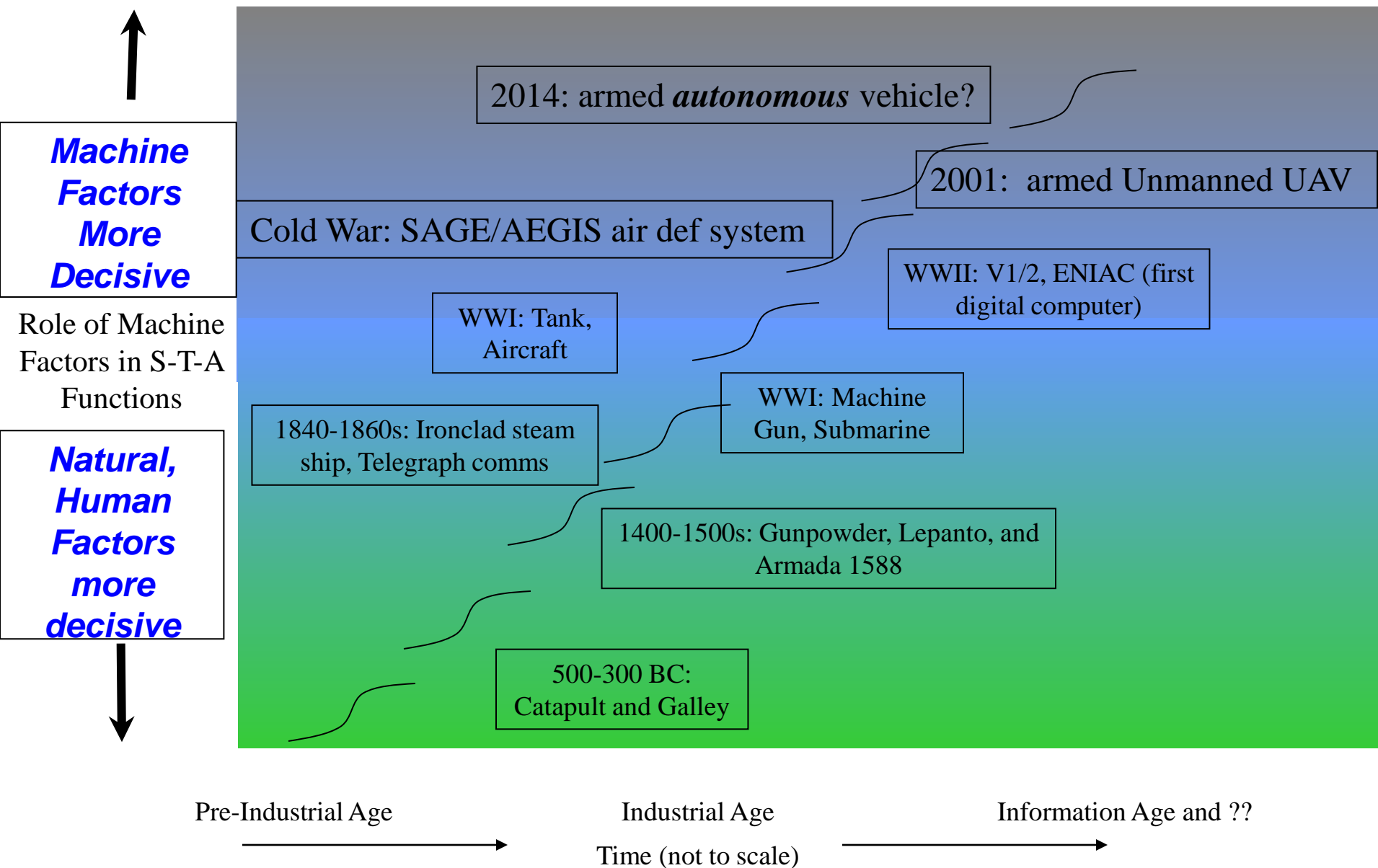
- As distinct from multiple, preceding and coincident micro-techno revolutions... a **“Macro”** revolution is a combination of multiple technologies which create an entirely **new**, never before seen, **structure of global economic/social/military activity... what might be called, a new REALM of activity...**

Theory 2: the World as Realms...Two Macro- Technological Revolutions underway...

- Robotic/AI guided digital machines in 3D dimensions
- Cyberspace... a global Information nexus (a purely digital information space, that is a marketplace, a meeting place, entertainment.... and battlefield)

The people Now Alive are the Most Important Generations in History, as they will navigate the emergence of Intelligent Machines and Cyberspace.

Waves of Technical Innovation Creating new Realms of the Integration of Human, Machine and Robotics (military example)



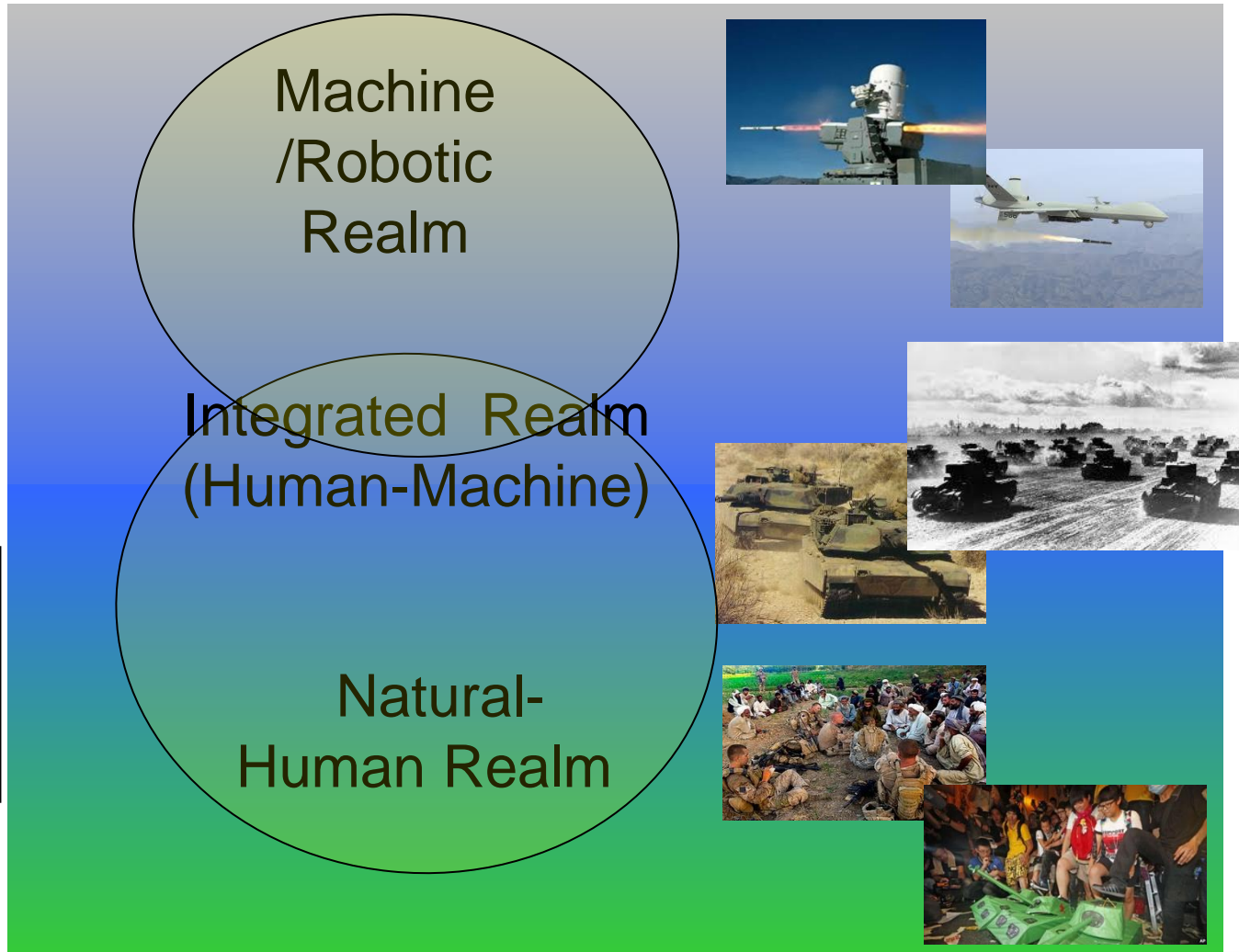
Macro Revolution Yields Three Realms of War



**Machine
Factors More
Decisive**

Role of Machine
Factors in S-T-A
Functions

**Natural-
Human
Factors more
decisive**



Military Technology Led the Economy/Society in this Emergence

Macro Revolution: Second Realm economy emerges... massive disruption... known as Industrial Revolution

- In pursuit of Sense-Think-Acting advantage and efficiency...
 - 1st: Natural-Human Realm
 - (apprx10,000 BC... (rise of cities, farming, **human slavery era**))
 - 2nd: Integrated Human-Machine Realm (the Industrial Revolution)
 - 1701^{AD}: steam engine; 1865, industrial power helps to end slavery in U.S. by overwhelming the Confederacy with mass production.



2nd Macro Revolution Deepens... huge implications for the human workforce...

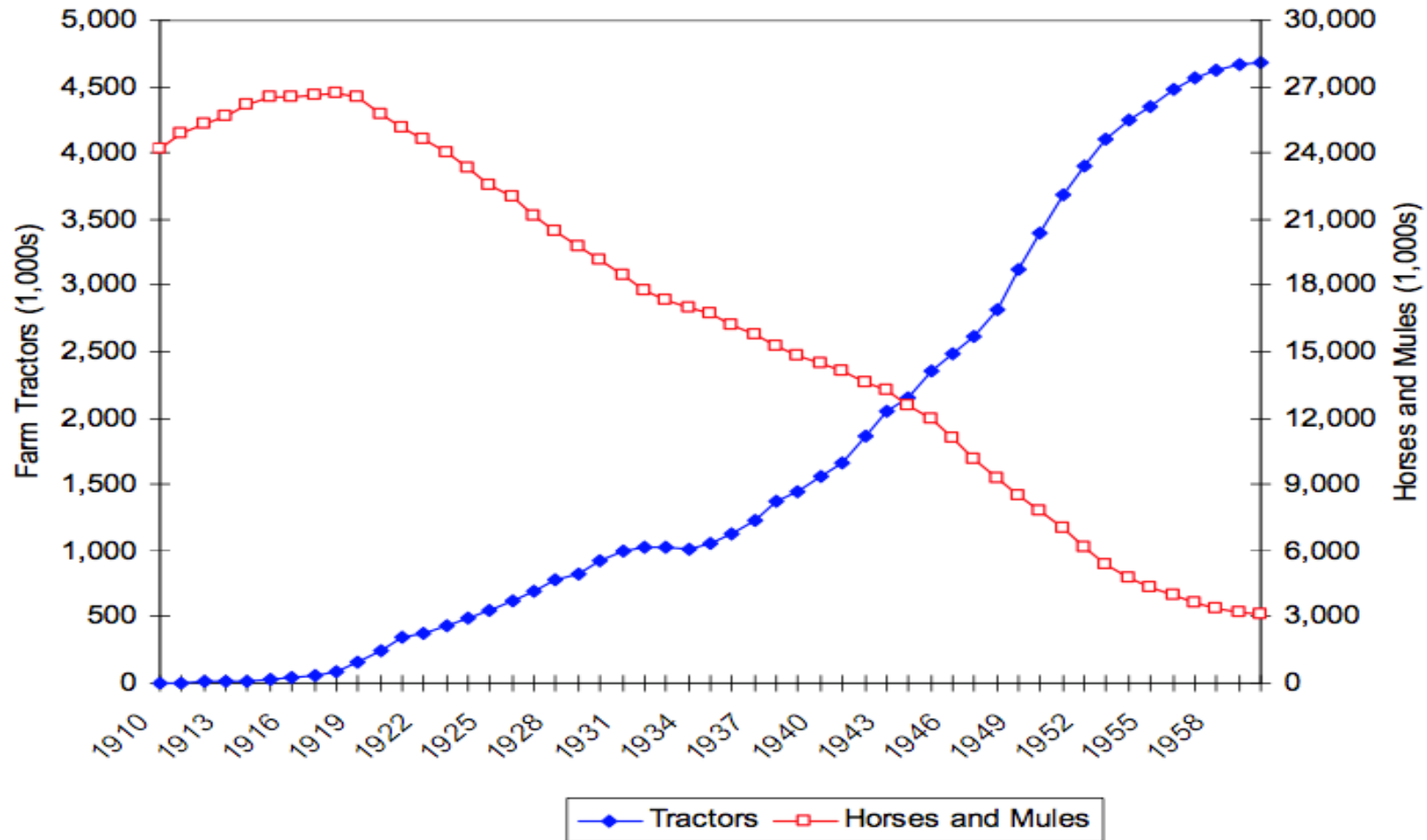
- Second Realm matures as machines replace people...
 - 1st: Natural-Human Realm
 - (apprx10,000 BC... rise of farming)
 - 2nd: Integrated Human-Machine Realm
 - Industrial Revolution on the farm continues....the “Combine”

...life and work was never the same...
where are the people...my grandfather
adapted and kept his job...

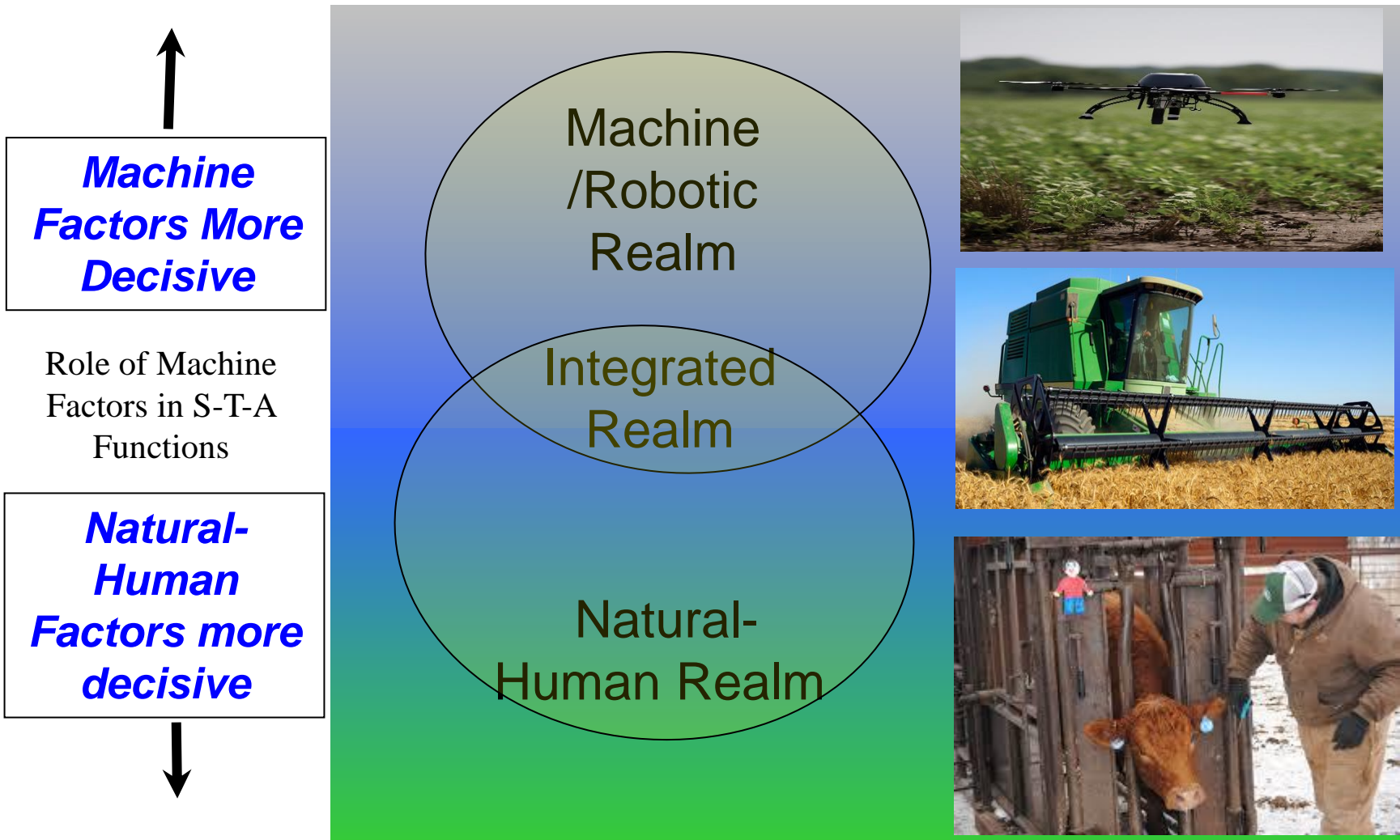


2nd Macro Revolution: horses replaced by machines... and....crop prices collapse late 1920s...Crash of '29

Replacement of Horses by Tractors on U.S. Farms—1910 to 1960



Third Realm of Agriculture appears before our eyes...



Unclassified

If Robotics in the Military, AG, Mfg, Society isn't enough....another challenge

... the emergence of the weirdest surprise.... not fully anticipated until Gibson, and his sci-fi novel, *Neuromancer*... the place we call **CYBERSPACE**... and **advanced A.I.**

Unclassified

Communication, Processing, and Information begins to move at the Speed of Light

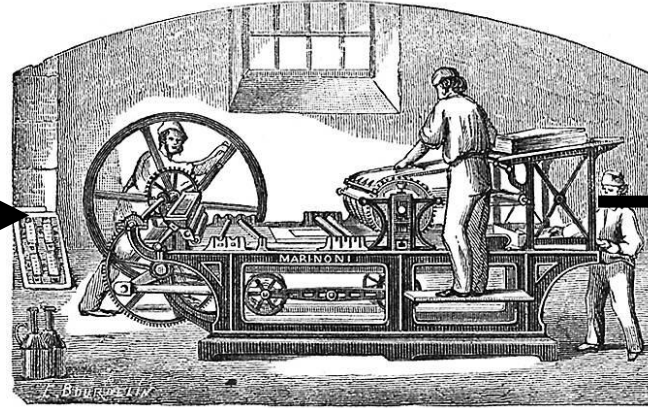
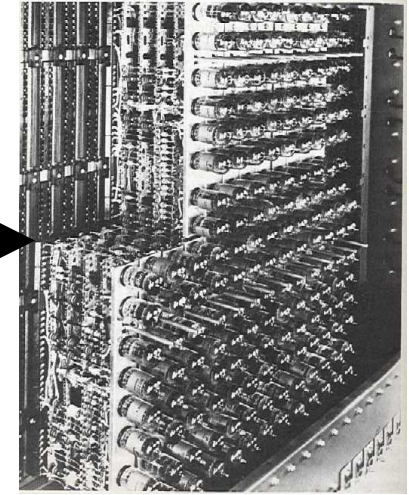
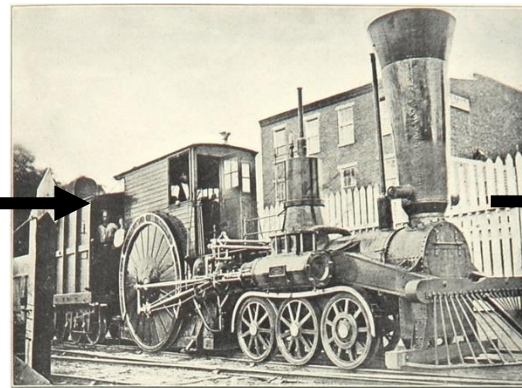
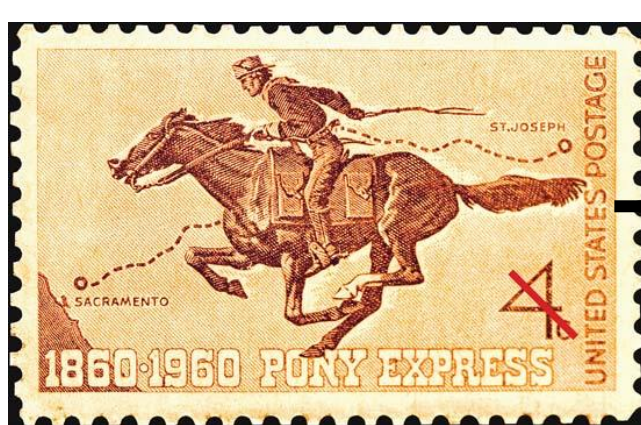


Fig. 3. Machine simple. oldbookillustrations.com



Recording/Processing/Storage of Information



AN EARLY LOCOMOTIVE BUILT BY WILLIAM NORRIS FOR THE PHILADELPHIA & READING RAILROAD

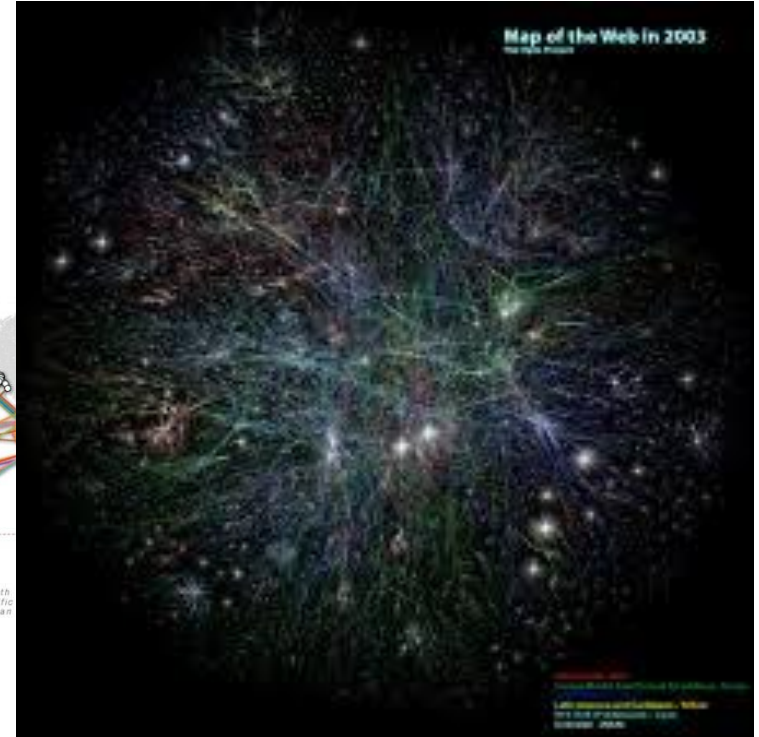
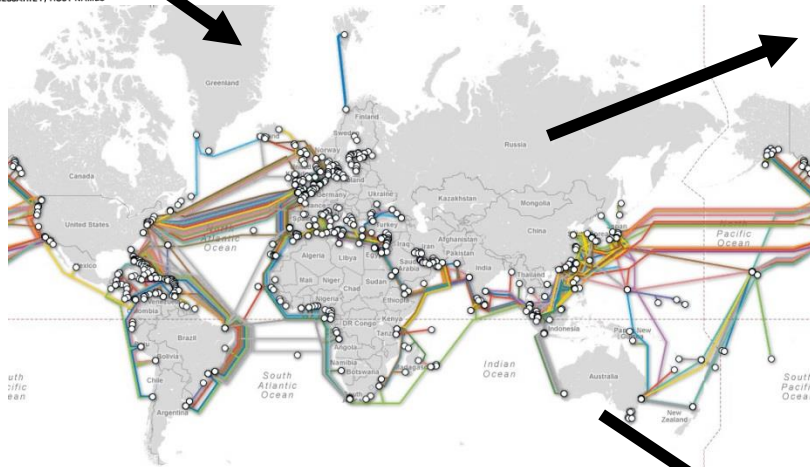
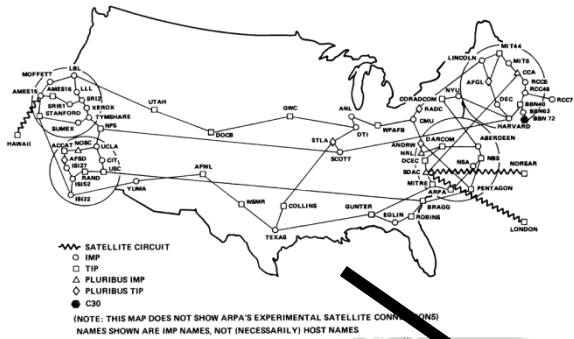


Communication of Information

4th Macro Revolution: ...Cyberspace and related AI breakthroughs...

Unclassified

ARPANET GEOGRAPHIC MAP, OCTOBER 1980



Rapid A.I. advance with access to massive internet/IoT data...

War in Cyberspace... attacks on the US infrastructure, IoT, and Individuals...

Unclassified



Video, Chinese DDOS attacks on FB:

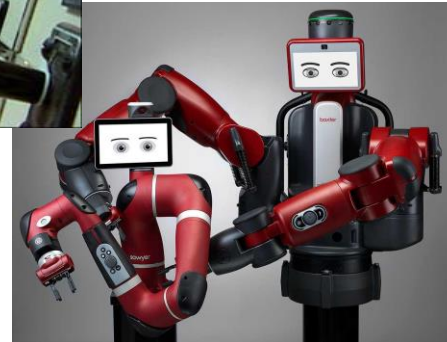
https://www.youtube.com/watch?v=efmJsE_NgG-o

Emergence of the Fourth Realm: Cyberspace powered by advanced A.I....

- ❑ We have NO IDEA what this will mean ultimately for humanity.... politics... economy....society... war.... medicine...
- ❑ But YOU are alive, now, to help create this emerging Realm of intelligent S-T-A... completely artificial...
- ❑ Artificial Intelligence: currently the most advanced AI machines are stationary, 'at rest', but operating thru Cyberspace

Three Realms of physical action and Fourth Realm of Cyberspace

- 1st: Natural-Human Realm
- 2nd: Integrated Human-Machine Realm
- **3rd: Robotic/Machine Realm (Robotics/AI in 3 dimensions)**
- **4th: Cyberspace (AI Machines in The Cloud)**



Unclassified

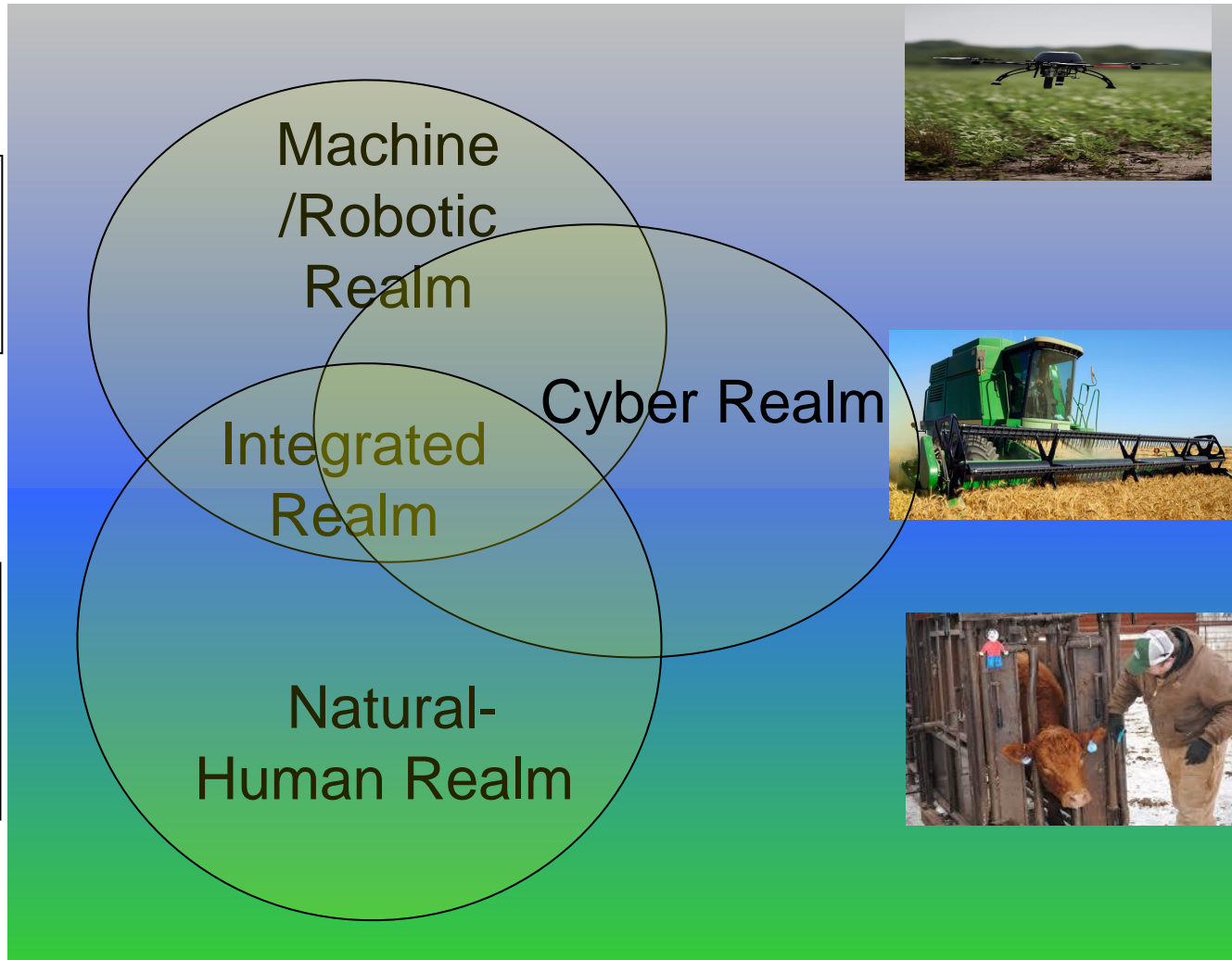
Emergence of New Cyber Realm... Agriculture Example



**Machine
Factors More
Decisive**

Role of Machine
Factors in S-T-A
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Factors more
decisive**



Complicating Factor: COVID is Accelerating Change, Giving Preference to the Digital...plus Two Dangers...

- Massive Speeding up of prior Digitization trajectory
- Huge Shifts in Wealth to Digital Companies
- Human Centric Systems Weakened
- Human Labor Markets Weakened
- Human Centric Companies Weakened

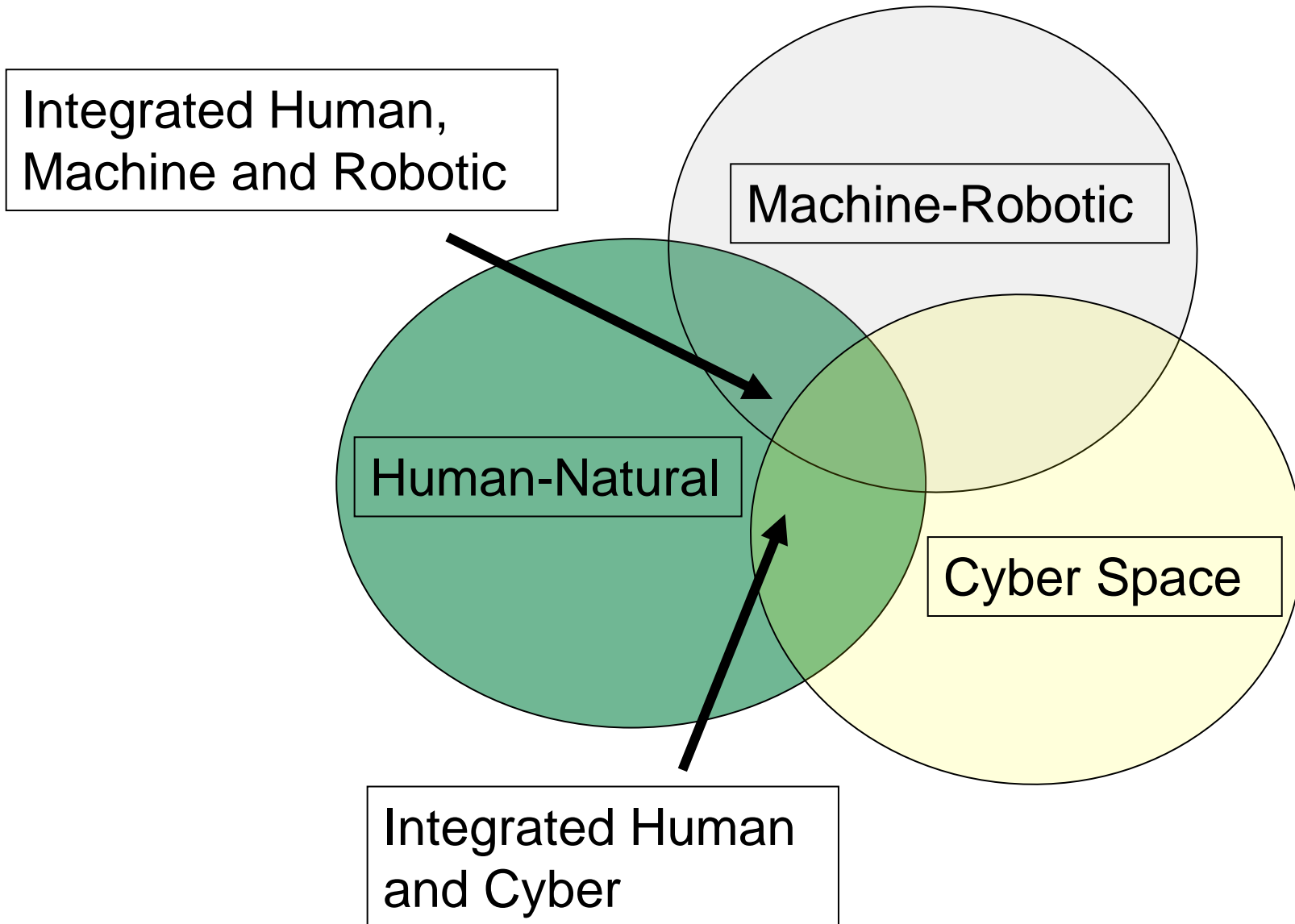
Complicating Factor: COVID is Accelerating Change, Giving Preference to the Digital...plus Two Dangers...

- Human Community Bonds Weakened
- Human Culture being Distorted to favor digital mediation of communication and activity
- Human Inequality Aggravated further (small elite who own machines and algorithms, versus human labor)
- **And to complicate matters further:**
- **1.Danger of technological Momentum/LOCK IN....**
- **2. Danger of Societal Confusion... where is truth?**

Summary:

- 1. Four Realm Visual Framework***
- 2. Displaying the Effects of COVID19***
- 3. Danger When Decisions “Lock In”***
- 4. the Question of Digital Confusion and the Human...***

Visual Framework of our Digitizing World ... and How our Response to Covid is Accelerating Change...

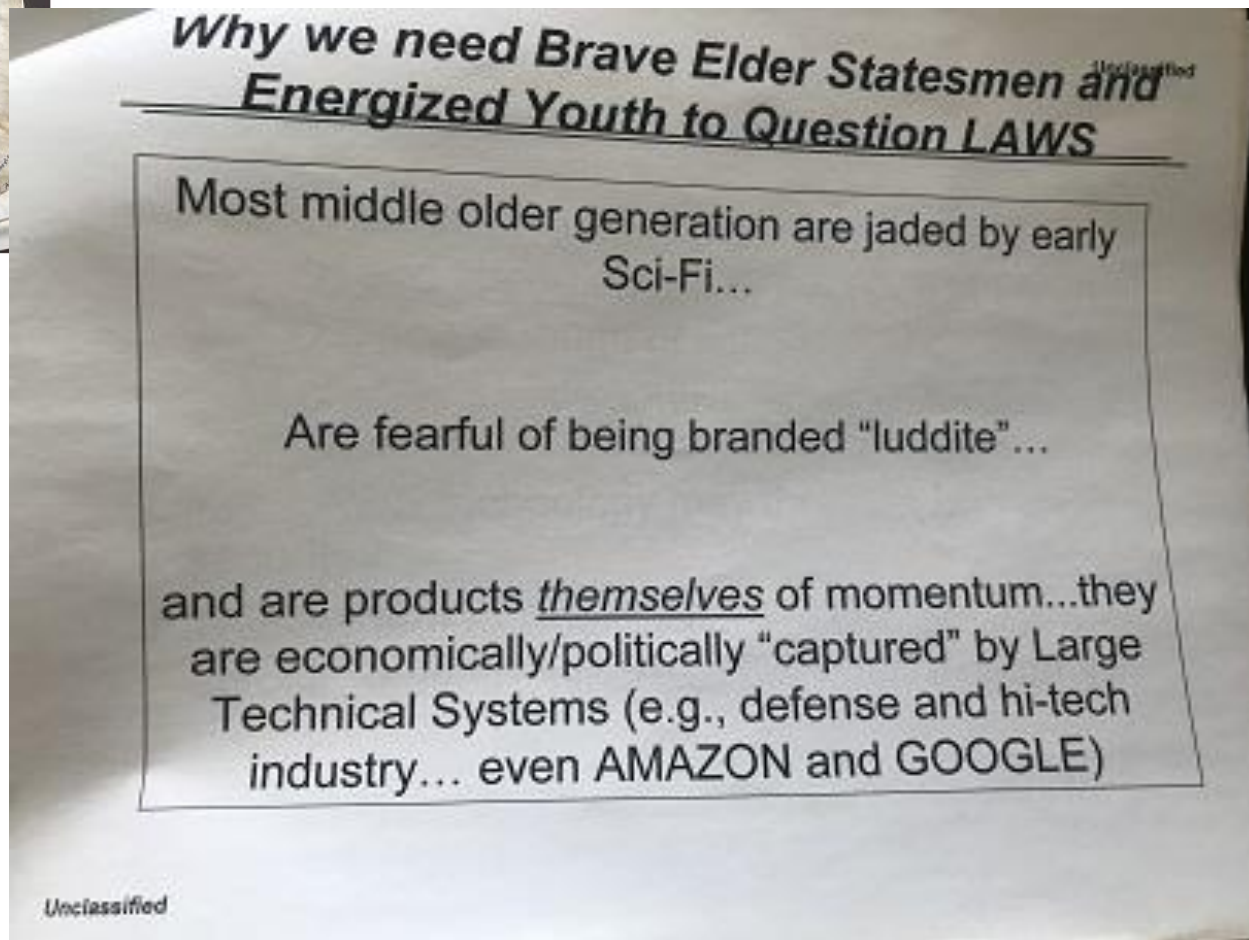
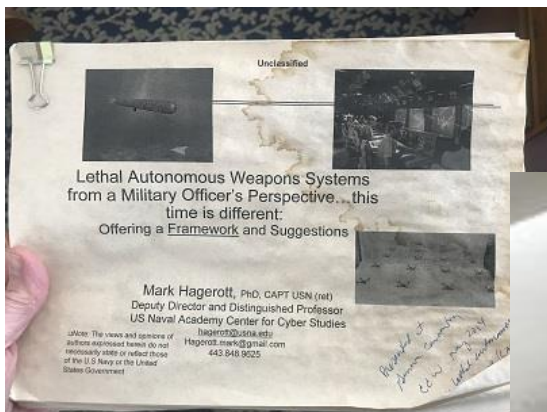


The most profound, unprecedented challenge in human history is upon us... multiple new Macro Realms of Robots, Cyberspace and Advanced AI are emerging... simultaneously...and it is urgent that we respond in a timely and thoughtful manner... Why? The danger of “lock In”

Theory 3/Observed Phenomenon of Technological “Lock In” or “Momentum”... “QWERTY” in your hand!

- **Early Stages of Technology Innovation**: leaders and society exerts most influence. Redirecting technological change is relatively easy.
- **Middle Stage**: momentum accumulates around the invention (e.g., capital, labor, political)... redirecting change is harder but doable at moderate cost.
- **Late Stage**: technology is “Locked In” or beyond social redirection. (Think Minneapolis computer industry 1958 versus Silicon Valley 2019; military example: think Nuclear Arms Race (1945-62, Cuba); Nuclear power design flaws (1955-2011, Fukushima); think of walkable city challenge of today due to negative effects of automobiles road priorities from 1940s-2000s...)

Careerism further Adds to Momentum... business, defense, labor, and government... and academic



These slides presented to 100+ ambassadors of Geneva Convention 2014, explaining why they must lead paradigm change (Arms Control of Robots/AI) because of the natural resistance of Career Military Officers and Corporate Executives

Can the Natural-Human Flourish when Confronted with Digital Confusion? From Fake News to RobinHood and Game Stop? How to guide our Youth?

- ❑ The most advanced information infrastructure in history... but does it convey truth to our youth?
- ❑ What happens to the young when their value frameworks are disrupted... “Anomie”...



Recommendations to Rebalance the Natural-Human Realm, now, and in the Future:

- 1. Infusion of support for Human-Centric companies and labor markets
- 2. Support for Caring-Economy, and perhaps direct payments to arts, charities, churches
- **3. Major re-Investment in K12 and Higher Education**
- 4. Presidential Task Force or Governor's Task Force by region: ***Human Vitality in the Age of Digital Machines***, to develop the new policies going forward
- 5. Tax on Social Media Companies, Robots, and perhaps major Digital Search to support the Natural-Human Realm

The Challenge for Educators and Students...

- Those of us alive today have challenges: C³R
 - Create the Technology, a competitive race (e.g., robots, code, businesses, services)
 - Control the Technology for safety, security.
 - Civilize the Technology (eg., law, policy, ethics, norms, art, history....)
 - Regenerate the learning mechanisms and educate the next generations to meet the continuing challenges of creation, control, and civilizing...

Higher Education ... Transformative Role

- ❑ Wave of Literature for Reforming HE:
 - ❑ Aoun 'Robot Proof'; Crow and 'Fifth Way'; Alexander 'Academia Next'; Ellis "Breakdown of HE", etc

- ❑ But there is a problem in North Dakota/Midwest:
 - Imbalance of investment (see *Atlantic Monthly* 1/18)
 - Poaching of Midwest/Mountain region campuses

- ❑ Help Coming?
 - ❑ Senator Schumer: Endless Frontier (\$100bill)
 - ❑ My own, state centric: a new national act, the "Digital-Cyber Land Grant Act" <https://issues.org/time-for-a-digital-cyber-land-grant-system/>

How to Transform & Adapt UND to be Agile, responsive to current challenges and ones to come?

Unclassified

Brainstorming/Discussion: Inter-Disciplinary Studies

Engage the Needs in Four Realms: 1. the Human/Natural Environment, 2. Integrated (intersection with the Human), 3. Robotics (AI in any machine system), and 4. CyberSpace.

-Promote Interdisciplinary Learning/Research. How to tie together Med School, Law, Engineering, Comp Sci, Cyber, EERC, Liberal Arts etc?

-Establish UND “ Science, Technology, Environment, and Human/Society” program (STEH/S) (eg., see VaTech, Univ MD, MIT, and recently Mt State have STS or STES programs).

Unclassified ***Brainstorming/Discussion: Achieving Scale and Scope in “Hard to Hire” areas***

Engage the Needs in Four Realms: 1. the Human/Natural Environment, 2. Integrated (intersection with the Human), 3. Robotics (AI in any machine system), and 4. CyberSpace.

- Accelerate Tenure Process/ or modify for digital talent

- Expanded Partnerships in NDUS (eg., Dakota Digital Academy) and corporate partners

- “White Labeling” with other, larger universities? (WGU, ASU)

- Intra-State Regional Partnerships to better compete for grants (e.g., Space, AI groups, liberal arts cooperative SD/MT/WY and Roosevelt Library?)

Brainstorming/Discussion: Where to Meet Needs of ND and Upper Midwest?

Engage the Needs in Four Realms: 1. the Human/Natural Environment, 2. Integrated (intersection with the Human), 3. Robotics (AI in any machine system), and 4. CyberSpace.

-Meet the needs of the non-traditional, Adult Learners and Work Force who now need to 'retool' and 'rethink' their careers and work to adapt to the emergence of Robotics/Cyber and intersection with Nature and Humanity. (esp., rural, Tribal, small town populations who have limited access to your on-campus programs)

Unclassified

Questions/Discussion
