5: Understanding the adaptive value of knowledge

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Tonight

- Tonight the fugue's **Counter Subject** is developed
  - What is the value of knowledge and how do we determine it
  - The relationships between knowledge and strategic power
  - How tools that extend cognition contribute to strategic power and evolutionary success

COUNTER SUBJECT – **Knowledge and its value**
    Defining Information and Knowledge is Contentious
    Transforming Data, Information, and Knowledge into Power
        Measuring the Quantity of Information
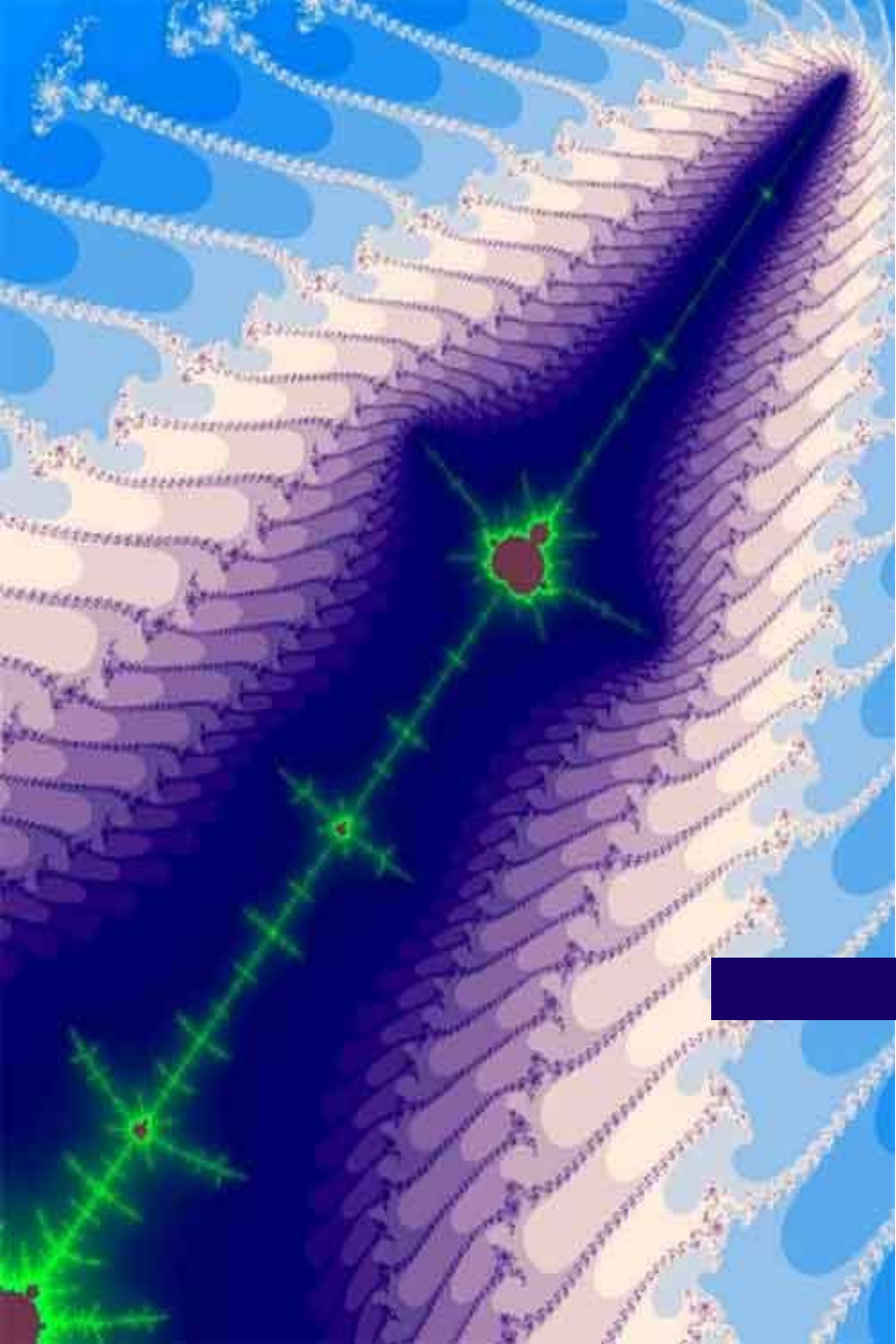   *Qualitative Values of Different Kinds of Information*
        Adaptation, Knowledge and Strategic Power in Popper's Three Worlds
        The Cybernetics of Power: Boyd's OODA Loop Concept
        The Revolution in Military Affairs
    Evolutionary vs Revolutionary Adaptation
        Tools and Applications that Extend Humanity's Cognitive Abilities

More on the difficulties of defining information and knowledge

# Why people who should know better ignore Popper

- Popper's intellectual arrogance
  - Ignored or denigrated those he disagreed with (e.g., Polanyi)
  - Irritated many academic philosophers (ref Wittgenstein & Polanyi affairs), especially ex positivists and constructivists
- Popper's "negative attitude towards definitions" facilitated misunderstanding (reaction to Wittgenstein)
  - Undefined language created paradigmatic barriers between schools
- Popper's use of 'objective' in the title Objective Knowledge apparently caused those who believed knowledge could not be objective (i.e., "objective" in that it was verifiably true) to reject the book without reading it (ref constructivists)
  - Popper used "objective" in the very different sense that knowledge could be objectively codified in tangible objects, e.g:
    - "the world of the logical *contents of books, libraries, computer memories, and suchlike"* (1972: p. 74)
    - *our theories, conjectures, guesses (and, if we like, the logical content of our genetic code)"* (1972: p. 73)

Michael Polanyi – major component of knowledge paradigm followed by most knowledge managers

- Born 11 March 1891 (died 1976), Budapest as a Jew

  - 1919 Chemistry PhD
  - 1923 convert to Catholicism
  - 1933 chair in physical chemistry Manchester Uni
  - 1948 resigned chemistry for new chair in philosophy

- Developed anti-positivist anti-reductionist epistemology of personal knowledge & tacit knowing

  - Objectivity is a false ideal, all knowledge claims (including rule-based ones) rely on personal judgements based on faith and belief
  - Denied that scientific methodology can reveal "truth"
  - "We believe more than we can know, and know more than we can say"

- Polanyi, M. (1958) Personal Knowledge: Towards a Post-Critical Philosophy

  - Title reacted to to Popper's critical rationalism & seminar affair (no citation anywhere to Popper's work – see next slide)
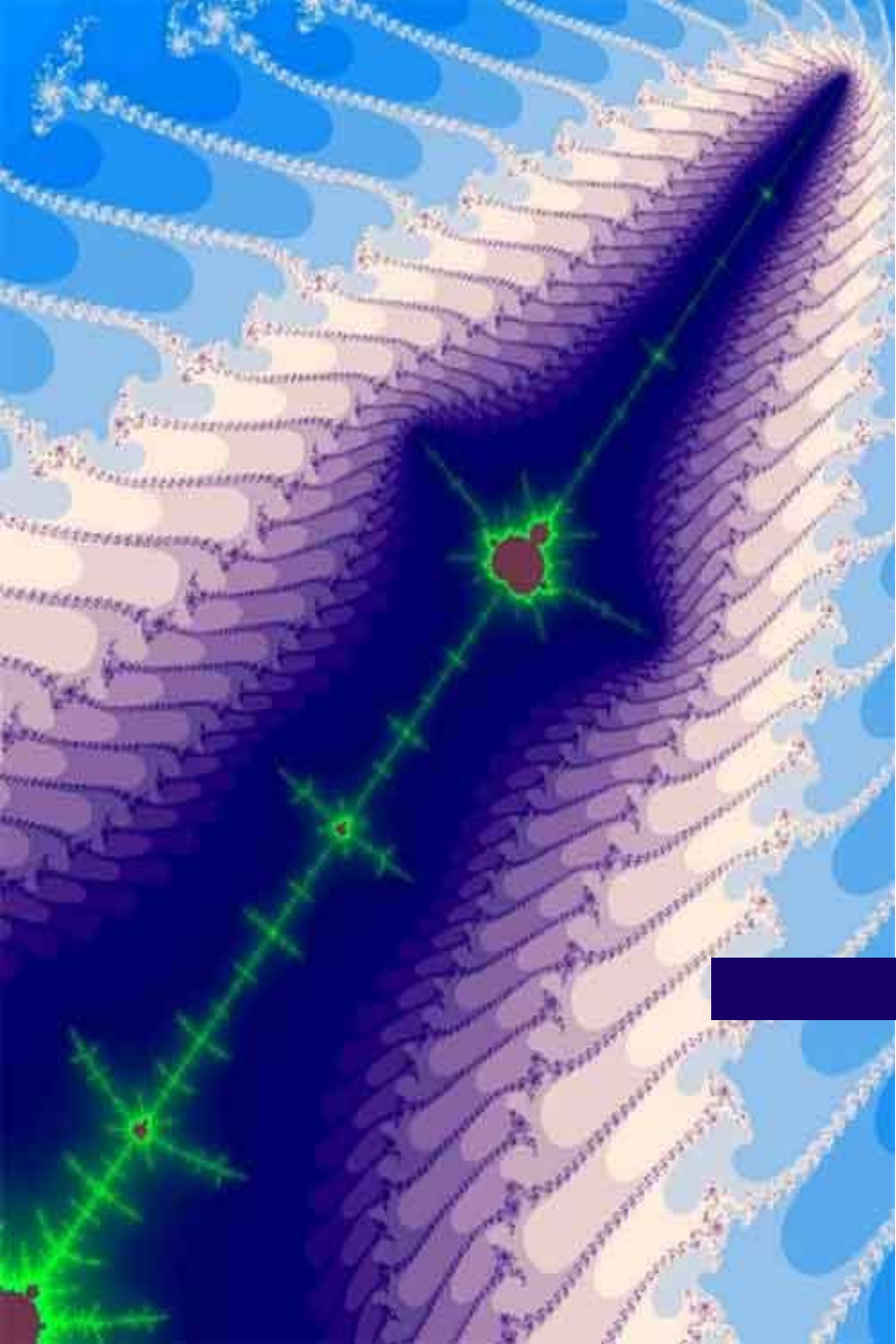
Karl Popper – a rationalist, biologically based understanding of knowledge
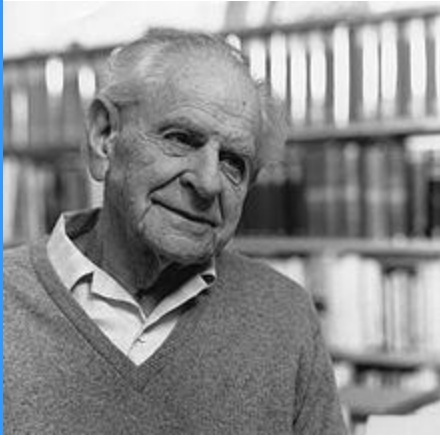
Karl Popper - b. 1902, d. 1994
"Objective Knowledge", 1972

- Born in Vienna to well-off ex-Jewish, Lutheran family
- 1929 doctorate in psychology on method in cognitive psychology
- 1934 Logik der Forschung (Logic of Scientific Discovery 1959)
  - "Solved" the problem of induction
  - Falsifiability demarcates between science and pseudo-science
- 1937 New Zealand, completed Open Society and its Enemies
- 1946 London School of Economics – professor from 1949
- 25 Oct. 1946 – "Wittgenstein's Poker affair"
  - Edmonds, D. and Eidinow, J. (2001) Wittgenstein's Poker: The Story of a Ten-Minute Argument Between Two Great Philosophers
  - Munz, P. (2004). Beyond Wittgenstein's Poker: New Light on Popper and Wittgenstein. (full text)
- 6 March 1952 –Michael Polanyi's humiliation in Popper's LSE seminar
  - Neither author nor the authors' followers will cite the other
  - Watkins, J. (1997) Obituary of Karl Popper, 1902-94. Proceedings of British Academy 94, 645- 654
- 1963 Conjectures and Refutations: the Growth of Scientific Knowledge
- 1972 Objective Knowledge: An Evolutionary Approach

# Transforming data, information, and knowledge into power

(presented in different order from book)

What is information?

- "Information"
  - a very generic term for descriptions of the world, and
  - a particular level in a hierarchy of epistemic quality
- Information (1) is a catch-all term for representations of the world in the form of transmissible or persistent content conveying something meaningful about that which exists.
- Quantitative vs qualitative measures
  - Counting bits, bytes, words and the like helps to determine storage requirements but little else
  - Focusing on the value of "content"
- "Epistemic quality" is a relative measure of what an actor can do with the information. The greater the information quality, the more useful or valuable the information is likely to be.

Ian Coombe's WIKID Power
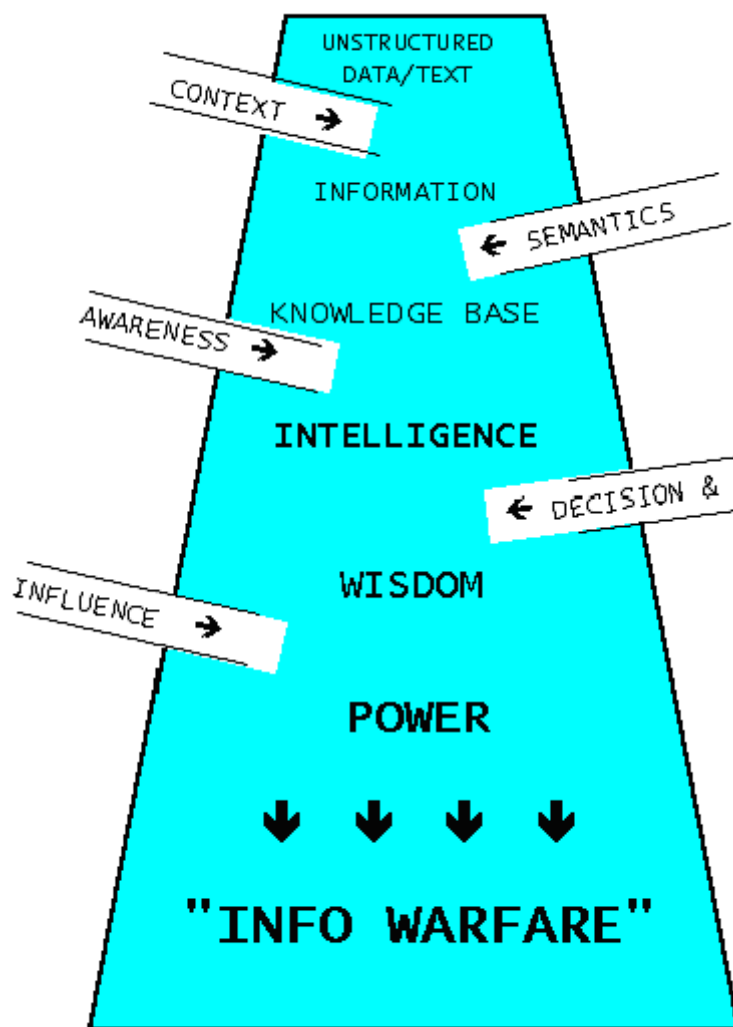
- Various types of cognitive processing adds value to "data"
- An idea that made instant sense to me when an application salesman first encountered in a Defence CALS conference

Ian Coombe's Information Definitions and Transformations. (Based on the diagram ©1995 by Ian Coombe, as published in The Australian Army Information Management Manual, Ver. 2).
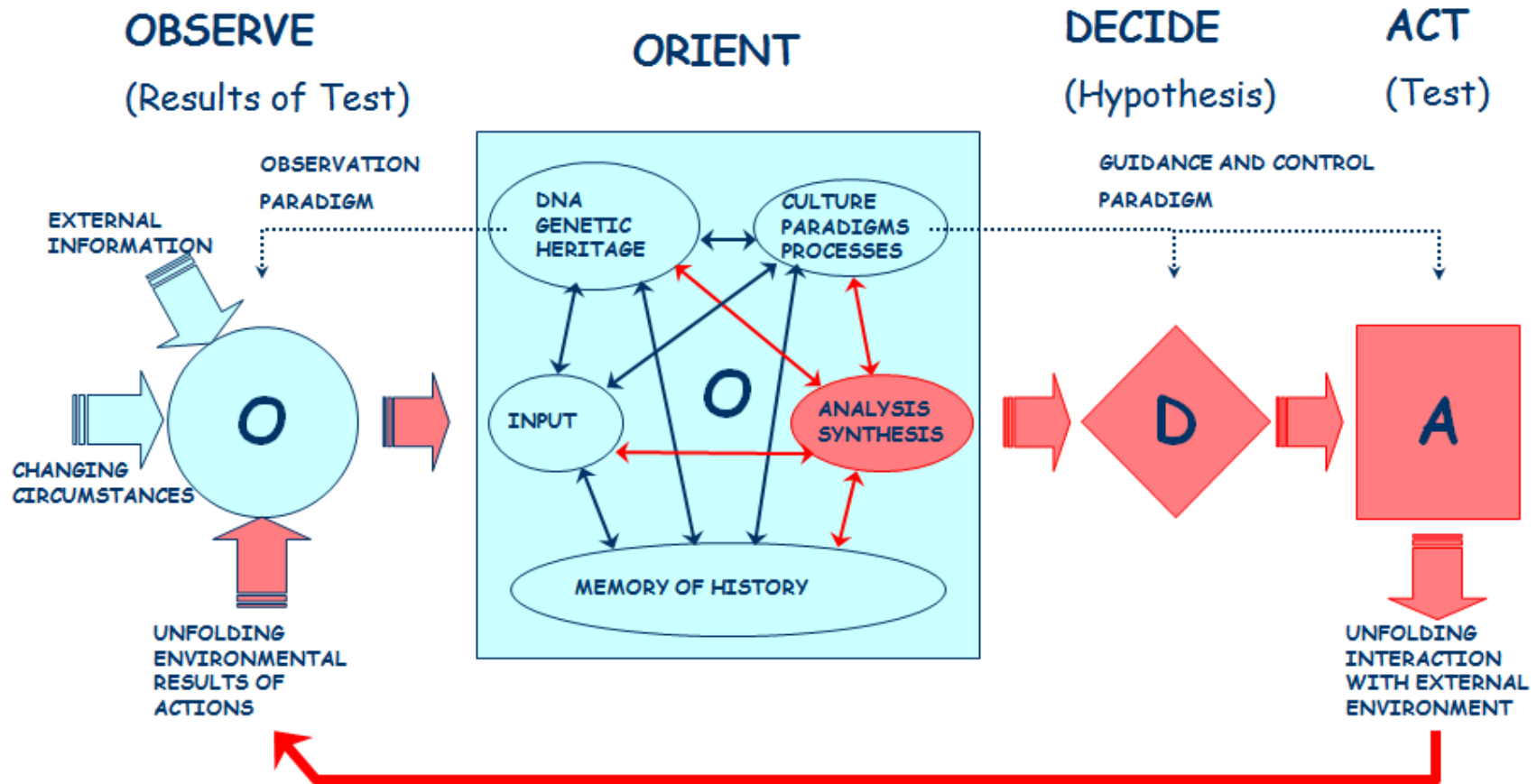
Presumably sourced from

Ackoff, R. L. 1989. "From Data to Wisdom," Journal of Applied Systems Analysis (16), pp 3–9. see Brodie & Brodie 2009)

# Transformations add epistemic quality (a.k.a. WIKID Power)

- **Data** is the raw state of information, i.e., binary or character strings without context or syntax
  - transformed by providing context and syntax (i.e. relationships)
- **Information** is data that has been given a context by relating it to other items of data in a syntax
  - transformed by assimilation (into a human memory) and semantics (meanings)
- **Knowledge** is information that is made useful because it is semantically assimilated into a body of information grounded in experience. Explicit knowledge is assimilated information that can be transmitted for others
  - transformed by human assessment and selection
- **Intelligence** (in the military sense) is knowledge that has been assessed and evaluated
  - transformed by intelligent hypothesis and action (testing against reality)
- **Wisdom** is intelligence that has survived (probably repeated) testing
  - transformed by applying wisdom and control
- **Power** (in the strategic sense) is the result of applying wisdom to gain or maintain control over external circumstances.

USAF Col. John Boyd's OODA Loop process wins dogfights and military conflicts

OBSERVE (Results of Test)

ORIENT

DECIDE (Hypothesis)

ACT (Test)

OBSERVATION PARADIGM

GUIDANCE AND CONTROL PARADIGM

EXTERNAL INFORMATION

DNA GENETIC HERITAGE

CULTURE PARADIGMS PROCESSES

O

INPUT

O

ANALYSIS SYNTHESIS

D

A

CHANGING CIRCUMSTANCES

MEMORY OF HISTORY

UNFOLDING ENVIRONMENTAL RESULTS OF ACTIONS

UNFOLDING INTERACTION WITH EXTERNAL ENVIRONMENT

- Achieving strategic power depends critically on learning more, better and faster, and reducing decision cycle times compared to competitors.

- See Osinga (2005) Science, strategy and war: the strategic theory of John Boyd - http://tinyurl.com/26eqduv

Popper's General Theory of Evolution + John Boyd's (1996) OODA Loop process
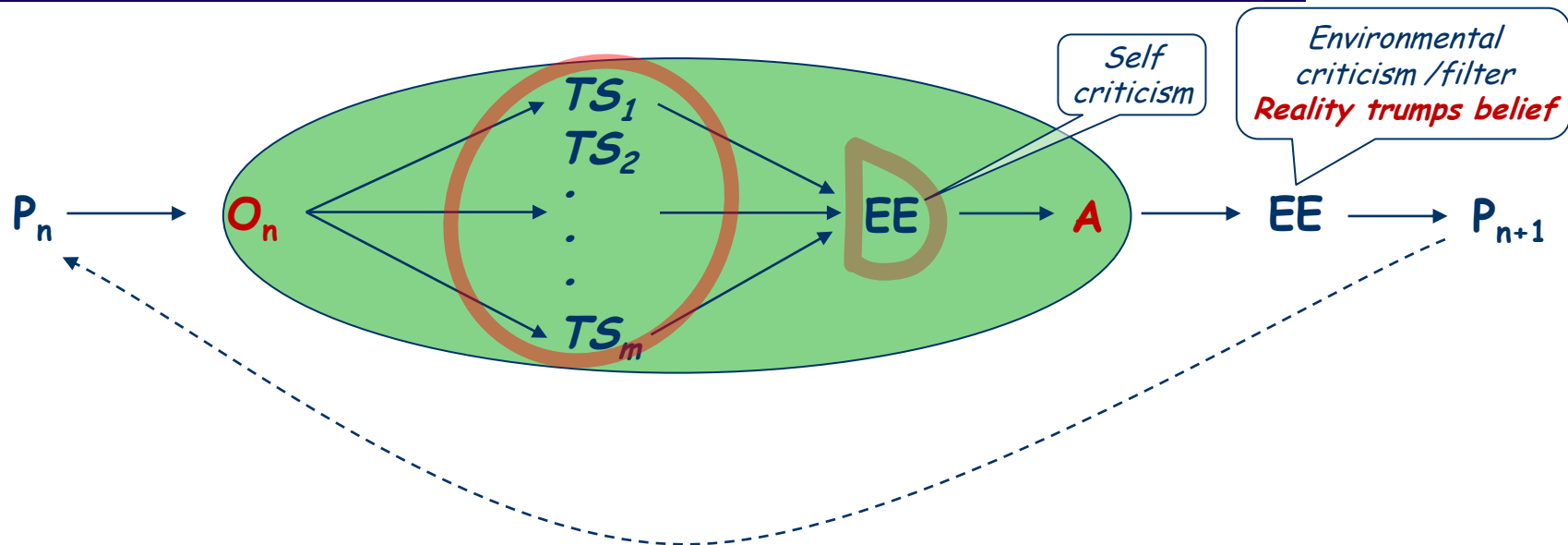
O = **Observatio**n of reality; *O* = Making sense and **orienting** to observations with solutions to be tested; *D* = Selection of a solution or making a "**decision**"

A = Application of decision or "**Action**" on reality

The real world is a filter that penalizes/eliminates entities that act on mistaken decisions or errors (i.e., Darwinian selection operates)

- Conscious self-criticism eliminates bad ideas
- If errors remain, the environment penalizes or eliminates entities acting on the errors – *Reality trumps belief*

Some OODA definitions after Col. John Boyd's OODA Loop process

- Generic process for any complex adaptive entity
  - **Observation** assembles **data** about the world (including the entity's own prior effects and those of its competitors on that world). *Data* is given context relating to interactions with the world.
    Orientation transforms **information** from those observations into semantically linked **knowledge** to form a world view comprised of
    - recent observations
    - memories of prior experience (may be explicit, implicit or even tacit)
    - genetic heritage (i.e., "natural talent")
    - cultural traditions (i.e., paradigms)
    - sense making (i.e., inferring meaning)
    - analysis (destruction) of the existing world view
    - synthesis (creation) of a revised world view including possible actions.

    This generates **intelligence** (in a military sense).
  - **Decision** selects amongst possible actions generated by the orientation, action(s) to try. Choice is governed and informed by
    - **wisdom** based on experience gained from previous OODA cycles
  - **Action** tests decisions against the world. The loop begins to repeat as the entity observes the results of its action.

This concept has been <u>animated</u> to make it somewhat clearer (see slides 11 – 15).
It will also be helpful to read the complete paper, <u>Hall et al. 2011</u>

What does orientation comprise for the organization

- Input information
  - Results of latest actions
- Transformed into knowledge as guided by
  - Individual members' genetic heritage
    - Capabilities
    - Natural talent
  - Organizational memory = Assimilated observations of external reality and prior history
    - Results of prior actions
    - Records
    - Documents (distilled knowledge)
  - Culture, paradigms and processes
    - Explicitly / implicitly learned / mandated methodologies
- Analysis and synthesis create intelligence
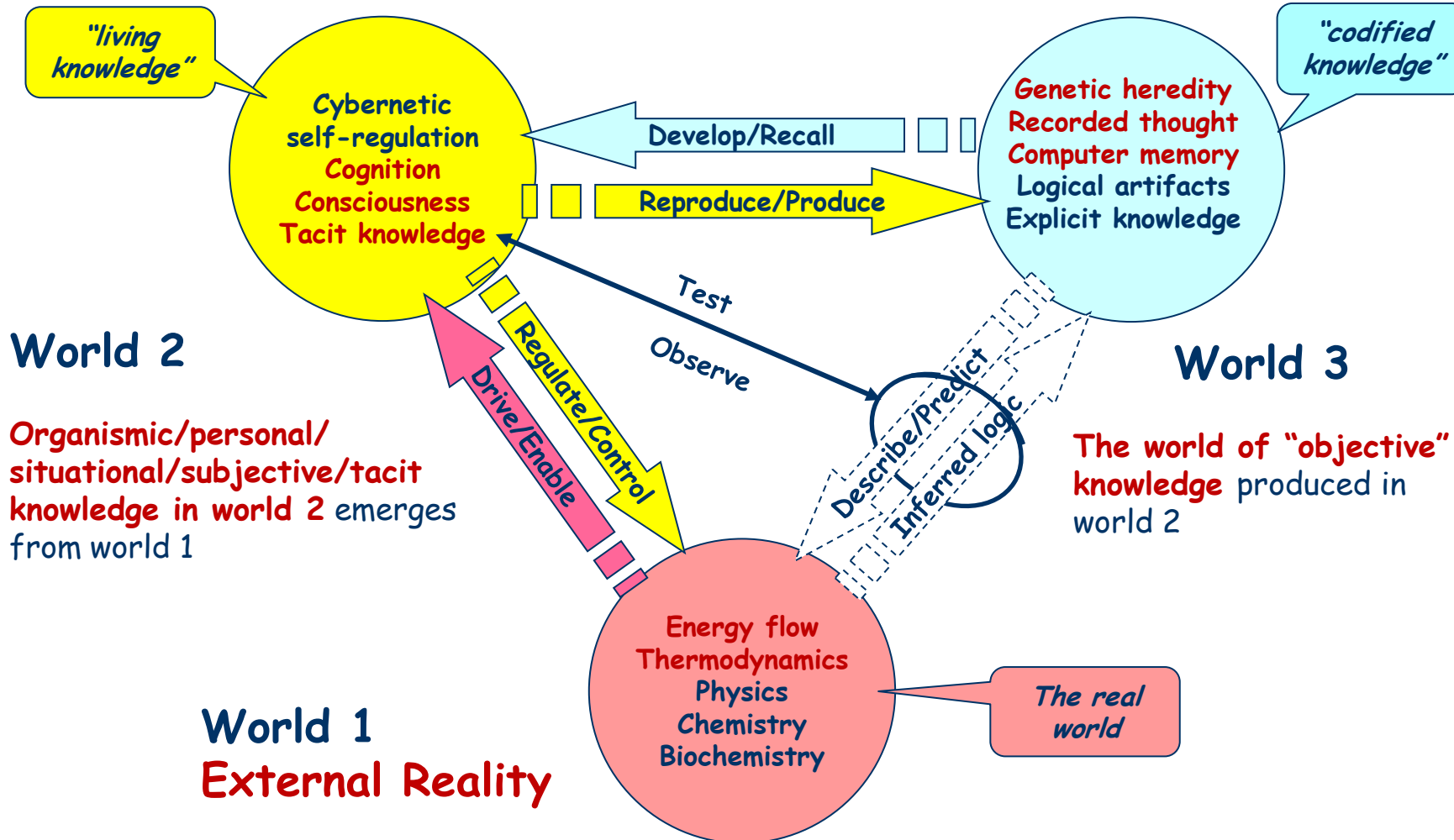 - Reasoning, reaction, theory building

Individual / organizational knowledge (WIKID Power)

- Value is added to the result as information is transformed from one level in the hierarchy to the next

- In an organizational context, *knowledge* is the assimilated information (= organizational memory) able to be exchanged between members of the organization or preserved and transmitted through time to guide behavior and support decisions

- Compared to an individual's knowledge, which is lost when the individual leaves the organization, organizational knowledge is represented in culture, processes and document content that exist independently outside individual memory

Strategic power is the goal to be achieved by most entities

- **Strategic power** has three major sources developed through the epistemic transformation processes discussed above:
    - *epistemic power* - the wisdom ("know that") and know how to apply power effectively,
    - *will power* - the decision or will to apply power,
    - *logistic power* - available resources enabling the application of power
- Strategic power to control events in the world is gathered and built by entities able to complete their OODA cycles faster and more effectively than their competitors.
    - The competitor with the more complete and accurate picture of the world is more likely to achieve the predicted results from an action than will be the case for a competitor with a less complete and accurate picture.
    - An entity that can decide and act in less time than a competitor alters reality so it no longer conforms to the competitors' observations of the world.
- The entity holding strategic power makes the world appear to be chaotic to less powerful entities.

Fitting it all into Popper's three worlds ontology

"living knowledge"

Cybernetic self-regulation
Cognition
Consciousness
Tacit knowledge

Develop/Recall

Reproduce/Produce

"codified knowledge"

Genetic heredity
Recorded thought
Computer memory
Logical artifacts
Explicit knowledge

World 2

Organismic/personal/situational/subjective/tacit knowledge in world 2 emerges from world 1

Test
Observe

Regulate/Control
Drive/Enable

Describe/Predict
Inferred logic

World 3

The world of "objective" knowledge produced in world 2

Energy flow
Thermodynamics
Physics
Chemistry
Biochemistry

The real world

World 1
External Reality

And then there is knowledge in the form of cultural inheritance in both worlds 2 and 3

Further reading on the transformation of data and information into knowledge and power in an organizational context

- Includes ideas that will not be developed in this book until later episodes:

- Hall, W.P., Else, S., Martin, C., Philp, W. 2011. Time-based frameworks for valuing knowledge: maintaining strategic knowledge. Kororoit Institute Working Papers No. 1: 1-28.

- Vines, R., Hall, W.P. 2011. Exploring the foundations of organizational knowledge. Kororoit Institute Working Papers No. 3: 1-39.
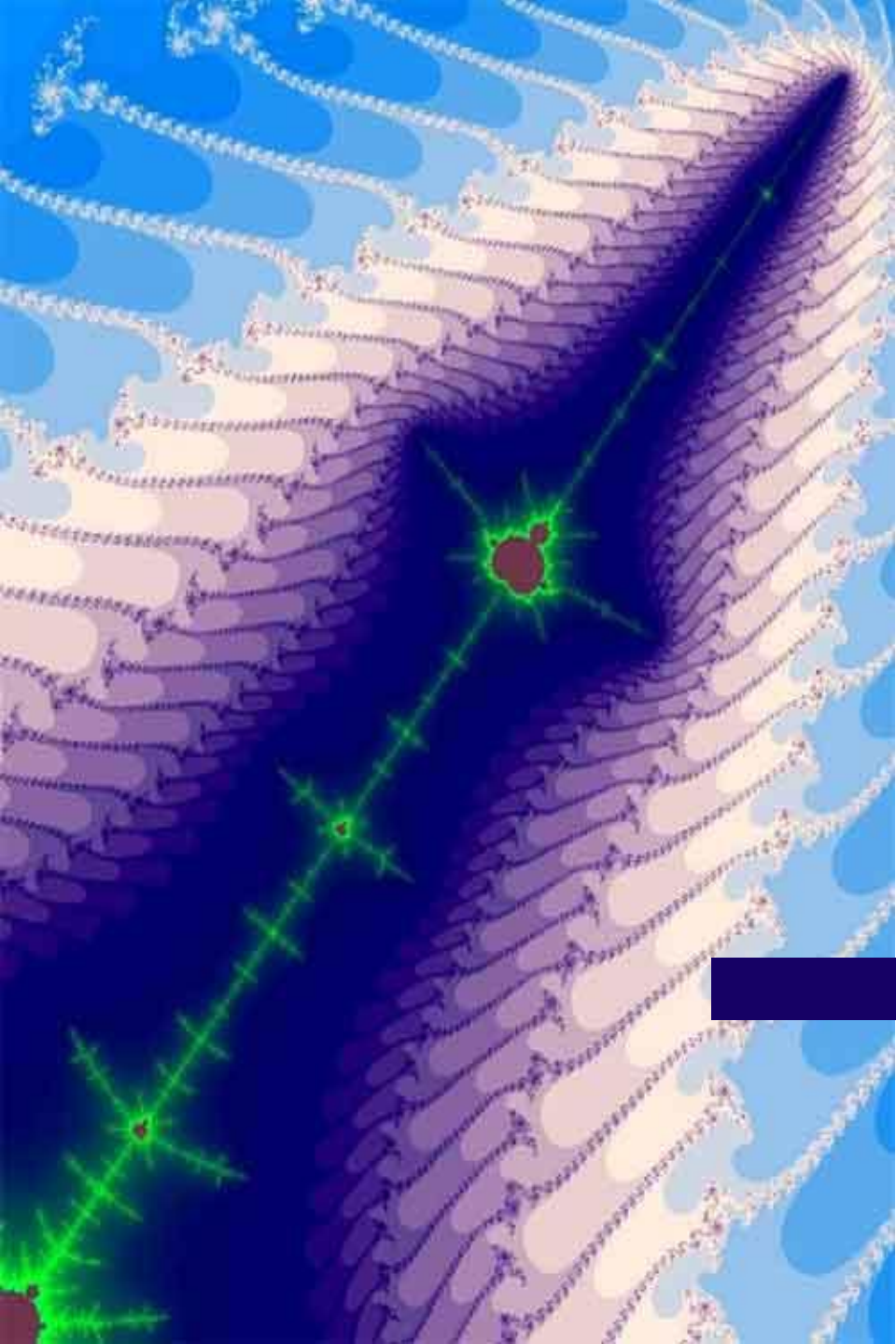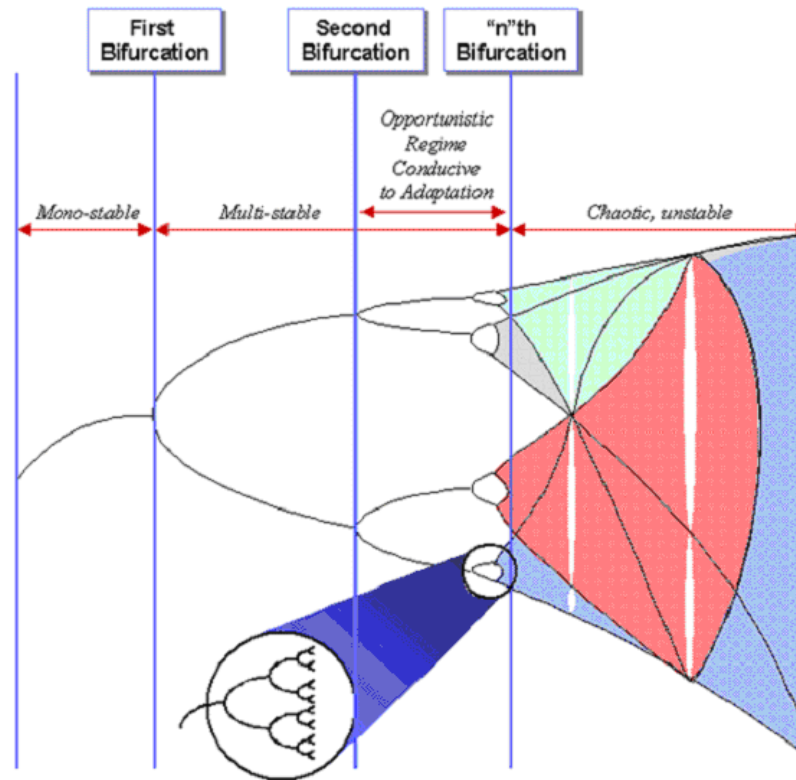
Evolutionary and revolutionary adaptation

Emergent phenomena in non-linear systems

- Non-linearity – small incremental changes can lead to widely divergent consequences – bifurcation is one example

First Bifurcation | Second Bifurcation | "n"th Bifurcation

Opportunistic Regime Conducive to Adaptation

Mono-stable | Multi-stable | Chaotic, unstable

- Life exists on the the edge of chaos

Small incremental changes may cause revolutions by allowing complex systems to cross thresholds

- Grade shifts in cognitive processes
  - New ways to interact with the environment
  - New way to organize and access memory
  - New ways to communicate and share survival knowledge
- Grade shifts in technologies
  - New ways to capture data externally
  - New ways to represent knowledge
  - New ways to store and retrieve knowledge
  - New ways to construct knowledge
  - New ways to aggregate different functions in the same device.
  - New ways to interface with human users
- Major feedback and synergies from combining grade shifts in technologies with those in cognition