Thinking in OODA Loops

Venkatesh Rao

With monotonous regularity, apparently competent men have laid down the law about what is technically possible or impossible — and have been proved utterly wrong, sometimes while the ink was scarcely dry from their pens. On careful analysis, it appears that these debacles fall into two classes, which I will call **"failures of nerve"** and **"failures of imagination."**

The failure of nerve seems to be the more common; it occurs when even given all the relevant facts the would-be prophet cannot see that they point to an inescapable conclusion. Some of these failures are so ludicrous as to be almost unbelievable, and would form an interesting subject for psychological analysis.

— From **Hazards of Prophecy** by Arthur C. Clarke, in Profiles of the Future: An Inquiry into the Limits of the Possible

Thinking in OODA loops is about getting the right mix of nerve and imagination for a winning strategy.

"an **organizational climate** for **operational success**"

**Blitzkrieg Model**   **OODA loop**

Today's session!

"an **organizational climate** for operational success"

THE STRATEGY OF JOHN BOYD, APPLIED TO BUSINESS

CERTAIN TO WIN

Chet Richards

Trust (Einheit)
Capabilities (Fingerspitzengefühl)
Contracts (Auftragstaktik)
Goal (Schwerpunkt)

1. A vocabulary, grammar and syntax for thinking about organizations
2. A style of diagnosing and intervening in organizations
3. A foundation for building a winning culture

"an organizational climate for **operational success**"

John Boyd's OODA loop
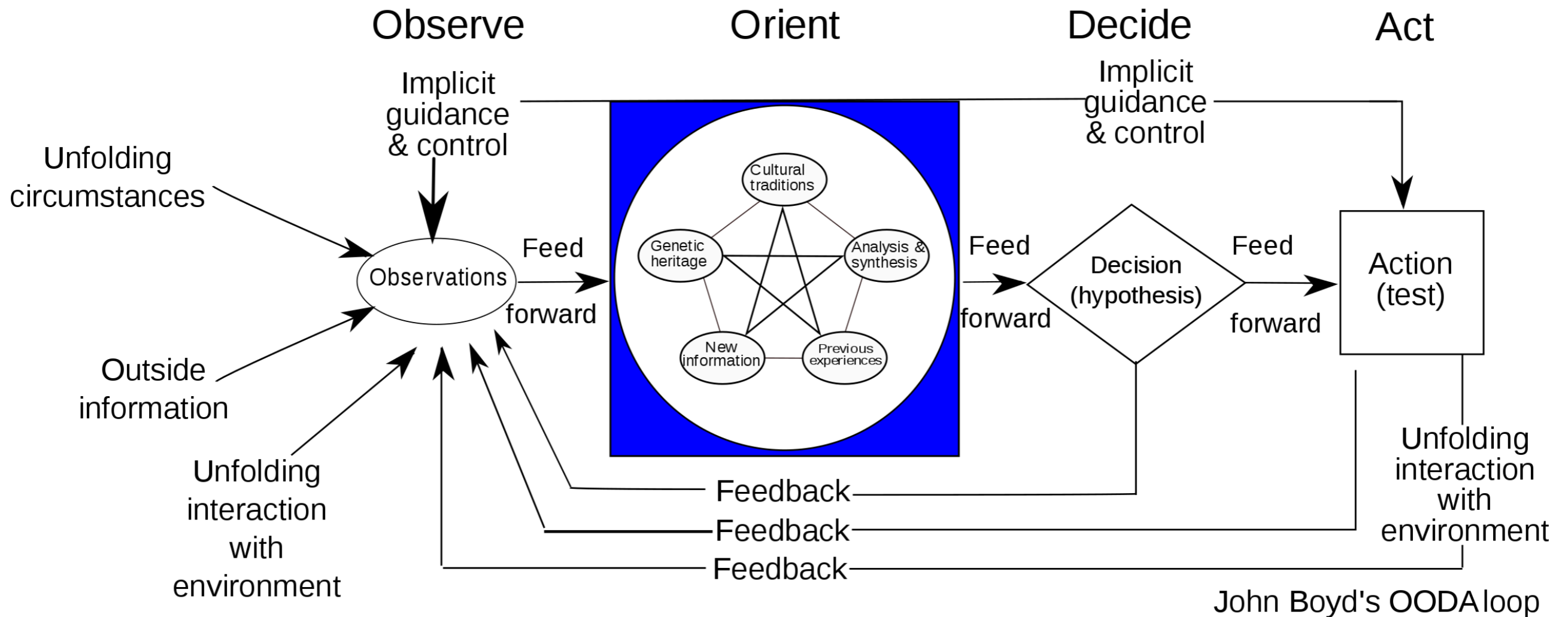
1. A vocabulary, grammar and syntax for live decision-making
2. **A habit of seeing problems with boldness and imagination**
3. A foundation for "doing" strategy

Today's session!

Core of OODA thinking

Operate inside another agent's decision-cycle, collapsing it from within

WARNING #1: OODA is a not a process diagram. Treat it as a mindful meditation catalyst, not a blueprint

WARNING #2: OODA is NOT a cyclic sequence. All 4 behaviors evolve in parallel flowing into each other.

WARNING #3: Orientation is a context-sensitive gestalt state, not a behavior. *Re*-orientation is an unscripted state reset that is the result of imaginative re-perception and re-situation in the environment, accompanied by active creative destruction. It is not a predictable "meta" process.

WARNING #4: OODA is not about "iterating faster" than the competition.

How to "do" OODA-based strategy

1. **Operate in real-time**: if you need time to think you must create it
2. **See in functionally unfixed ways**: things are not their functions
3. **Mind the matrix**: perceptions are not realities
4. **Workshop through sparring**: if it's not being free-play tested, it isn't thinking
5. **Develop deep memory**: historical amnesia equals bad strategy

"Create time" = "operate inside the adversary's decision cycle"

If you *don't* create time

1. Time pressure builds
2. You make mistakes
3. Imagination starts to fail
4. Your luck turns bad
5. Appetite for risk starts to collapse
6. Fear forces an unsafe retreat
7. Your OODA loop "collapses"
8. Feeling of **certain doom**

This is **ZEMBLANITY**

If you *do* create time

1. Time advantage accumulates
2. You make inspired moves
3. Imagination starts to compound
4. Your luck turns good
5. Appetite for risk starts to increase
6. Confidence fuels a bold advance
7. You "seize the initiative"
8. Feeling of **unstoppable power**

This is **SERENDIPITY**

Pure Conflict OODA (Zero/Negative-Sum)

The goal of OODA operations is to **operate inside the adversary's decision cycle**, to seize and retain the initiative, in order to control the conflict, to make yourself surprisingly lucky and your **adversary** unsurprisingly unlucky
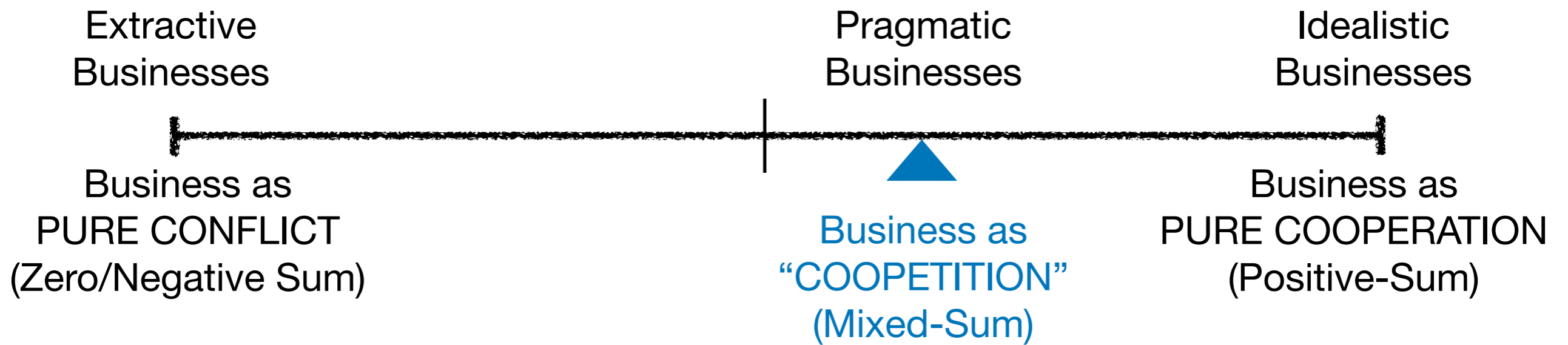
Prototype: War

"No bastard ever won a war by dying for his country. He won it by making the other poor dumb bastard die for his country."

— General George S. Patton
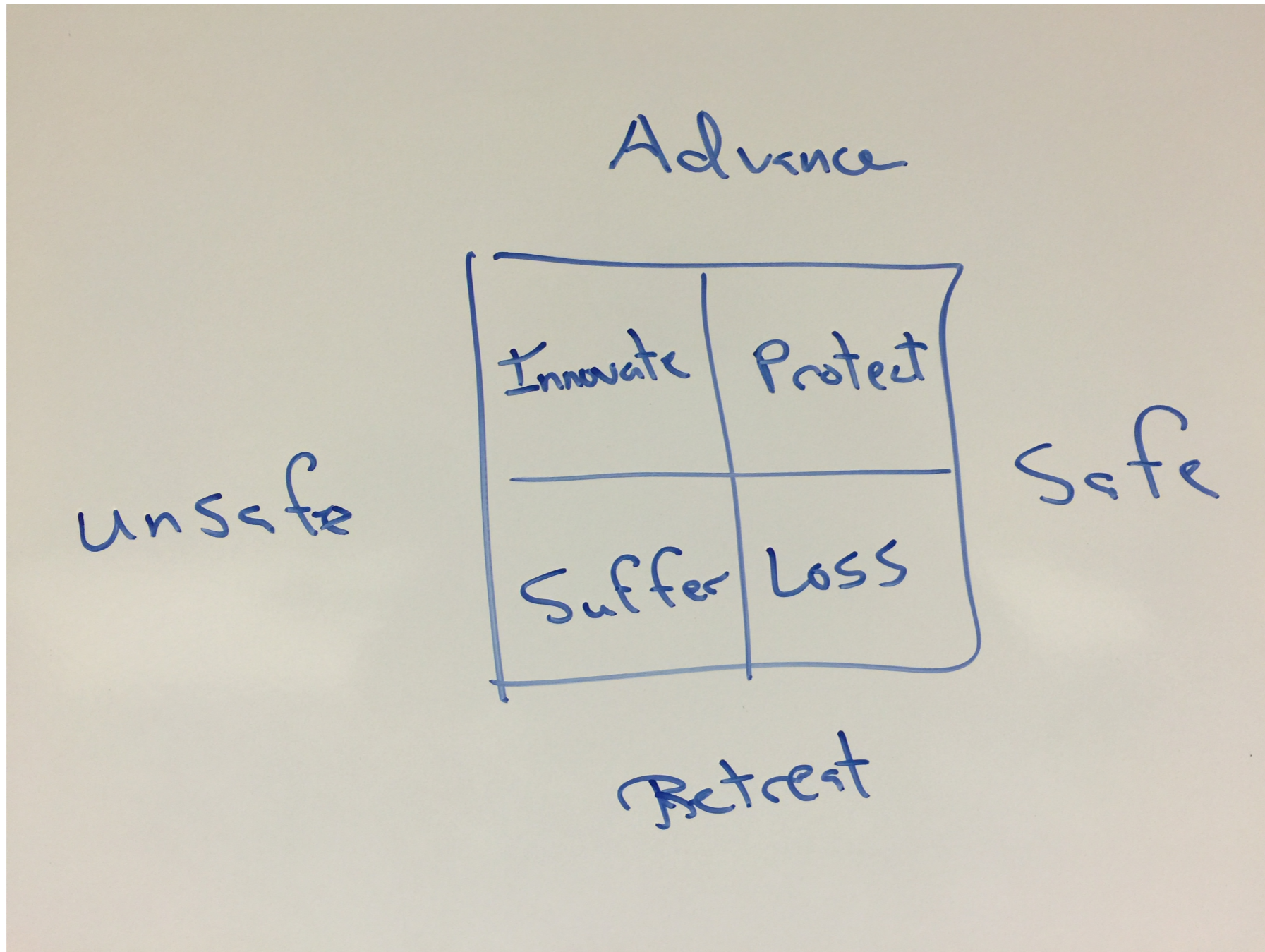
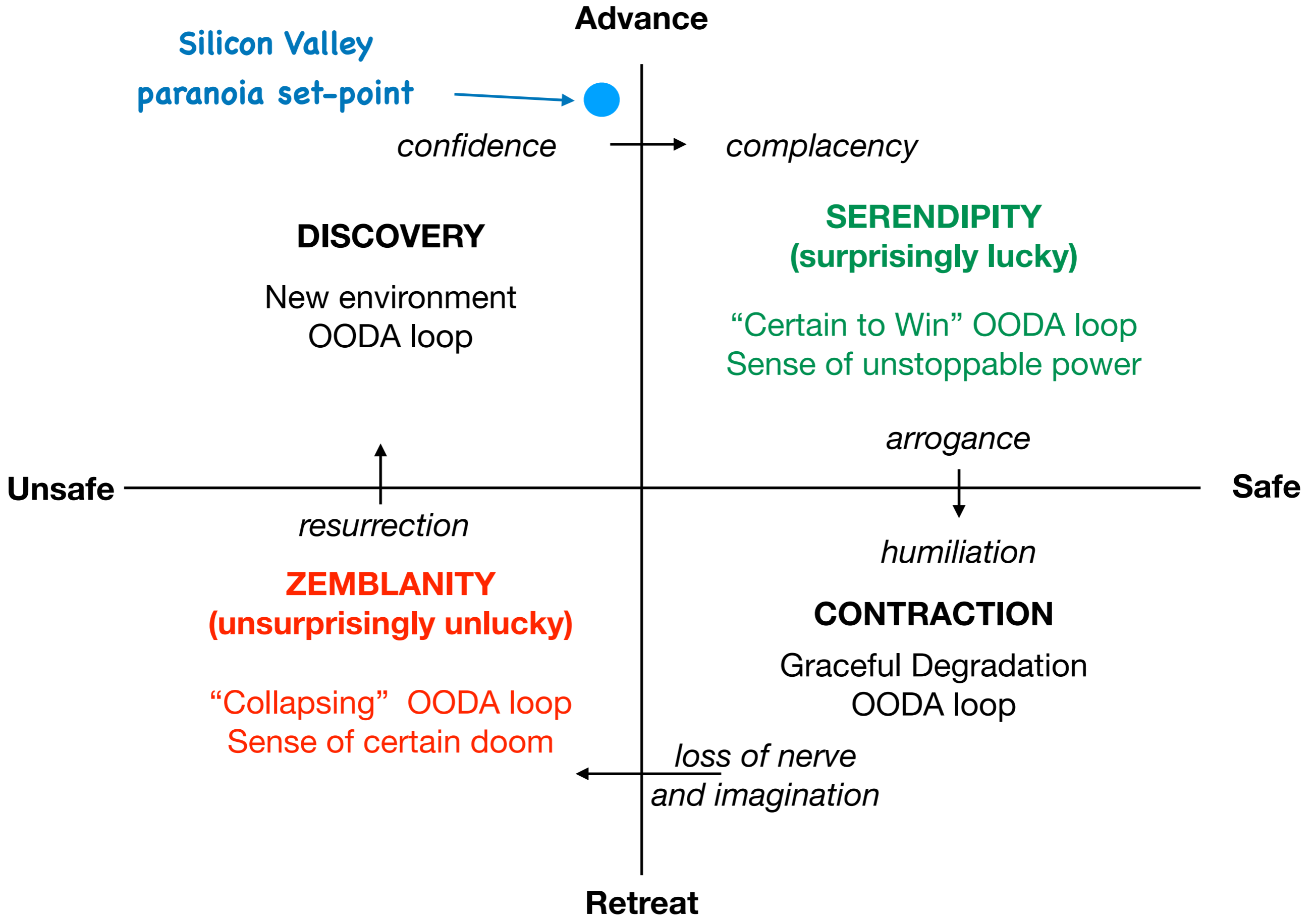# Pure Cooperation OODA (Positive-Sum)

The goal of OODA operations is to **operate inside the market's decision cycle**, to seize and retain the initiative, in order to control the market, to make yourself surprisingly lucky, and your **customer** predictably delighted

Prototype: Caring for an infant

Extractive
Businesses

Pragmatic
Businesses

Idealistic
Businesses

Business as
PURE CONFLICT
(Zero/Negative Sum)

Business as
"COOPETITION"
(Mixed-Sum)

Business as
PURE COOPERATION
(Positive-Sum)

Jim Keller 2x2:™ 4 possible OODA loop regimes

Advance

Silicon Valley
paranoia set-point

confidence → *complacency*

DISCOVERY

New environment
OODA loop

**SERENDIPITY
(surprisingly lucky)**

"Certain to Win" OODA loop
Sense of unstoppable power

arrogance

Unsafe ——— **Safe**

resurrection

humiliation

**ZEMBLANITY
(unsurprisingly unlucky)**

"Collapsing" OODA loop
Sense of certain doom

CONTRACTION

Graceful Degradation
OODA loop

*loss of nerve
and imagination*

Retreat

15

Wherever you are on the spectrum…
…There is no permanent strategic advantage

Covid Response in 4 regimes

Advance
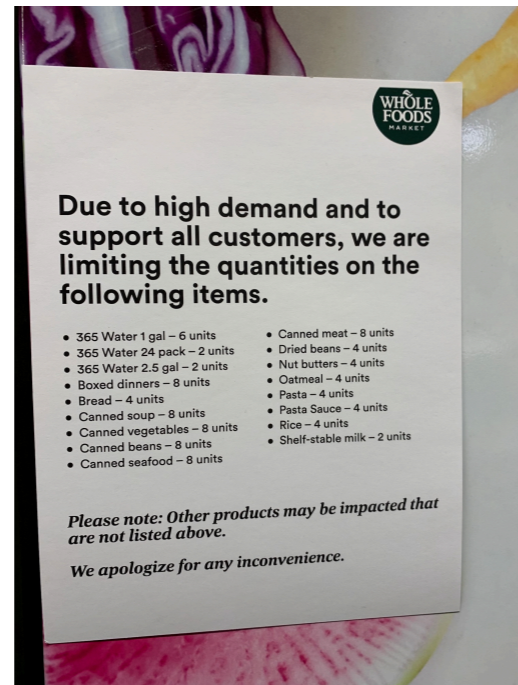
Unsafe ——————————————————————— **Safe**

Retreat

12 Examples

1. Lanchester attrition
2. Turnicate (sea squirt)
3. *Leuchordium* (a worm)
4. Throwing a ball
5. Infinite walking
6. Asymmetric chess
7. HITEN mission salvage
8. Robot soccer
9. Traffic enforcement
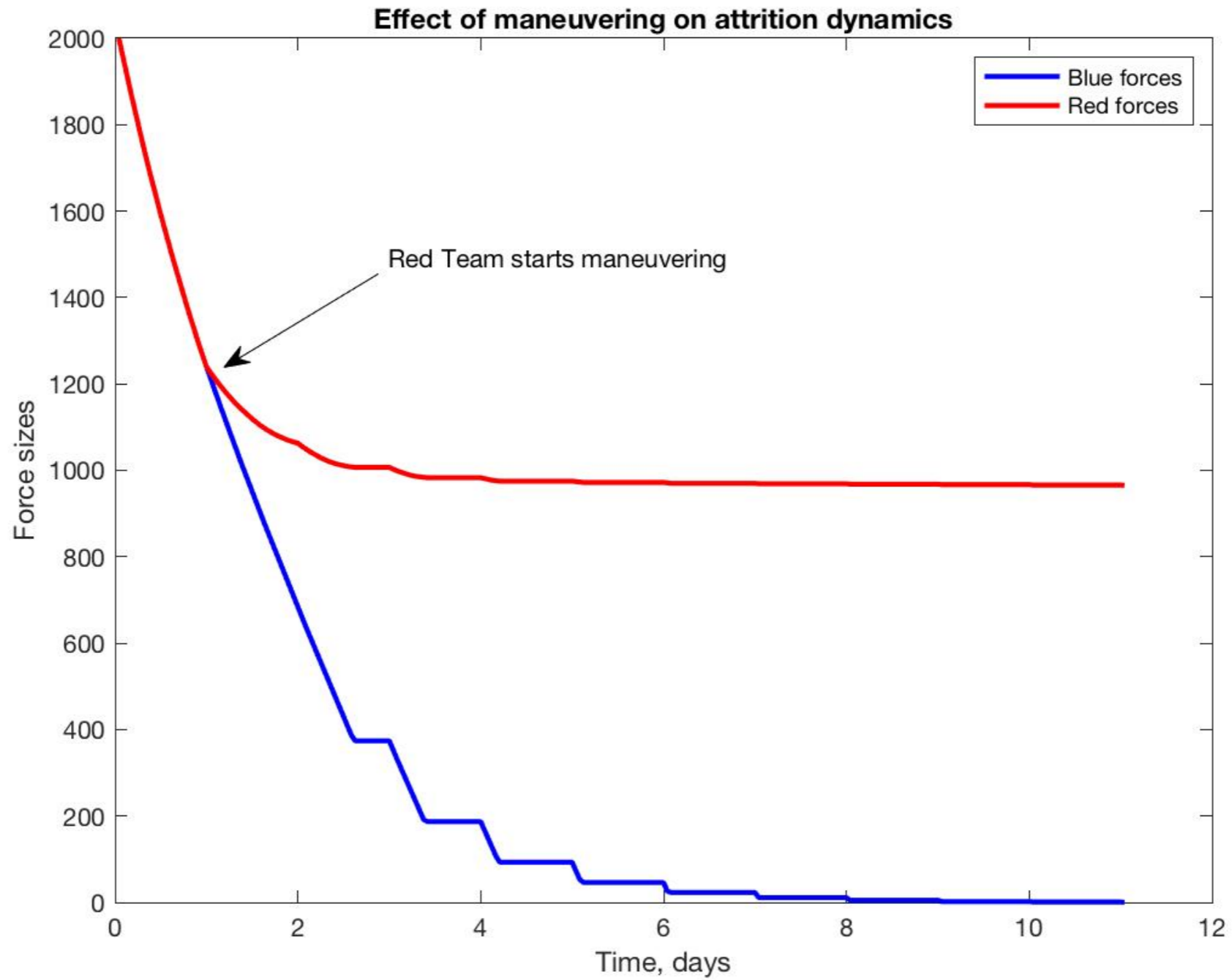10. Southwest Airlines
11. Nakatomi Spaces
12. The Van Riper Affair

1.

Problem: Attrition conflict creates a doomsday stalemate between equally matched sides. How do you break out?

Lanchester's Law (1916): The relative loss rates of opposed forces in combat is inversely proportionate to the ratio of the squares of their strengths

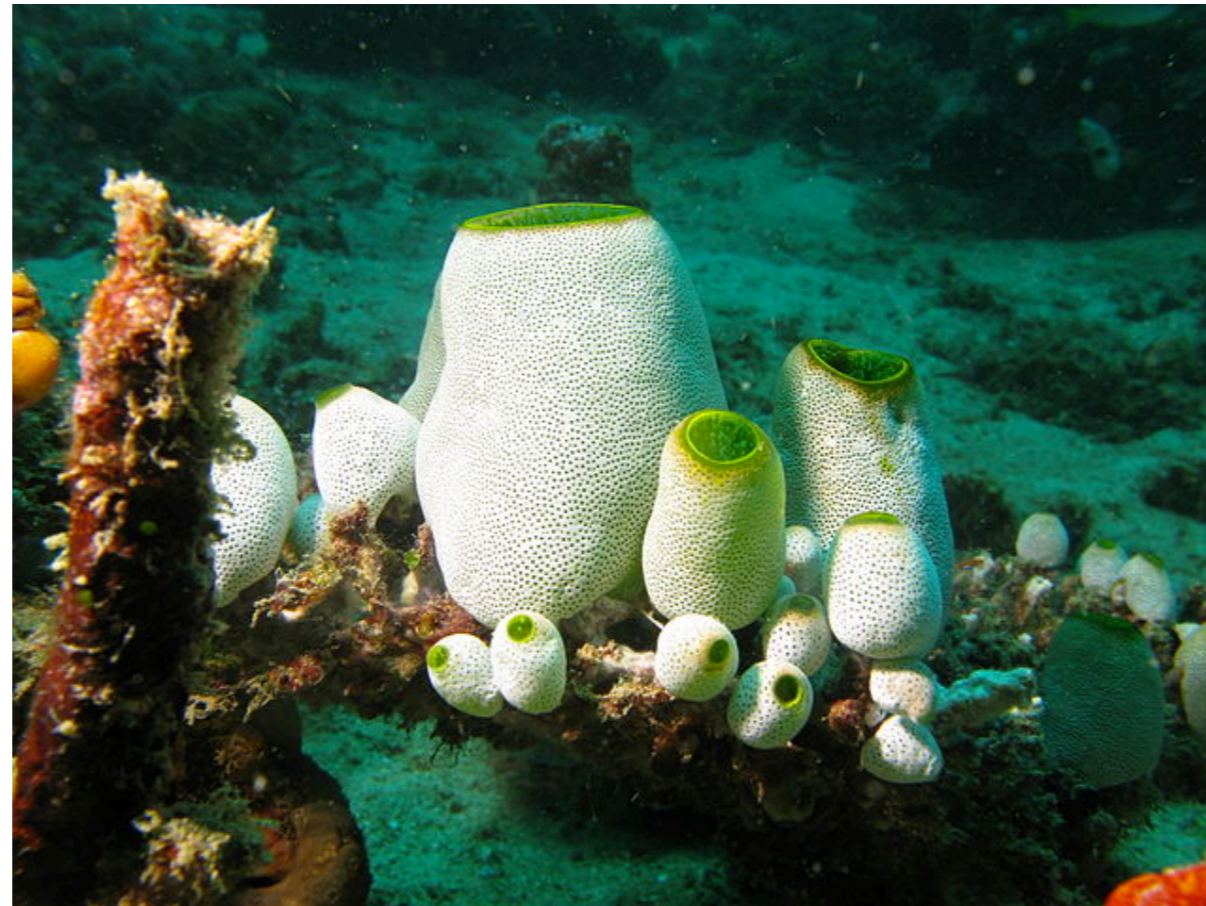# **OODA solution:** Start maneuvering!

Blue Right

Blue Left

****

****

Red Left

****

Red Right

****

Effect of maneuvering on attrition dynamics

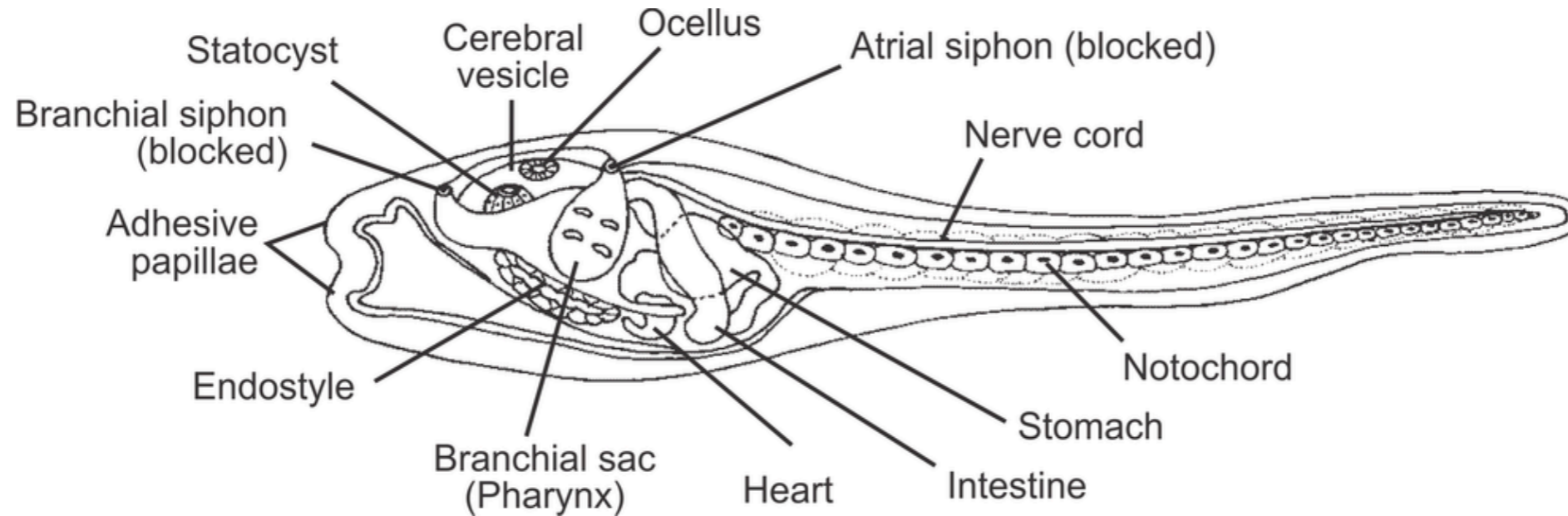https://github.com/vgururao/MatlabFun/tree/master/lanchester

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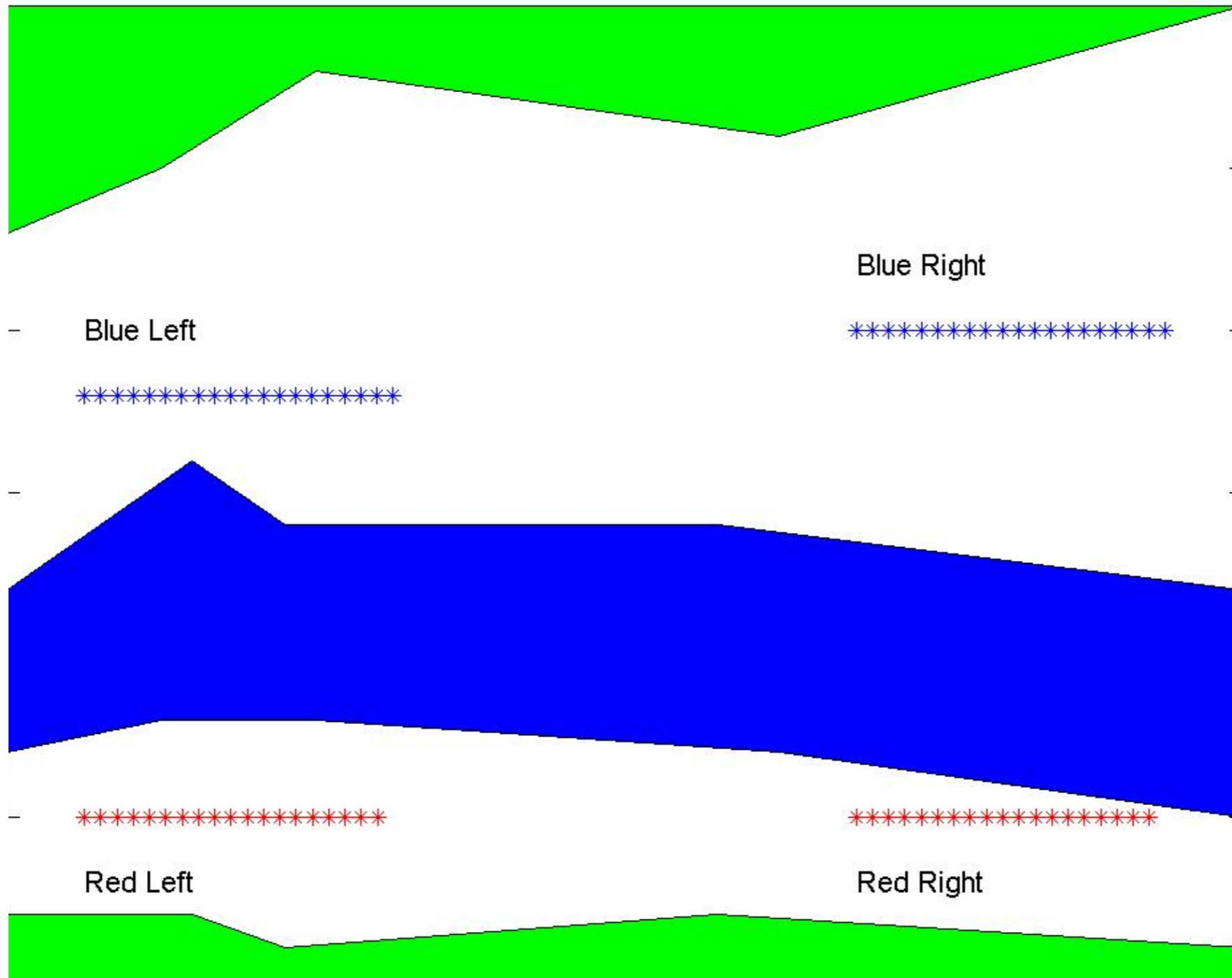
Lesson 1: maneuvering creates the equivalent of a resource advantage

2.

Problem: The Sea Squirt (Turnicate) needs a brain to find a good location to live on the sea floor, but doesn't have the energy to sustain a large brain

OODA solution: Eat your brain when you're done!

Statocyst — Cerebral vesicle — Ocellus — Atrial siphon (blocked)

Branchial siphon (blocked) — Nerve cord

Adhesive papillae

Endostyle — Notochord

Branchial sac (Pharynx) — Heart — Intestine — Stomach

When sufficiently developed, the larva of the sessile species finds a suitable rock and cements itself in place. The larval form is not capable of feeding, though it may have a rudimentary digestive system,[34] and is only a dispersal mechanism. Many physical changes occur to the tunicate's body during metamorphosis, one of the most significant being the reduction of the cerebral ganglion, which controls movement and is the equivalent of the vertebrate brain. From this comes the common saying that the sea squirt "eats its own brain".[35] However, the adult does possess a cerebral ganglion which may even be larger than in the embrionic stage, so the scientific validity of this joke is questionable.[36] In some classes, the adults remain pelagic (swimming or drifting

Lesson 2: You don't need much of a brain to run an OODA loop, only a reality signal

3.

Problem: *The Leuchordium worm needs to get around, but has weak mobility*

ABSURD CREATURE OF THE WEEK: THE PARASITIC WORM THAT TURNS SNAILS INTO DISCO ZOMBIES

OODA solution: Hijack a snail to hitch a ride in a bird's gut

Mother Nature, you see, has cooked up an even more sadistic punishment for the humble snail. It's called *Leucochloridium*, and it's a parasitic worm that invades a snail's eyestalks, where it pulsates to imitate a caterpillar (in biology circles this is known as aggressive mimicry—an organism pretending to be another to lure prey or get itself eaten). The worm then mind-controls its host out into the open for hungry birds to pluck out its eyes. The worm breeds in the bird's guts, releasing its eggs in the bird's feces, which are happily eaten up by another snail to complete the whole bizarre life cycle.

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Lesson 3: Containment does not equal control. Just because you run the OODA loop, doesn't mean you *own* the OODA loop

4.

Problem: *You're throwing a ball but a mad scientist has messed with your vision by putting wedge prism glasses on you, so you keep missing*
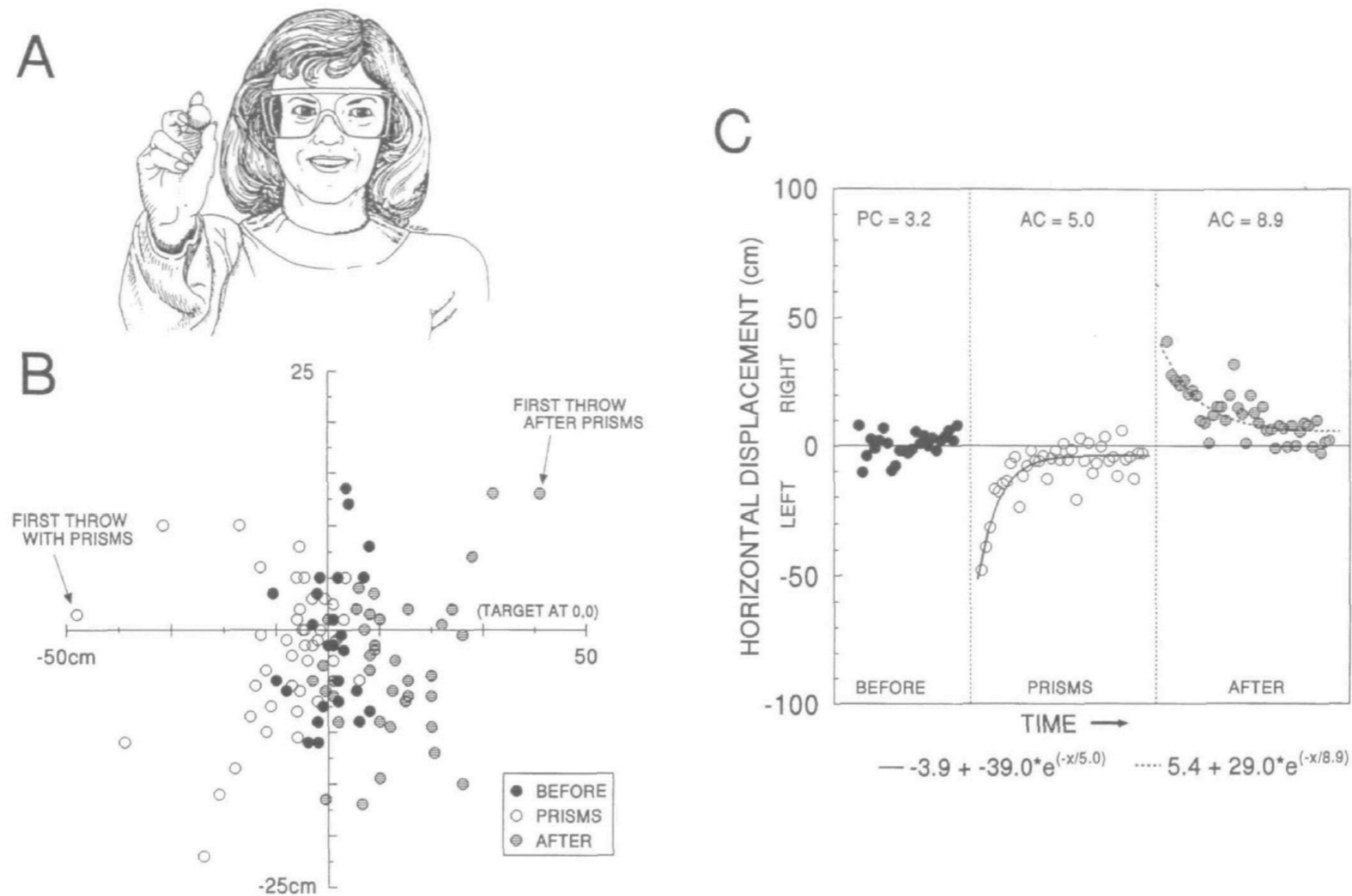
OODA solution: Your cerebellum has you covered!

Fig. 1 Prism adaptation test, control subject. (A) Eye–hand positions after adaptation to base-right prisms. The light path is bent to the subject's right, giving a fuller view of the right side of her face. Her gaze is shifted left along the bent light path to foveate the target in front of her. Her hand position is ready for a throw at the target in front of her. (B) Normal results of the throwing test of prism adaptation for a control subject (control subject no. 8, Table 1). Target centre is at the origin of the graph. Impact locations are shown before donning the prisms (black circles), while wearing 30 diopter base right prisms (empty circles), and after removing the prisms
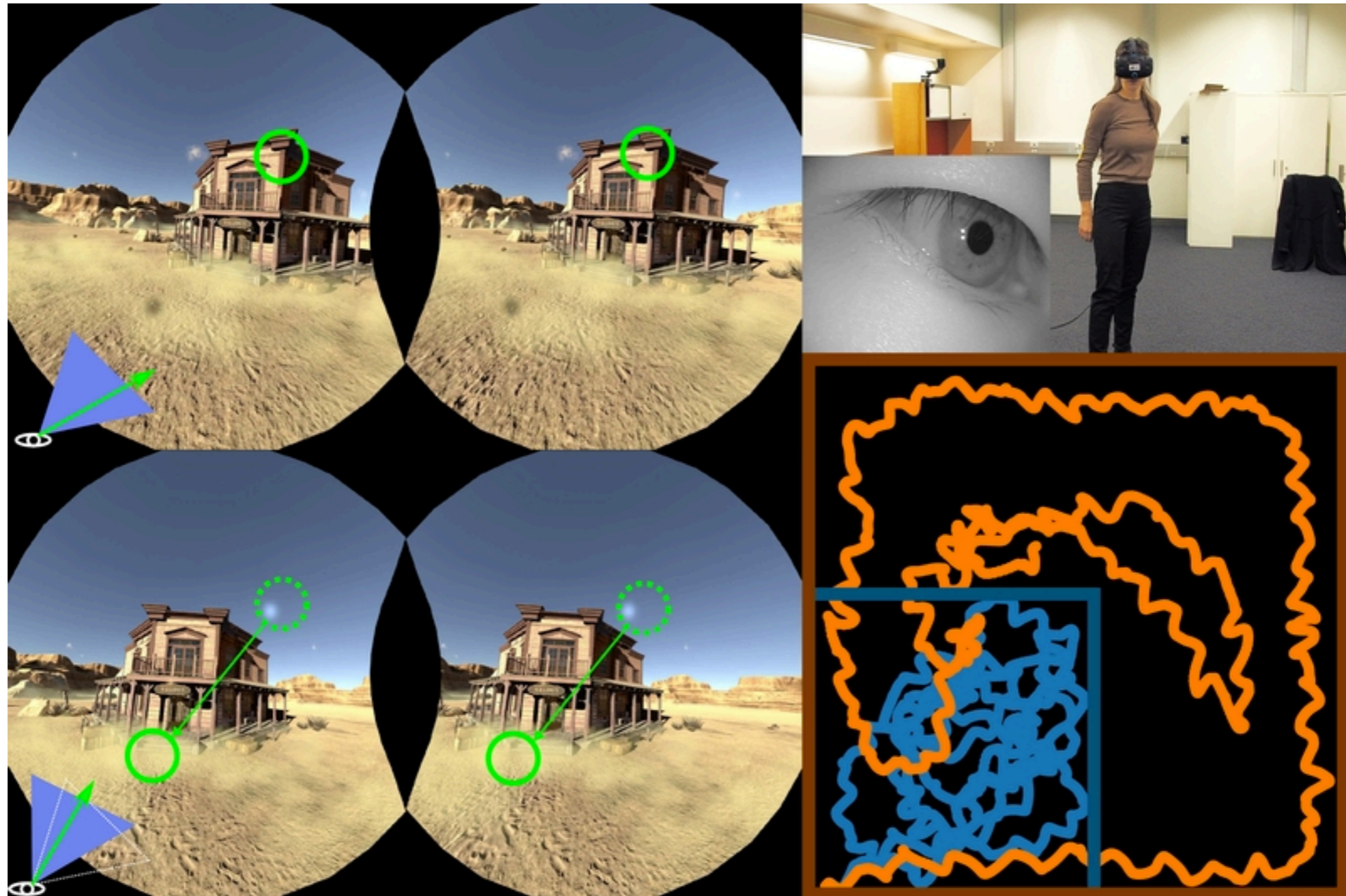
Purkinje cells: the cerebellum re-orientation hardware
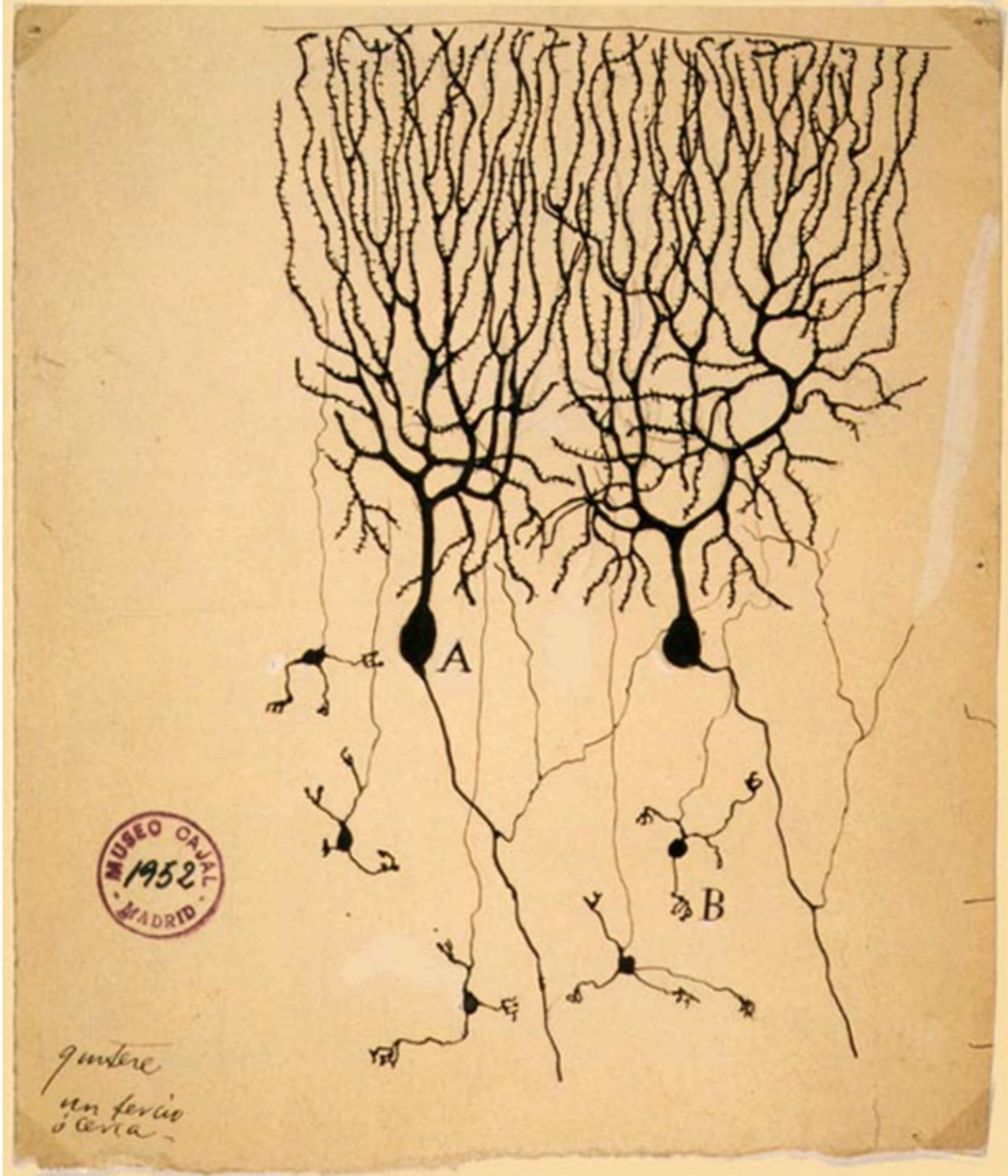
Lesson 4: The older parts of your brain are already wired for OODA. It's the newer parts that have some learning to do.

5.

Problem: Rooms are much smaller than the VR environments we'd like to walk around in
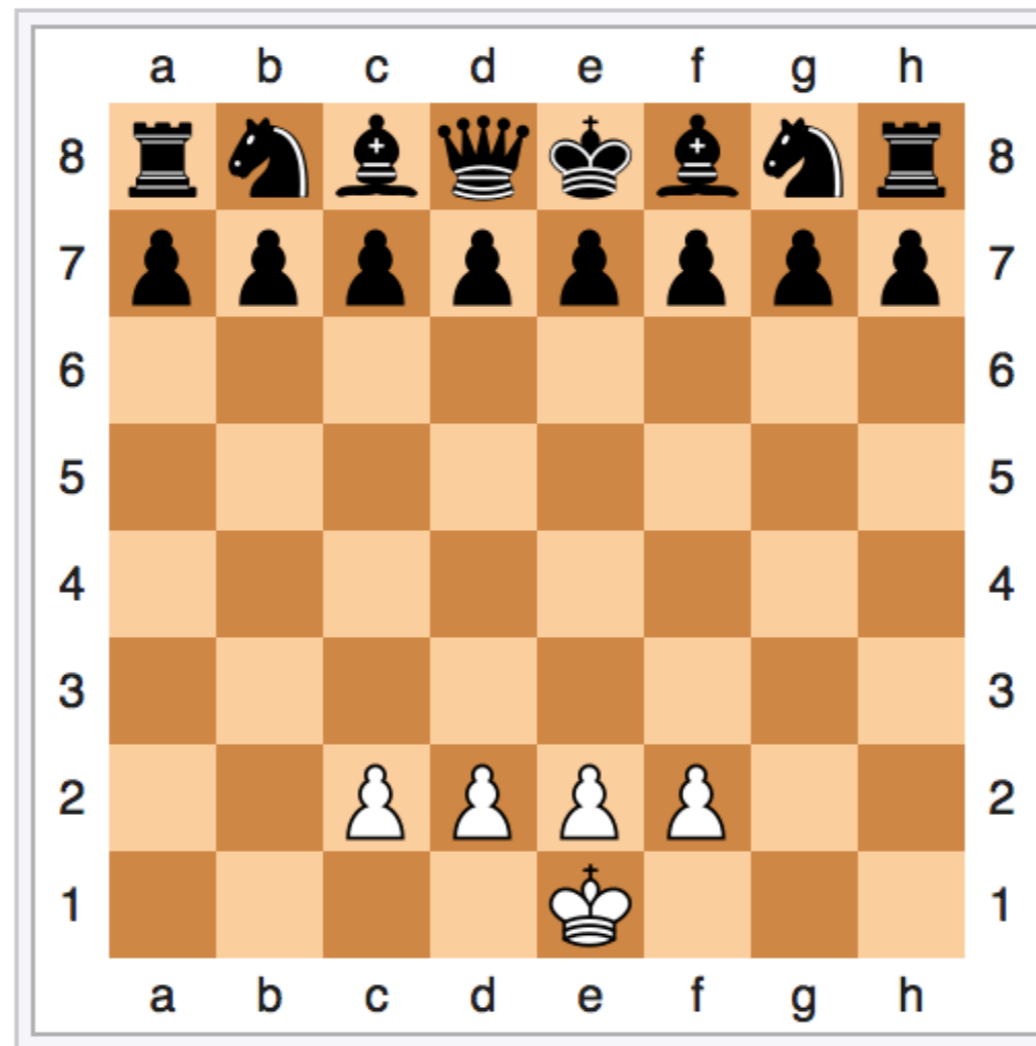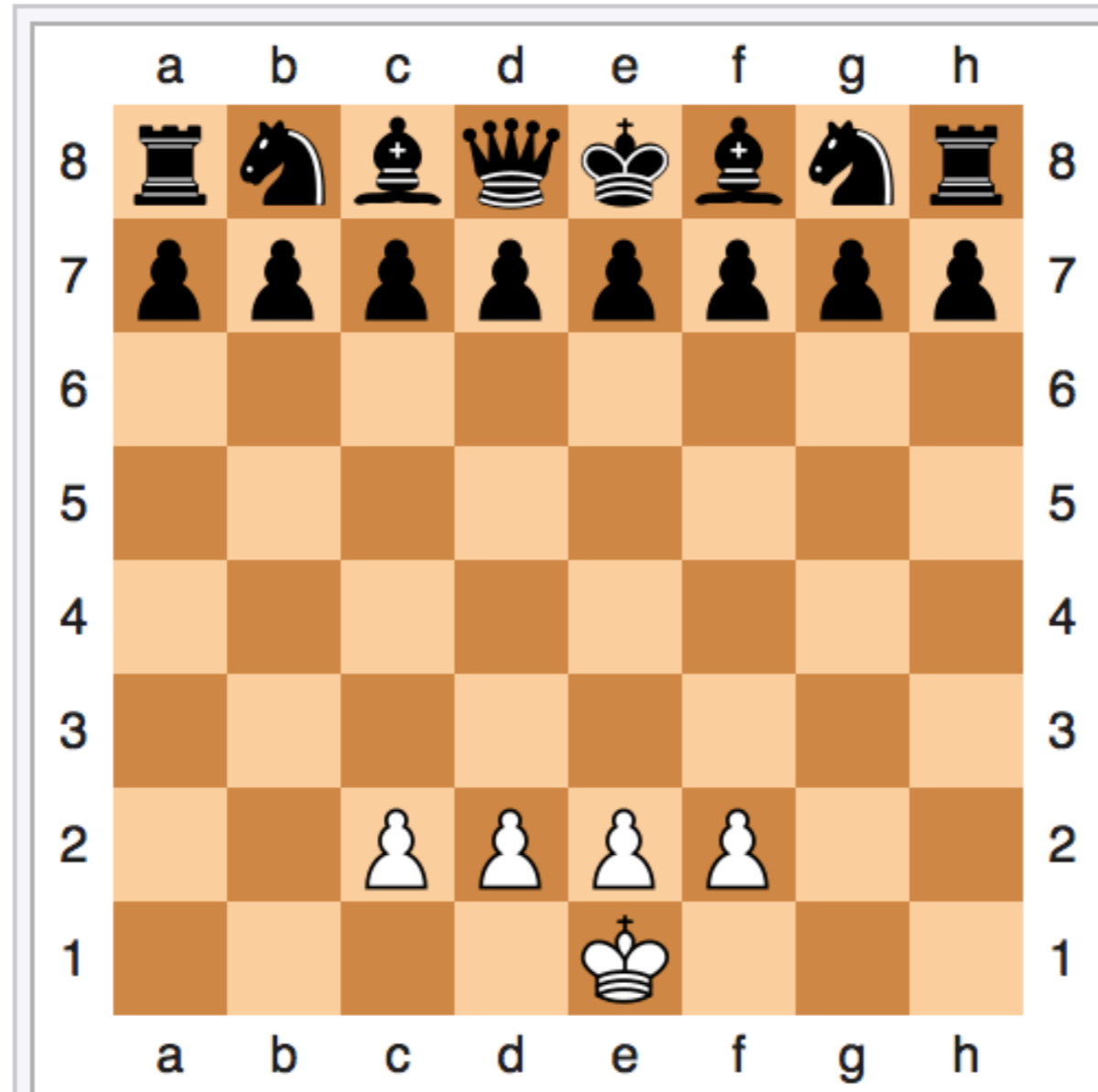
OODA solution: hack the saccades!

Lesson 5: You normally drive on the map, not on the territory. This fact can, and generally will, be used against you

6.

Problem: *You're playing white in a weird chess game with a severe material disadvantage, how do you even the odds?*
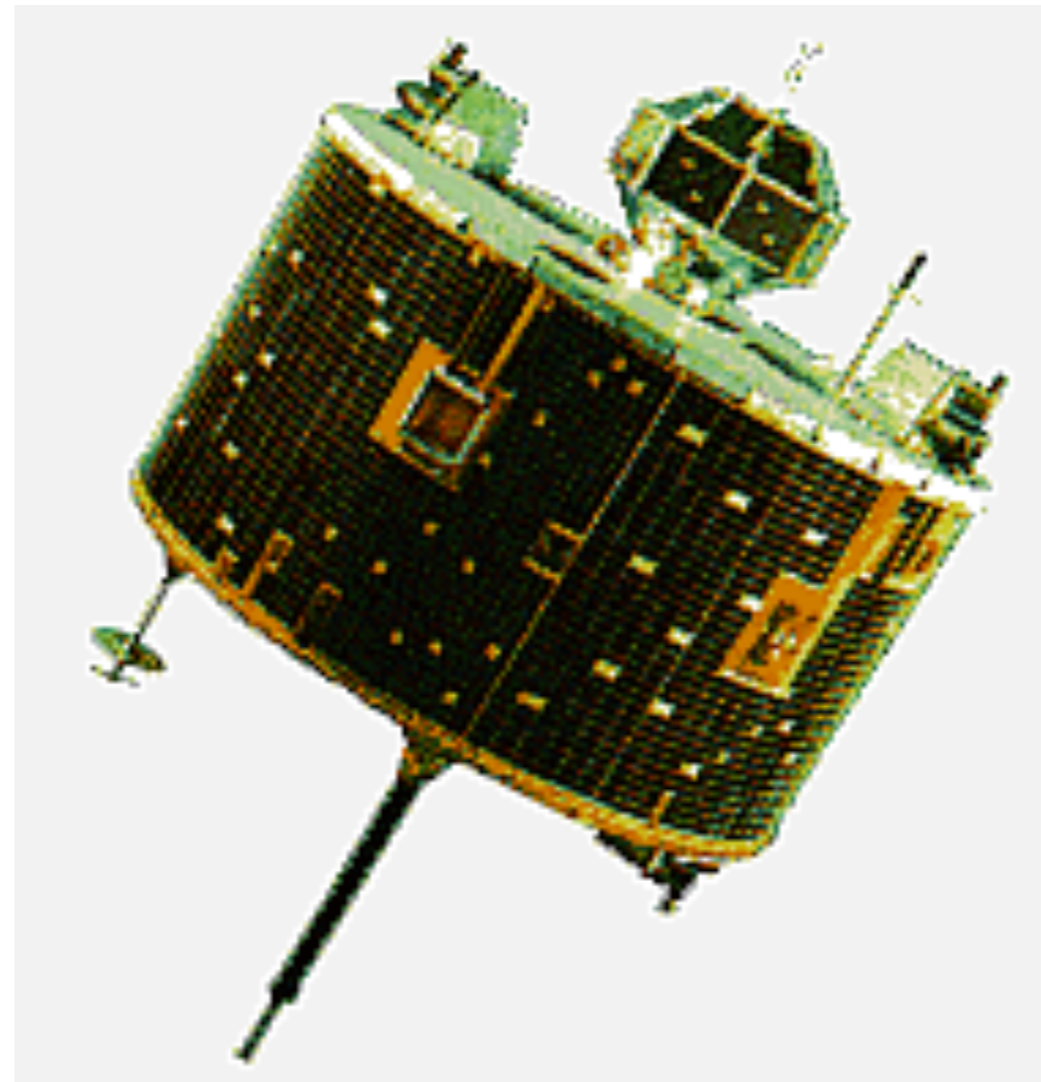
OODA solution: Move twice as fast!

**Monster chess**. White King can move twice (king-type) moves per turn.

Lesson 6: a tempo advantage can make up for a surprisingly heavy material or positional disadvantage… for a while.

7.

Problem: *Your lunar probe is in the wrong earth-moon orbit and doesn't have enough fuel to get into the planned lunar orbit*

OODA Solution: Exploit the chaos created by the sun in the earth-moon system
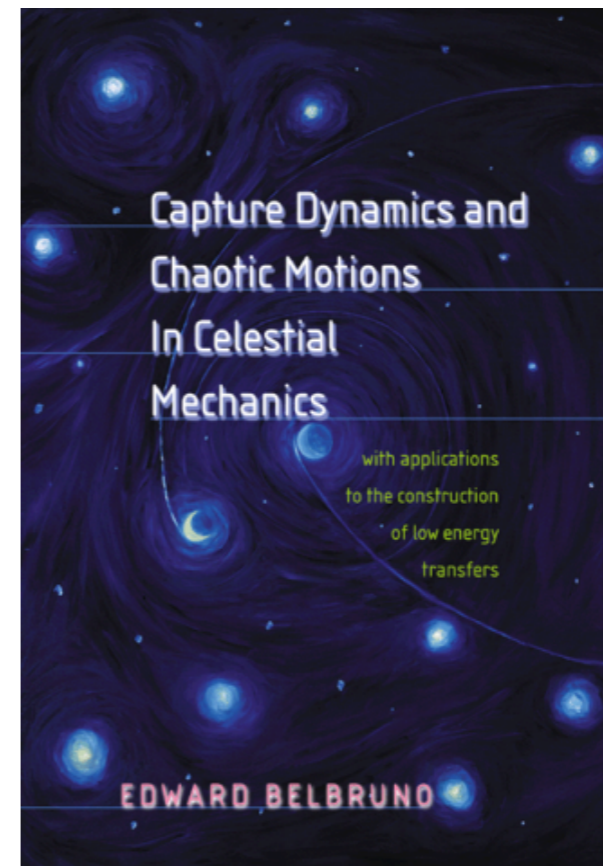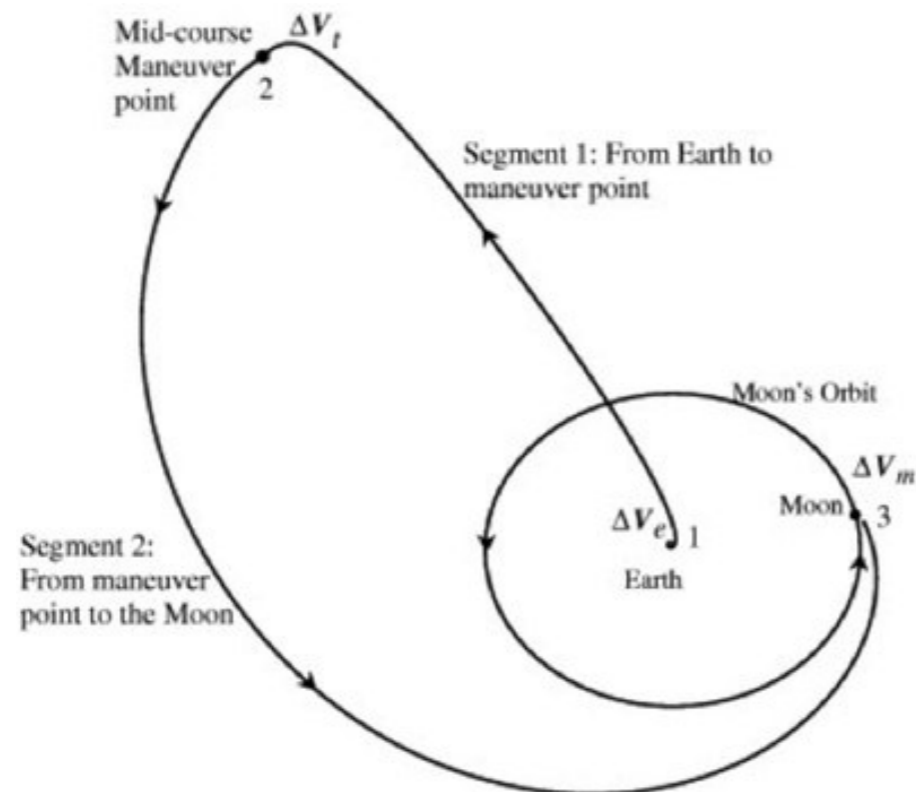
Sun-Perturbed Earth-to-Moon Transfers with Ballistic Capture

Edward A. Belbruno* and James K. Miller†

Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California 91109

A method is described for constructing a new type of low energy transfer trajectory from the Earth to the moon leading to ballistic capture. This is accomplished by utilizing the nonlinear Earth-moon-sun perturbations on a point mass in three dimensions. The interaction of the gravitational fields of the bodies defines transition regions in the position-velocity space where the dynamic effects on the point mass tend to balance. These are termed weak stability boundaries. The transfer is obtained by the use of trajectories connecting the weak stability boundaries. It uses approximately 18% less ΔV than the Hohmann transfer to insert a spacecraft into a circular orbit about the moon. The use of this transfer has recently been demonstrated by Japan's Hiten spacecraft, which arrived at the moon on October 2, 1991. Application of the transfer method is also made to the Lunar Observer Mission.
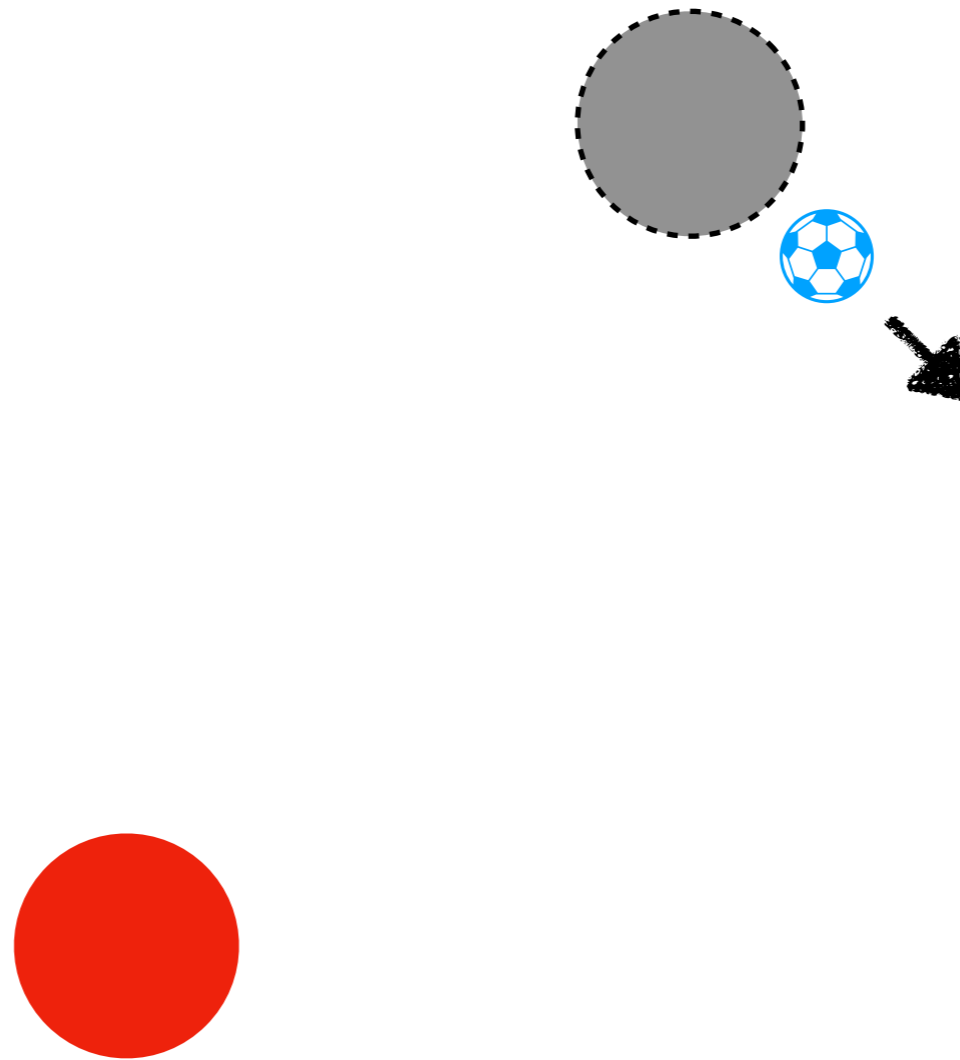
Lesson 7: the map is not the territory

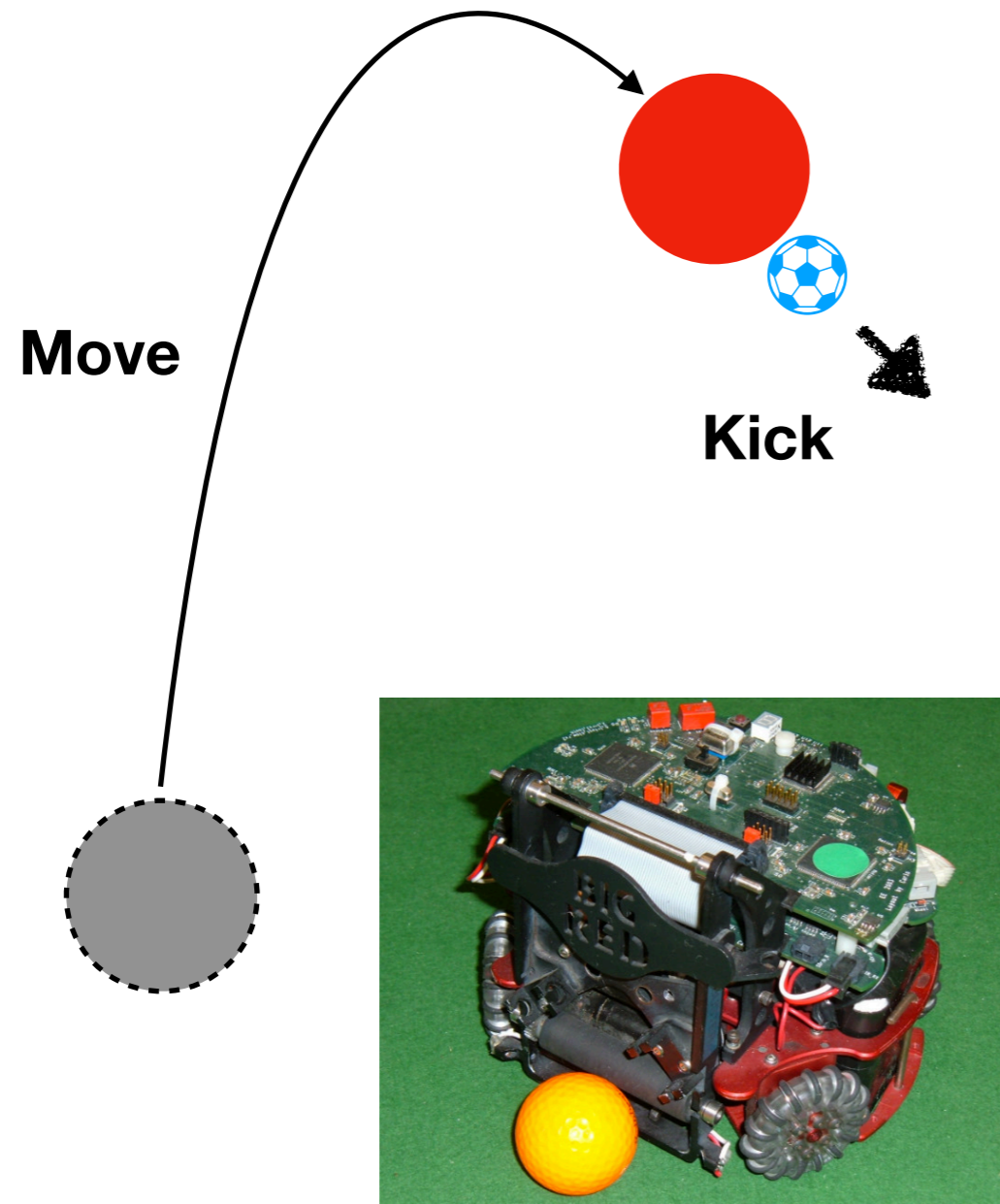**Lesson 8:** The right boundary is the one that "carves reality at the joints"

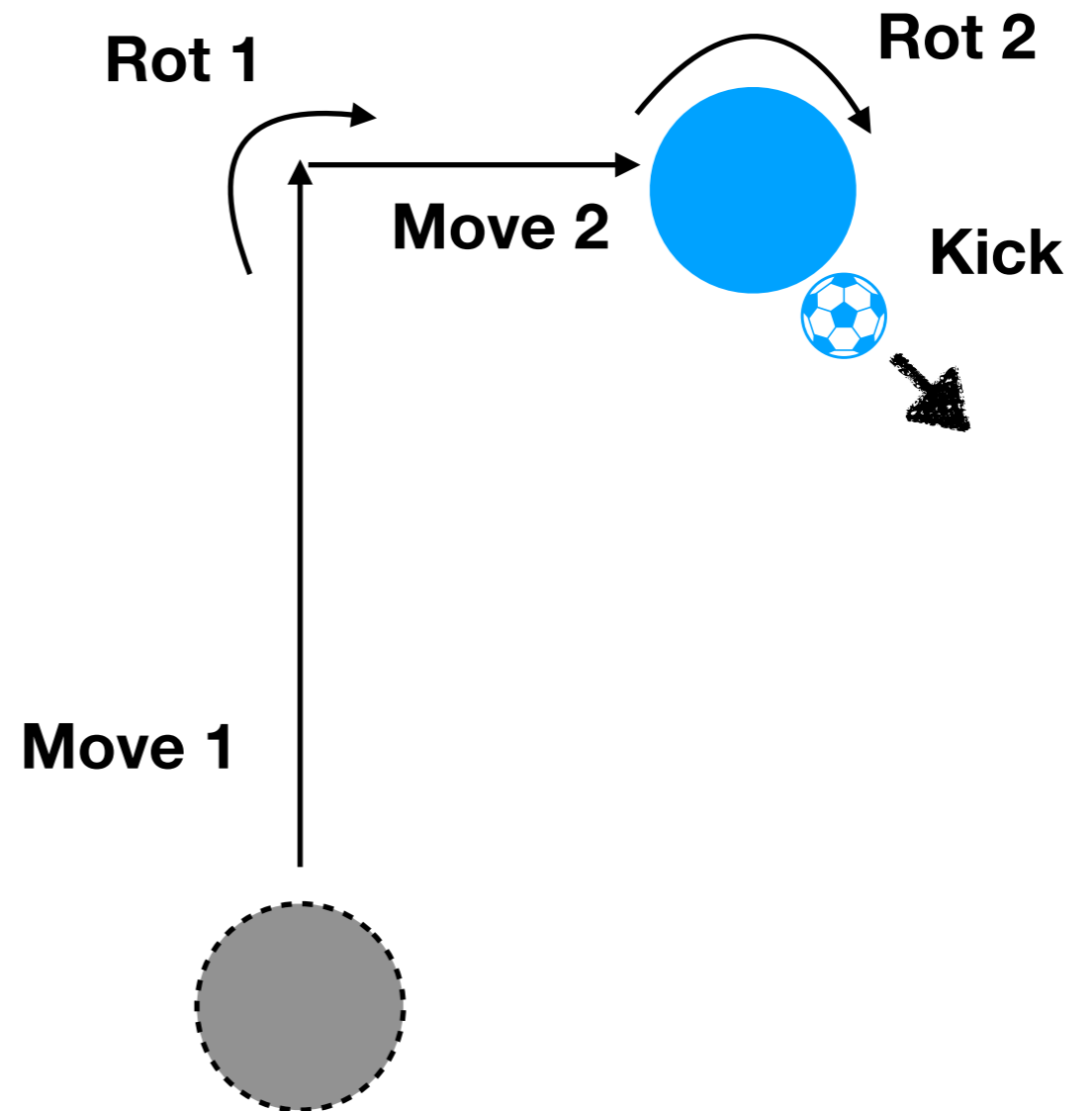**Lesson 9:** Chaos favors the superior orientation

8.

Problem: *You need to move to a new position and kick the ball towards the goal before the competition does*

OODA solution: Invent better moves than the competition

Move

Kick

Rot 1

Rot 2

Move 2

Kick

Move 1

Cornell omnidirectional drive with optimal-control maneuvering

Unidirectional drive with Manhattan grid maneuvering
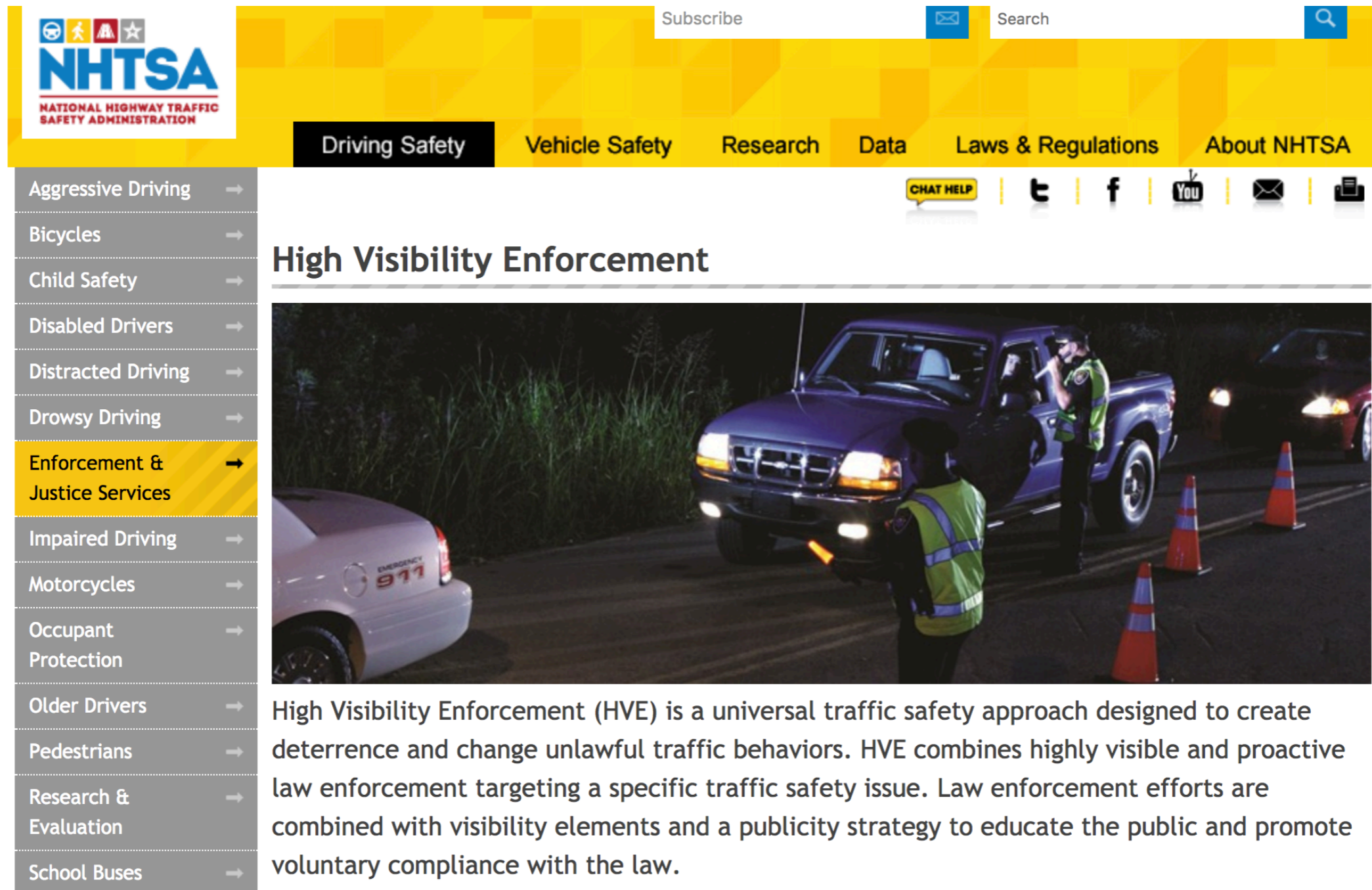
Lesson 10: Richer moves beats more moves

Lesson 11: Higher tempo with an inferior orientation loses to lower tempo with superior orientation

9.

Problem: *There are way more drivers than cops. How do you get drivers to obey the law?*

OODA solution: Loom menacingly so you look bigger than you are

High Visibility Enforcement

High Visibility Enforcement (HVE) is a universal traffic safety approach designed to create deterrence and change unlawful traffic behaviors. HVE combines highly visible and proactive law enforcement targeting a specific traffic safety issue. Law enforcement efforts are combined with visibility elements and a publicity strategy to educate the public and promote voluntary compliance with the law.

Lesson 12: People respond to perceptions, not realities, and having the initiative allows you to shape perceptions

10.

Problem: *It's 1967 and you're entering a supposedly "Golden Age" crony industry where everybody sucks, which of the gazillion parts of the playbook should you rewrite?*

1. Single aircraft type or heterogeneous fleets?
2. Short-hop or hub-spoke?
3. Peanuts or fancy full-service meals?
4. Many classes or a single class?
5. Assigned or non-assigned seating?
6. Fast or slow gate-turnaround time?
7. Customer experience first or employee experience first?
8. Stingy or generous baggage allowance?
9. Premium or budget pricing?

OODA solution: Compete with buses and cars, not other airlines!

1. **Single aircraft type** or heterogeneous fleets?
2. **Short-hop** or hub-spoke?
3. **Peanuts** or fancy full-service meals?
4. Many classes or a **single class**?
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Lesson 13: Superior orientation leads to superior goals, which makes all other decisions easy
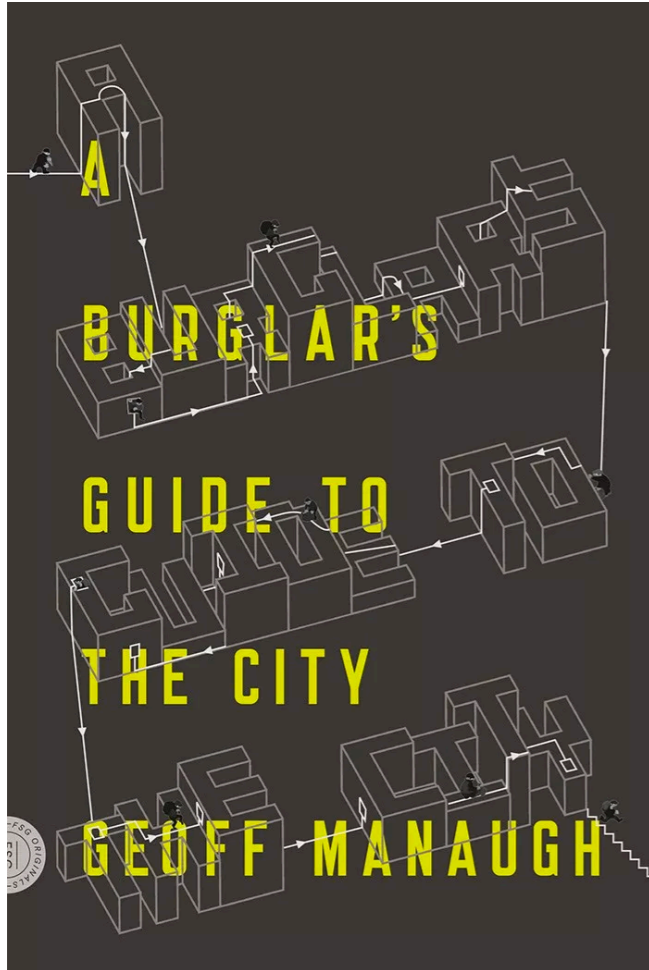
11.

Problem: *Hans Gruber has taken over your building and controls all exits, entries, and passageways*

OODA solution: Move through the ventilation ducts (Nakatomi Space!)

Worthy of particular emphasis is Weizman's reference to a technique called "walking through walls":

> Furthermore, soldiers used none of the streets, roads, alleys, or courtyards that constitute the syntax of the city, and none of the external doors, internal stairwells, and windows that constitute the order of buildings, but rather moved horizontally through party walls, and vertically through holes blasted in ceilings and floors.

http://www.bldgblog.com/2010/01/nakatomi-space/

Lesson 14: Just because it was designed for a purpose doesn't mean you must ONLY use it for that purpose

12.

Problem: *Your adversary has is dominant on all technological fronts and has perfect hive-mind situation awareness*
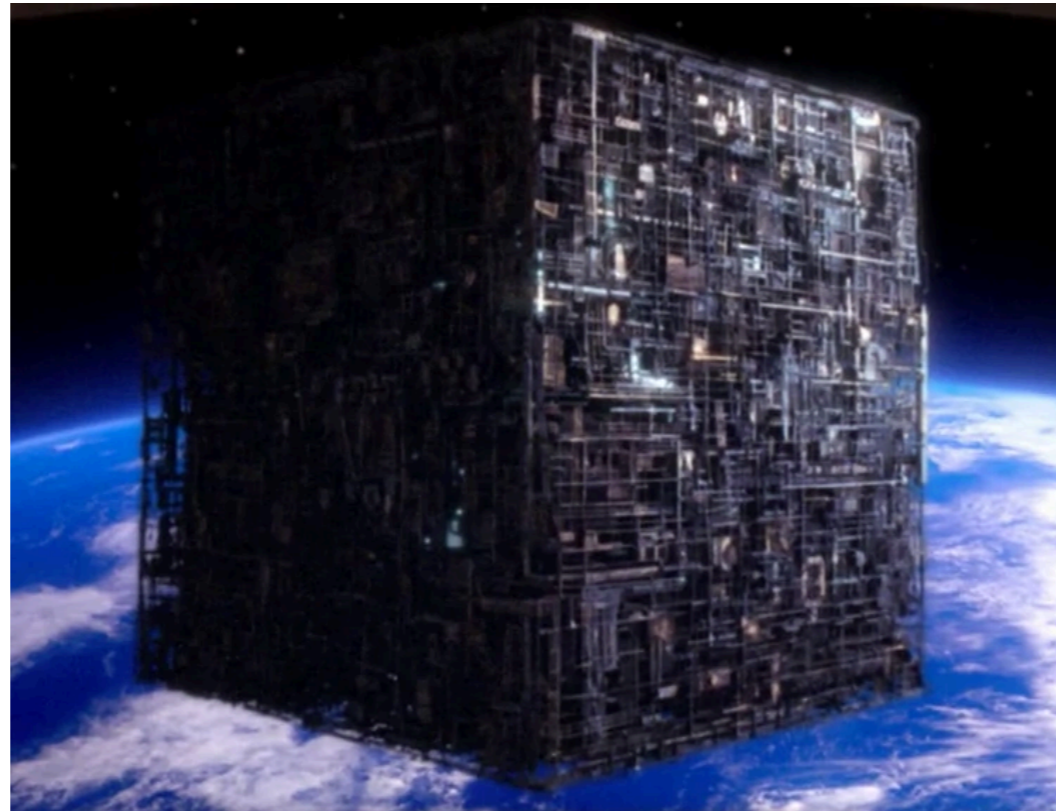
Millennium War Games to test Network-Centric Warfare

OODA solution: Fight low-tech

Lt .General Paul Van Riper

Red Team strategy: Radio silence, motorcycle couriers, swarm attack by fishing boats

Lesson 15: Don't attack where the adversary is already massively over-prepared

BONUS! 13

Problem: *What happens when you put the following together?*

Handlebars from a bicycle

Outboard motor from a boat

Caterpillar treads from a child's toy tank
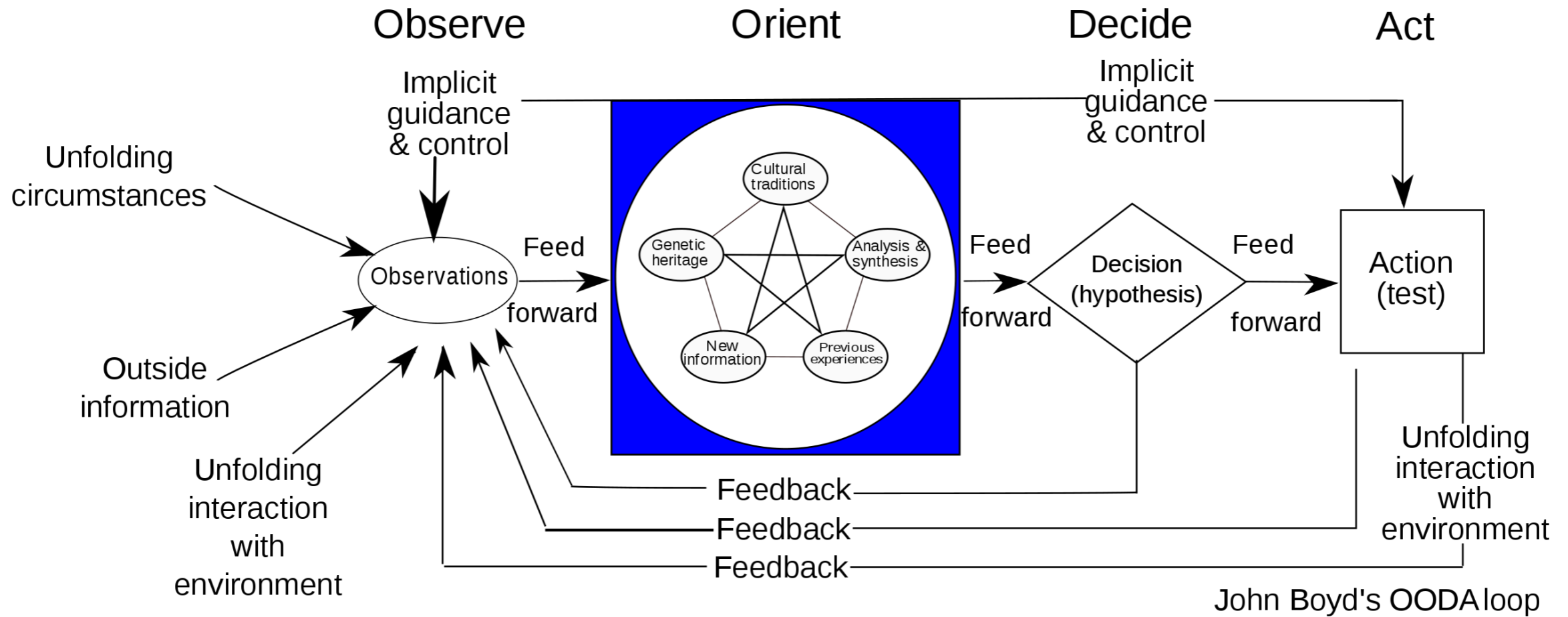
A pair of skis

Boyd's problem

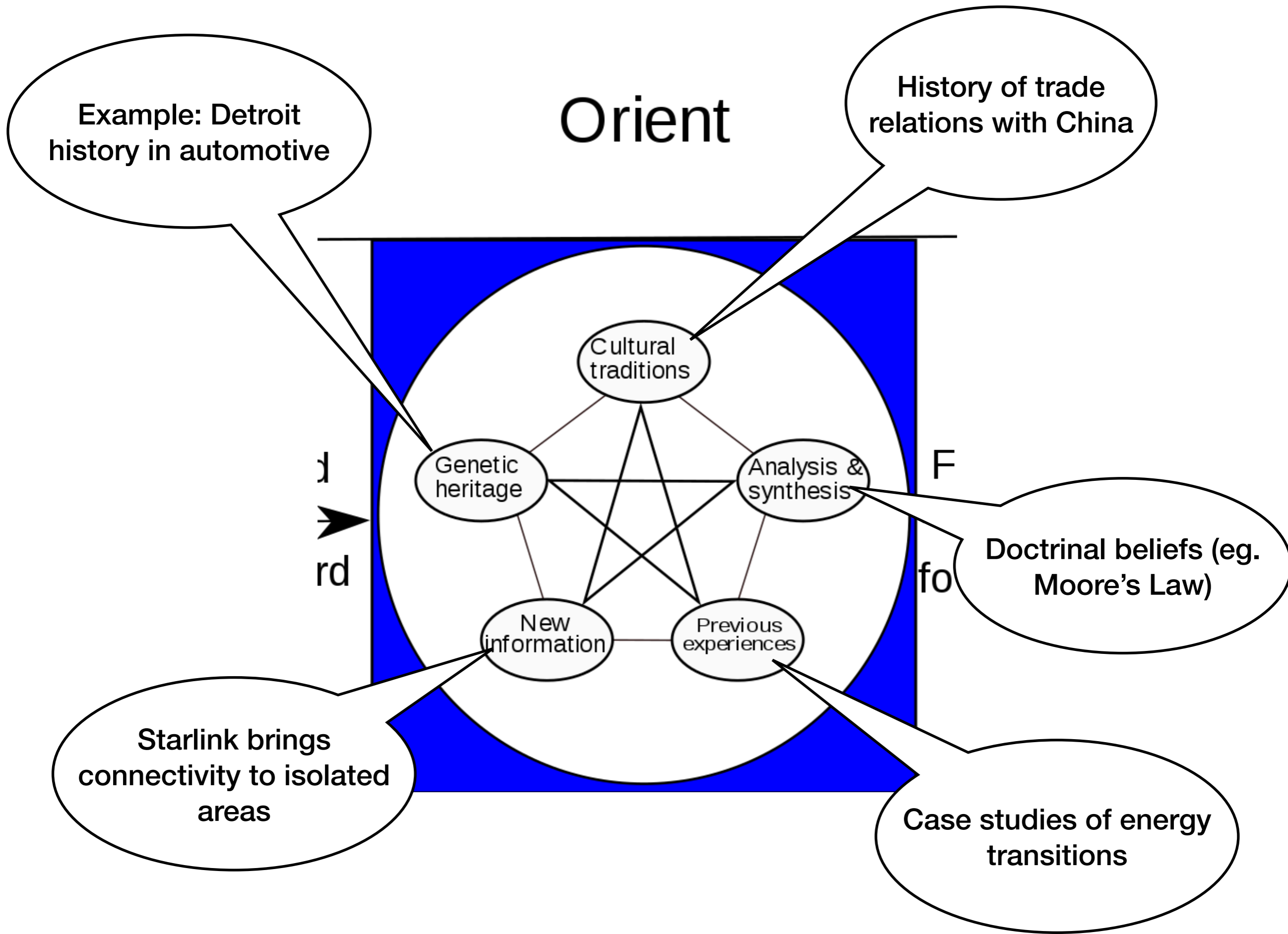# **OODA solution:** Snowmobile!

Boyd's Snowmobile

Lesson 16: Objects are not the same as their functions or behaviors

1. Maneuvering creates the equivalent of a resource advantage
2. You don't need much of a brain to run an OODA loop, only a reality signal
3. Just because you run the OODA loop, doesn't mean you own the OODA loop
4. The older parts of your brain are already wired for OODA. It's the newer parts that have some learning to do.
5. You normally drive on the map, not on the territory. This fact can, and generally will, be used against you
6. A tempo advantage can make up for a surprisingly heavy material or positional disadvantage… for a while
7. The map is not the territory
8. The right boundary is the one that "carves reality at the joints"
9. Chaos favors the superior orientation
10. Richer moves beats more moves
11. Higher tempo with an inferior orientation loses to lower tempo with superior orientation
12. People respond to perceptions, not realities, and having the initiative allows you to shape perceptions
13. Superior orientation leads to superior goals, which makes all other decisions easy
14. Just because it was designed for a purpose doesn't mean you must ONLY use it for that purpose
15. Don't attack where the adversary is already massively over prepared
16. Objects are not the same as their functions or behaviors

Observe Orient Decide Act

Implicit guidance & control

Unfolding circumstances

Observations

Feed forward

Cultural traditions

Genetic heritage

Analysis & synthesis

New information

Previous experiences

Feed forward

Decision (hypothesis)

Implicit guidance & control

Feed forward

Action (test)

Outside information

Unfolding interaction with environment

Feedback

Feedback

Feedback

Unfolding interaction with environment

John Boyd's OODA loop

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Orient

Example: Detroit history in automotive

History of trade relations with China

Doctrinal beliefs (eg. Moore's Law)

Starlink brings connectivity to isolated areas

Case studies of energy transitions

Cultural traditions

Genetic heritage

Analysis & synthesis

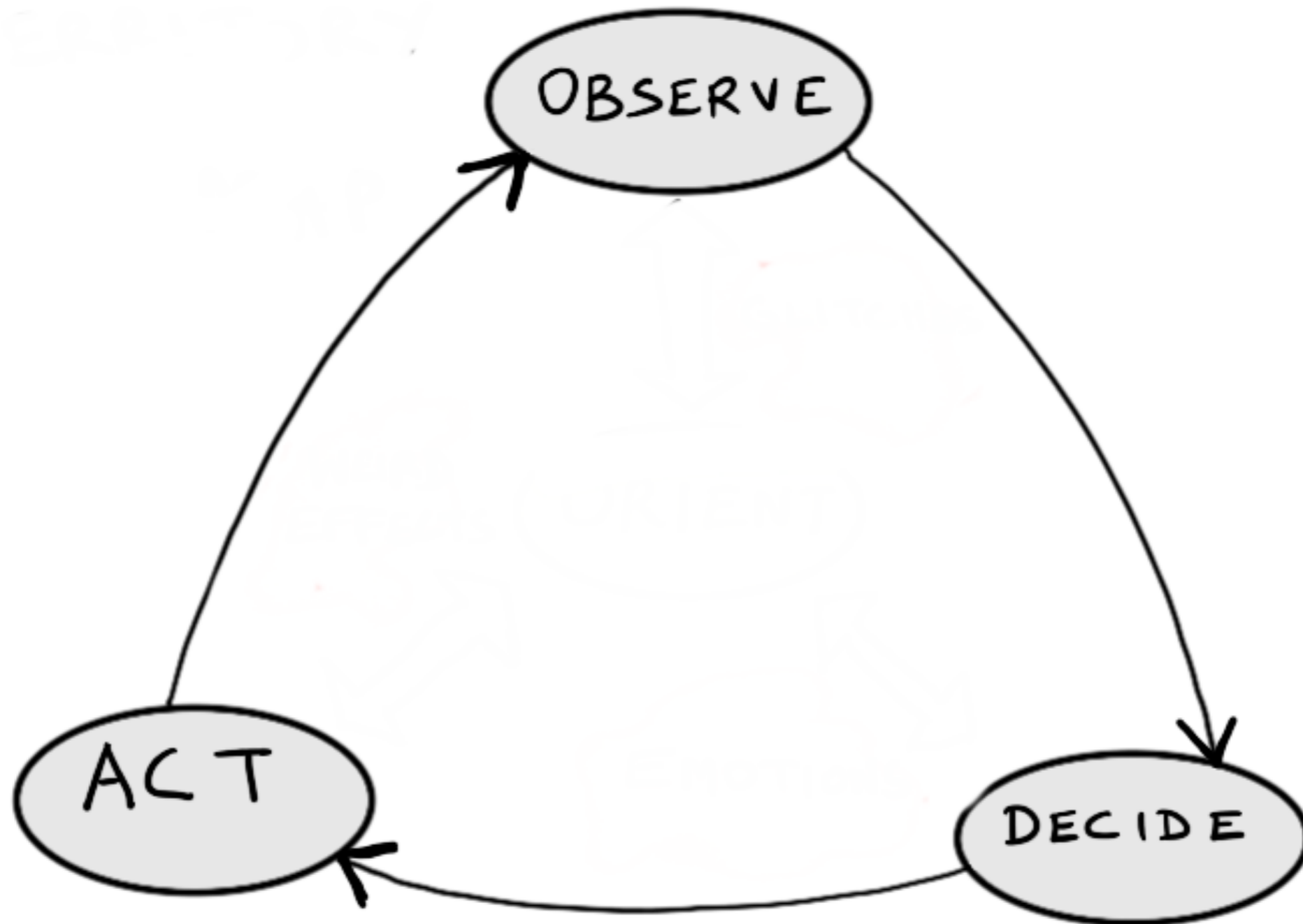New information

Previous experiences

Unpacking "Orientation"

"Head in the game"
Deepening, more fluid orientation,
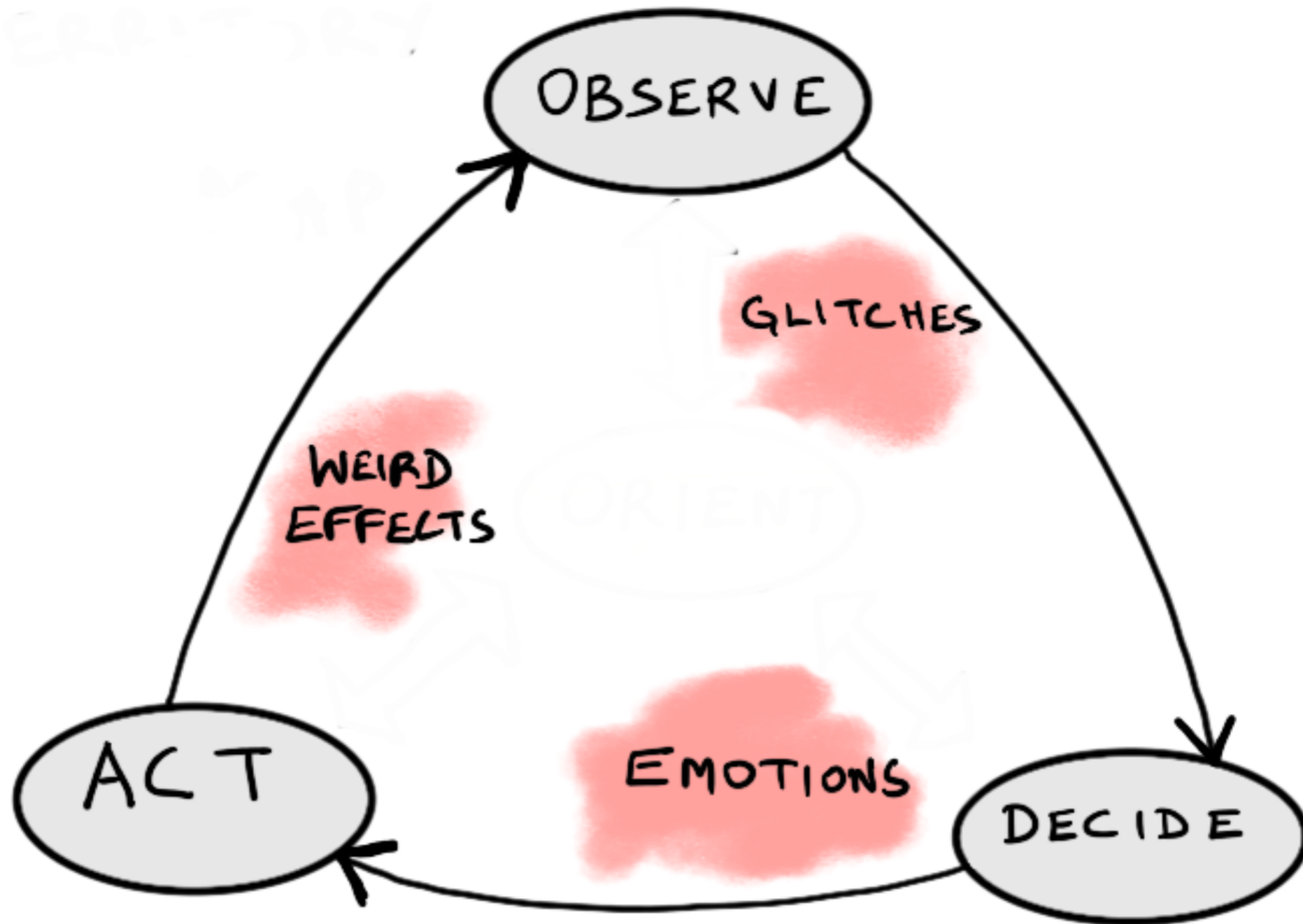faster transients, higher tempo

Territory orientation
Map orientation
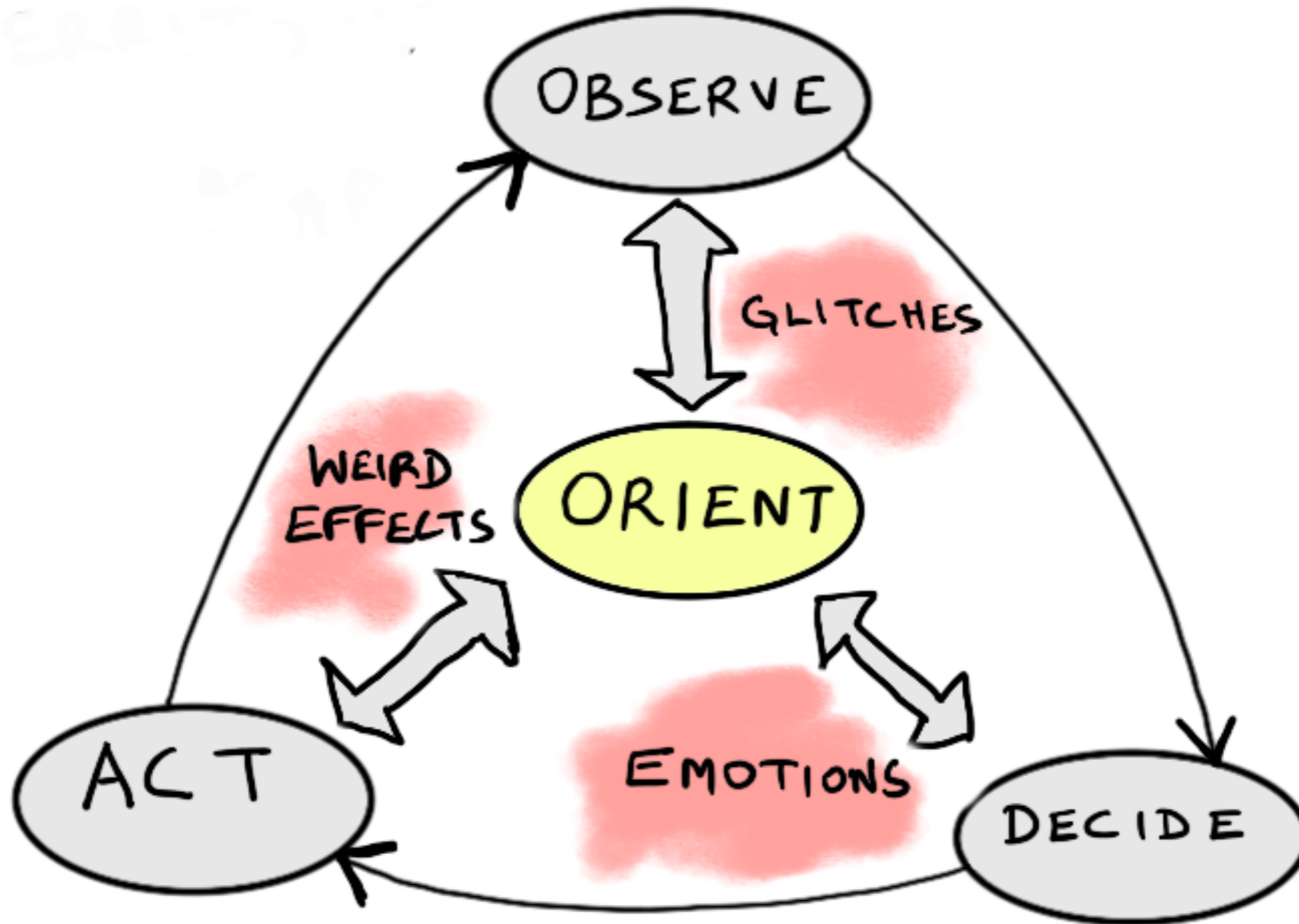Explicit orientation
Implicit orientation
Null orientation

Null orientation: wearing a "kick me sign"

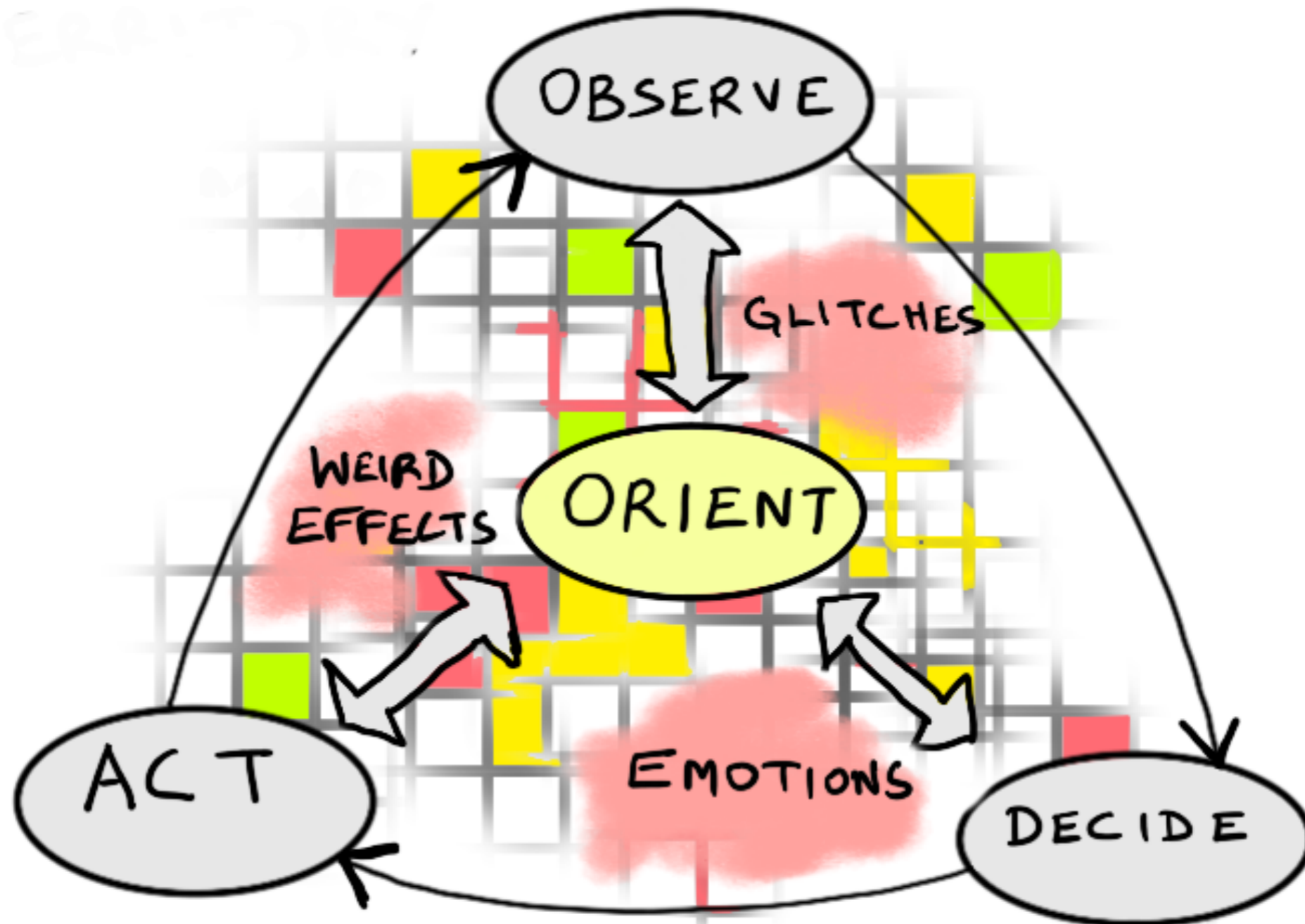**Implicit orientation**: Noticing deviations from "normalcy"

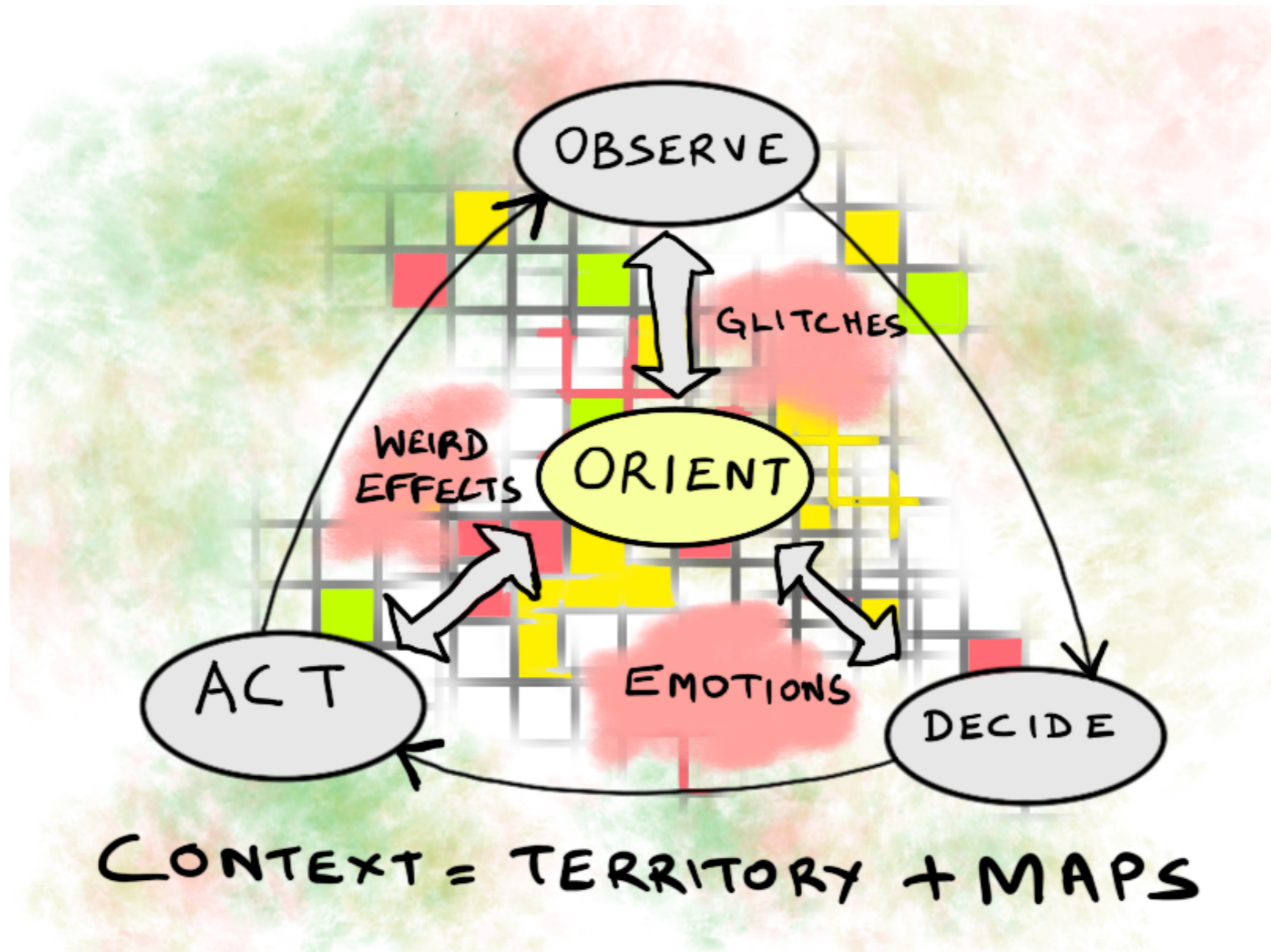**Explicit orientation**: Having models that can at least be wrong

Map orientation: Knowing how models are situated in environments

Territory awareness: Knowing when maps are going wrong

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"an **organizational climate** for **operational success**"

Blitzkrieg Model

OODA loop

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