08 · READING GUIDE

# COGNITION AND FEELING

Abstraction Under Constraint

### WHAT IS IT?

Investigates the hypothesis that feeling may function as a highly condensed form of operational abstraction, capable of guiding action efficiently under energy constraints — a solution that the TMC proposes may have been progressively shaped over the course of evolution.

The chapter examines how a finite cognitive organization can operate in a world that presents more differences than it can fully process, retain, or compare.

Under constraints of time, energy, and capacity, cognition transforms what it encounters through four operations: excluding, compressing, combining, and reconstructing. The result is not an impoverished copy of the world, but an architecture capable of preserving and producing differences that remain useful to its operation.

It is at this intermediate level — between the biophysics of matter and cognitive categories such as perception, memory, decision, and experience — that the TMC begins constructing its Architecture of the Middle.

### KEY INSIGHTS

**1. Intelligence Also Consists in Losing.**

To abstract is to leave differences behind without losing what must still continue to make a difference.

**2. A Present Response May Be Brief; Its Formation May Span a Trajectory.**

What now appears as recognition, urgency, or felt direction may result from an organization transformed by much earlier encounters. One second of response can carry years of formation.

### WHAT FOR?

To explain how selection, loss, compression, and reconstruction make it possible to operate with finite resources and, from this architecture, investigate whether thinking and feeling are as separable as our language often suggests.

### WHAT IS ITS EFFECT?

It shifts the question about intelligence from:

**“How much can a system process?”**

to:

**“What can it lose without losing what matters?”**

And it shifts the question about feeling from:

**“What is added to thought so that it is felt?”**

to:

**“How does a trajectory transform differences into relevance and direction for an entire organization?”**

### FOR WHOM / CONNECTIONS

- Neuroscience and cognitive science — selection, memory, bodily state, value, and integration.
- Philosophy of mind — thinking/feeling, function/phenomenality, and the philosophical zombie.
- Biology and evolution — cognitive operation under material and energy constraints.
- AI / AGI — abstraction, relevance, and the historical transformation of State, preparing its computational translation in Chapters 9–10.

### ROLE IN THE THESIS

Chapter 7 showed the unit that operates. Chapter 8 asks how that unit can operate when the world radically exceeds what it can carry.

It is this Architecture of the Middle that Chapter 8 begins to make explicit and that Chapters 9 and 10 will attempt to translate formally into engineering.

PATH THROUGH THE INVESTIGATION


01 ABSTRACT FEELING
02 INTEGRATION
03 CONSTRAINT
04 ABSTRACTION
05 TOPOLOGY I
06 TOPOLOGY II
07 STRATEGY
08 ARCHITECTURE




CHAPTER 08 · BLOCK 01

# 8.1 ABSTRACT FEELING

From Explicit Reconstruction to Felt Orientation

**WHAT IT IS**

Examines the relationship between felt orientation, explicit response, and work accumulated along a trajectory.

**QUESTIONS**

- What changes between calculating a danger and immediately feeling it?
- Can a rapid response carry years of trajectory?

**KEY INSIGHTS**

- The third person at the ledge may once have been the first.
- Time of formation and time of execution are not the same.

IN THIS BLOCK

8.1.1 THE BODY RECOILS BEFORE IT EXPLAINS

8.1.2 THE THIRD WAS ONCE THE FIRST

8.1.3 WHEN TRAJECTORY CHANGES HOW WE OPERATE

## 8.1 — ABSTRACT FEELING

*From Explicit Reconstruction to Felt Orientation*

## 8.1.1 — THE BODY RECOILS BEFORE IT EXPLAINS

Imagine three people standing at the same ledge on the tenth floor of a building. For simplicity, suppose they face the same risk. What differs is the path by which each arrives at the decision to step back.

1. The first looks at the building's height, estimates the distance to the ground, considers the acceleration of the fall and the strength of the wind. They examine the width of the ledge, sense the sway of their center of gravity, and calculate the probability of losing their balance. After thirty seconds, they conclude that remaining there is dangerous, feel fear, and step away.
2. The second looks down, recognizes how high up they are, and classify the situation as dangerous. They feel fear and step away in five seconds.
3. The third approaches the edge, feels fear, and recoils in less than a second. No calculation or concept appears in their experience. Continuing simply becomes difficult to do.

If the danger is immediate, which of them is more likely to survive?

Our intuition might choose the first. We are accustomed to imagining the mind as a calculator: the more detailed the representation, the more intelligent and precise the response. But while the first is still calculating and the second is recognizing, the third has already stepped back.

Which of them used more time, attention, and working memory? The first. Which spent the least time exposed to danger? The third.

These times are illustrative only. They are not experimental measurements and do not allow us to calculate directly the energy expenditure of each brain. Even so, they reveal an operational difference.

The first builds a causal model. The second condenses that model into a category: danger. In the third, not even the category needs to appear explicitly. The situation already presents itself as a felt direction: move away.

This does not mean that nothing was processed. Vision, balance, body position, earlier traces, and possibilities of falling continue to participate in the response. The difference is not between processing and not processing, but in how much of that processing must become explicit to guide action.

Fear loses almost the entire description of the event, but preserves what matters at that moment. It does not contain the physics of falling; it contains the fall's relevance to the I.

Experience can thus be understood not as a complete reproduction of reality, but as a condensed form through which certain differences acquire Weight and reorganize the entire unit.

> **Feeling is not an ornament added to thinking, nor a stage arising before or after it: in the TMC hypothesis, feeling is thinking in its efficient abstraction.**

### 8.1.2 — THE THIRD WAS ONCE THE FIRST

Perhaps we have presented three people when we could have presented just one at different moments in her trajectory.

If the first returns to the same ledge, they will probably not repeat every calculation. What once took thirty seconds may take only a few: they recognize the danger and step back. The past has been transformed into anticipation.

The same applies to the third. Their recoil may last less than a second and yet have begun years earlier. A child who fell from a piece of furniture need not remember the fall or formulate “I might fall” to hesitate the next time they climb.

This does not mean that complete reasoning is hidden inside fear. The trajectory need not preserve its reasons as a summarized archive; it may simply have transformed the organization that now perceives and decides.

**The present response may be brief in execution and long in formation:** experiences and reflections accumulated across an entire trajectory may participate in it.

The three people may therefore represent different regimes of an operation reorganized by trajectory. In the first, several relations still have to be reconstructed explicitly. In the second, they are condensed into “danger.” In the third, not even the word needs to appear: the situation already arrives as a felt direction.

These regimes do not form a hierarchy. Fear can be mistaken, preserve outdated responses, and demand renewed investigation. The third may need to become the first again.

### 8.1.3 — WHEN TRAJECTORY CHANGES HOW WE OPERATE

This also prevents us from calling the first response “pure thought.” They calculate height, wind, and balance, but the person doing the calculation already has a history, preferences, and a bodily state. They may hate mathematics, enjoy the wind on their face, and dislike the color of the ledge.

None of these need determine the result of the calculation, but all belong to the concrete organization performing it and may take part in how the situation is perceived, weighed, and faced.

These are not two parallel and independent operations, but processes integrated within the same unit. The calculation is abstract; the one who calculates is not.

A calculator operates in a closed environment on predefined inputs, applies formal relations according to specified rules, and produces a determined output.

This demonstrates that certain relations can be mechanized; it does not demonstrate that reproducing a calculation reproduces the entire operation of thinking, or the experience of performing it.

We operate in an open environment, do not receive inputs already carved out in advance, and do not produce deterministic responses: the organism itself participates in selecting, weighting, and interpreting what it encounters.

The tennis player makes this transition more visible. The beginner tracks foot position, force, and the ball's trajectory, experiencing distress during the process.

The experienced player has already incorporated many of these relations and can play without presenting them again as conscious instructions, feeling pleasure in the process.

For the experienced player, that pleasure may contribute to the motivation to play again; for the beginner, the discomfort of error and satisfaction of improvement may drive the attempt to overcome difficulties.

Remove feeling from the process and we would no longer have tennis matches.

**The expert has not stopped operating; the expert has stopped needing to reconstruct every operation explicitly.**

The TMC proposes that something similar may occur between thinking and feeling. What today requires explicit reconstruction may tomorrow appear as recognition and, later, participate in felt orientation.

This does not mean that feeling is compressed thought. It means that a trajectory can transform how perception, evaluation, orientation, and experience participate in present operation.

> **The third person at the ledge receives as felt direction what the first must still reconstruct as a relation. The one-second response may have taken an entire lifetime to form.**

CH 08 · BLOCK 02

# 8.2 INTEGRATION

Thinking and Feeling Under Empirical Scrutiny

## WHAT IT IS

Examines studies that link cognition and affective mechanisms while preserving the limits of the evidence.

## QUESTIONS

- Do cognition and affective processes operate separately?
- What do the studies demonstrate, and what do they not demonstrate?

## KEY INSIGHTS

- Perception, value, orientation, and memory can modulate one another.
- Functional integration does not demonstrate phenomenality.

IN THIS BLOCK

8.2.1 FROM OBJECT TO VALUE — Padoa-Schioppa & Assad, 2006

8.2.2 FROM BODY TO PERCEPTION — Garfinkel et al., 2014

8.2.3 FROM EVALUATION TO CHOICE — Bechara et al., 1997

8.2.4 FROM RELEVANCE TO MEMORY — Adolphs et al., 1997

8.2.5 FROM INDIVIDUAL EXPERIMENTS TO ARCHITECTURE — Luiz Pessoa

8.2.6 WHAT THE EXPERIMENTS, TAKEN TOGETHER, ALLOW US TO SAY

## 8.2 — INTEGRATION

*Thinking and Feeling Under Empirical Scrutiny*

The intuitive picture is simple: first we perceive, then we think rationally, and only afterward do feelings interfere with the operation. The experiments, however, reveal a less separated architecture.

The experiments do not find cold reason first, with emotion added afterward. In the processes studied, cognition and affective mechanisms jointly participate in shaping perception, choice, and what may guide future choices.

Thus, treating thinking and feeling as opposite and independent processes is not merely a didactic simplification: it may introduce an error of analysis from the outset, in both science and philosophy.

The philosophical zombie asks whether a physically and functionally identical organization could exist without subjective experience — while preserving even its affective and evaluative processes.

The following experiments put pressure on a simple separation between cognition and affect, but do not, by themselves, rule out that philosophical hypothesis.

In the TMC reading, this may be like trying to remove the applause while leaving intact the clapping of hands that produces it — or asking which of the two hands the sound belongs to.

We can separate them in language; it remains to be shown that they are separable in the occurrence itself.

The studies that follow are not treated as demonstrations of a single mechanism.

Each tests a different relationship relevant to the argument: whether differences can acquire value, whether internal state modifies perception, whether orientation can precede its explanation, and whether relevance can alter what is recorded.

The question is whether these independent findings converge on an architecture compatible or incompatible with the initial separation.

### 8.2.1 — FROM OBJECT TO VALUE — Padoa-Schioppa & Assad, 2006

*The Object Does Not Carry Its Value Within It*

Monkeys chose between different quantities of beverages. Neurons in the orbitofrontal cortex tracked the relative value of the options, rather than merely their physical properties or position.

> **For the thinking–feeling thesis:** choice does not operate only on neutral information. What is thought about may already arrive differentiated by the value it holds for the organism.

**Limit:** *neural value does not demonstrate felt experience.*

### 8.2.2 — FROM BODY TO PERCEPTION — Garfinkel et al., 2014

*What Is Outside Encounters What Is Already Inside*

Fearful faces were presented at different phases of the heartbeat. The same faces were perceived as more intense during systole.

> **For the thinking–feeling thesis:** there is not first a neutral perception upon which the organism's state acts only afterward. Bodily state already participates in what will be perceived and, therefore, in the material on which thought will operate.

**Limit:** *bodily modulation of perception does not demonstrate felt fear.*

### 8.2.3 — FROM EVALUATION TO CHOICE — Bechara et al., 1997

*Being Guided Before Knowing How to Explain*

In a card game, participants began avoiding disadvantageous choices and showed anticipatory autonomic signals before they could consciously explain the rule.

> **For the thinking–feeling thesis:** orientation does not always depend on an explicitly formulated reason coming first. Evaluative and bodily processes may participate in a choice before a person can put that orientation into declared thought.

**Limit:** *an autonomic signal does not, by itself, demonstrate felt experience.*

## 8.2.4 — FROM RELEVANCE TO MEMORY — Adolphs et al., 1997

*What Matters Can Leave a Different Trace*

Emotionally relevant content showed a memory advantage in participants without bilateral amygdala damage; that advantage was impaired in patients with those lesions.

> **For the thinking–feeling thesis:** the affective dimension does not appear only after thought, as a reaction to what has already occurred. Affective relevance participates in what will be retained and thus helps shape the material on which future thoughts may operate.

**Limit:** *emotionally enhanced memory does not demonstrate phenomenality.*

## 8.2.5 — FROM INDIVIDUAL EXPERIMENTS TO ARCHITECTURE — Luiz Pessoa

*The Boundary Between Reason and Emotion Does Not Appear in the Architecture Either*

Luiz Pessoa is a professor of psychology at the University of Maryland, holds a doctorate in computational neuroscience, and researches interactions among cognition, emotion, and motivation.

By bringing together behavioral, neuropsychological, anatomical, and neuroimaging evidence, Pessoa synthesizes a picture that does not correspond to a simple division between a “cognitive” system and an “emotional” one. His proposal is that these processes depend on distributed, overlapping, dynamic networks that integrate information across different brain regions.

> **In the TMC:** the preceding experiments show this integration in particular operations; network neuroscience shows that brain architecture itself is not organized around a simple boundary between cognition and emotion. Separating thought and emotion for study does not mean that the organism produces them separately.

### 8.2.6 — WHAT THE EXPERIMENTS, TAKEN TOGETHER, ALLOW US TO SAY

- Padoa-Schioppa: a difference can acquire Weight for the organization.
- Garfinkel: internal state participates in how that difference is perceived.
- Bechara: differences in Weight can incline orientation before conscious explanation.
- Adolphs: what becomes relevant can modify the record.
- Pessoa: these operations are not organized around a simple boundary between reason and emotion.

The intuitive sequence — object → neutral perception → reason → feeling — gives way to another dynamic:

difference → Weight → situated perception → orientation → record → new encounter.

> **The world changes the organization; the organization changes how the next world will be encountered.**

If these dimensions are causally intertwined in the organism, on what grounds do we assume that feeling could be removed without altering the operation?

At this level, the evidence is positive: in the processes examined, thinking and the affective dimension of the operation do not appear as independent systems, but as causally integrated and reciprocally modulated processes. It is in this functional sense that the TMC states that thinking and feeling are intrinsic to one another.

The TMC proposes to investigate the next step: whether, in sentient systems, this integrated operation and its experiential dimension are two events or two descriptions of the same event. Is there an operational and functional reason why thinking and feeling have become organized in this way?

CH 08 · BLOCK 03

# 8.3 CONSTRAINT

The Cost of a Finite Mind

### WHAT IT IS

Examines metabolic costs, processing limits, and the potential advantages of selection and loss.

### QUESTIONS

- What does it cost to retain, process, and retrieve information?
- When can losing a capacity be adaptive?

### KEY INSIGHTS

- The operation was already underway before the visible task.
- Under certain conditions, retaining less may allow better operation.

IN THIS BLOCK

8.3.1 THE COUNTERINTUITIVE COST OF THE MIND

8.3.2 THE BRAIN IS EXPENSIVE: WHY SELECT INSTEAD OF PROCESSING EVERYTHING?

8.3.3 INTELLIGENCE ALSO CONSISTS IN LOSING

8.3.4 WHEN BEING WRONG CAN BE RIGHT

### 8.3 — CONSTRAINT

*The Cost of a Finite Mind*

## 8.3.1 — THE COUNTERINTUITIVE COST OF THE MIND

*Does Experience Carry a Cognitive Cost?*

Thinking consumes resources, but not like a machine that simply "uses more the harder it works." The first counterintuitive finding is that the brain already maintains a high metabolic cost even before a task begins. Task-directed activity does not start from zero: it reorganizes an operation already underway.

Haier and colleagues (1992) showed a second, even more surprising result. After weeks of practicing Tetris, participants played much better while regional glucose metabolism decreased in the areas examined. What had previously required step-by-step reconstruction could later be performed with lower local demand.

This is precisely the difference suggested by the ledge: a brief response in the present can carry the accumulated work of a much longer trajectory and still require less local energy at that moment. Performing better can cost less at that time because part of the work of organization has already taken place during learning.

Marcus Raichle and colleagues revealed a third counterintuitive finding. In the so-called resting state, the awake brain remains metabolically active, and some networks even reduce their activity when an externally directed task begins.

This does not mean that remaining still necessarily consumes more energy than acting. It means something more important: the absence of external action is not the absence of internal operation. Even when no response is visible, the brain can reconstruct past experiences, generate spontaneous thought, and simulate future possibilities.

The organism, therefore, need not wait for the next ledge before beginning to prepare the conditions with which it will encounter it.

The three findings form a single sequence:

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> **First:** the operation does not begin when the task appears; the brain was already at work.

> **Second:** after learning, performing better may require lower local demand because the trajectory has reorganized the operation.

> **Third:** even without external action, internal work may continue modifying the conditions of future responses.

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These three points converge with a central proposition of the TMC: the cost of an operation cannot be located solely in the instant when we observe its execution. The work is distributed across the trajectory.

The snapshot shows the second of the response; the trajectory shows the work that made that second possible.

### 8.3.2 — THE BRAIN IS EXPENSIVE: WHY SELECT INSTEAD OF PROCESSING EVERYTHING?

The adult human brain accounts for **about 2% of body mass**, yet consumes approximately one-fifth of the body's energy at rest, operating continuously at a power of roughly 15 to 20 W. This figure proves neither consciousness nor feeling. It shows something more basic: processing, integrating, transmitting, and maintaining information has a cost.

The cost becomes even clearer in childhood. While the brain is being intensively built and reorganized, it consumes an extraordinary share of the body's energy.

Between ages four and five, this consumption can reach **about 43% of a child's daily energy expenditure** — nearly half of all the energy used that day — precisely during a period when physical growth slows (Kuzawa et al., 2014).

Thus, the organism may slow its own growth just as energy investment in the brain reaches its childhood peak.

Over the course of human evolution, supporting a larger number of neurons also required changes in the lineage's energy economy. Comparisons with other great apes indicate that humans evolved a higher daily metabolic budget, capable of supporting, among other demands, a more expensive brain (Pontzer et al., 2016). The mind was not built outside energy constraints; its architecture formed within them.

And the cost is not merely that of keeping the brain alive. Thinking also costs energy because neurons must send signals to one another and combine information to produce a response (Attwell & Laughlin, 2001; Howarth et al., 2012).

But **an expensive brain remains a limited brain**. It cannot represent every difference in the environment, compare every possibility, retain every detail, and only then decide. Neurobiology itself reveals economy strategies: selective activity, limited connectivity, and efficient, sparse coding (Attwell & Laughlin, 2001; Lennie, 2003).

The question then changes direction. If processing everything is impossible, the problem of intelligence ceases to be only how much a system can process and becomes what it can leave unprocessed without losing what matters.

Here constraint meets the TMC thesis. A limited organism must select differences, assign priorities, preserve some traces, and abandon others. Choosing, in this sense, is not merely deciding between two actions: it begins earlier, with what will receive attention, Weight, memory, and the possibility of guiding action.

> **The gain is not maximum fidelity to the world. It is more useful guidance per unit of available time, energy, and capacity.**

> **Perhaps biological intelligence did not prevail by processing more and more of the world, but by learning which parts of the world it did not need to process.**

This does not yet explain feeling. But it creates the question that feeling will have to answer:

if the organism must continually determine what matters, what role does feeling — the fact that some experiences already arrive with direction, Weight, or urgency for the organization — play in that selection?

## 8.3.3 — INTELLIGENCE ALSO CONSISTS IN LOSING

*To Evolve Is Not to Accumulate Everything*

If a limited organism cannot process everything, a less intuitive consequence follows: **adaptation does not necessarily mean acquiring ever more capacities. Sometimes, losing is advantageous.**

> The fish Astyanax mexicanus offers an extreme case. Populations living permanently in dark caves have lost their eyes and reduced brain structures associated with vision.
>
> In surface-dwelling fish, maintaining eyes and the visual system can consume a substantial share of metabolism — reaching about 15% in the juveniles studied.
>
> Where there is no light, maintaining that system no longer provided the same return on its cost (Moran, Softley & Warrant, 2015).

But losing does not have to mean eliminating an entire capacity. In mice subjected to food restriction, Padamsey and colleagues observed that the visual cortex reduced its energy expenditure while preserving its overall ability to respond to stimuli, **but sacrificing some of the precision with which visual information was encoded**.

> The principle appears even more directly in memory. In Drosophila, Plaçais and Preat showed that, during food deprivation, the brain specifically suppresses formation of metabolically costly long-term aversive memory.
>
> When that memory was experimentally forced, survival under scarcity decreased.
>
> In the TMC, this result is treated as evidence of a trade-off between memory and energy, without generalizing it to every form of memory.

The three cases show different degrees of the same logic: a structure can disappear, a representation can lose precision, or a memory may not be consolidated. In all three, “more information” or “more capacity” is not automatically better.

For the TMC, the point is precise: **loss is functional only when what remains is still enough to guide the operation**. A reduction that removes the decisive difference is a failure; one that removes dispensable details while preserving useful relationships can be an economy. This is

also the rule that survived the audit of studies on selection and compression.

> **Intelligence, therefore, does not consist solely in acquiring, retaining, and processing. It may also consist in knowing — biologically, without any subject consciously deliberating about it — what can cease to be maintained.**

And then the next question arises:

if loss can be advantageous, how does a mind lose information without losing what it will need in order to act?

## 8.3.4 — WHEN BEING WRONG CAN BE RIGHT

*Error Depends on the Cost of Being Wrong*

Every simplification accepts some risk of error. If the system leaves details aside in order to respond faster, it will sometimes confuse different situations. But this does not mean the strategy has failed.

Imagine a fire alarm that goes off ten times. Nine times there is only cooking smoke; the tenth time, there is a real fire.

If the cost of nine false alarms is small and the cost of ignoring the single fire would be losing the house, the system misidentified the situation nine times and yet its strategy may have worked on all ten occasions for what it actually needed to preserve.

The same principle applies to an organism under uncertainty. Waiting for perfect information may reduce false alarms but increase the risk of acting too late. **The best system is not necessarily the one that makes the fewest mistakes; it is the one that avoids the costliest mistakes.**

What this corroborates in the TMC: compression and selection need not produce a faithful snapshot of the world. They need to produce guidance that is good enough for the continuity of the instance. A perceptual error can be an error of description and, at the same time, a success of strategy.

> **For this reason, information loss can only be evaluated in relation to what was at stake. The question ceases to be merely "is this correct?" and also becomes "what is the cost of being wrong in one direction rather than the other?"**

> **This is where compression enters.**



CH 08 · BLOCK 04

# 8.4 ABSTRACTION

Reduce, Select, and Give Direction

**WHAT IT IS**

Distinguishes abstraction, compression, and selective delineation, leading to the question of how feeling acquires direction.

**QUESTIONS**

- What is the difference between abstracting and compressing?
- How does a reduction come to guide an operation?

**KEY INSIGHTS**

- Every input is a selective delineation of the world, not the whole world.
- The question of feeling arises when reduction acquires direction for the organization.

IN THIS BLOCK

8.4.1 DO NOT CONFUSE ABSTRACTION WITH COMPRESSION

8.4.2 COMPRESS TO MAKE OPERATION POSSIBLE

8.4.3 THE TIP OF A PIN: NO ACT OF ACCESS TAKES IN THE WHOLE WORLD

8.4.4 ABSTRACTING AND FEELING: WHEN REDUCTION ACQUIRES DIRECTION

## 8.4 — ABSTRACTION

*Reducing Strategically*

### 8.4.1 — DO NOT CONFUSE ABSTRACTION WITH COMPRESSION

> **Abstraction and compression are not synonyms. Compression can be part of abstraction, but abstraction can also exclude, combine, or reconstruct differences.**

To compress is to condense: to make much remain operable through less. To abstract is to transform differences into operable configurations according to their relevance to the organization. It can reduce, relate, or reconstruct, without requiring all these operations to occur together.

This distinction will matter later. Saying that feeling participates in efficient abstraction does not mean that feeling is simply compressed thought. The point is not merely to reduce the operation, but to transform what must remain to guide action.

### 8.4.2 — COMPRESS TO MAKE OPERATION POSSIBLE

*When Less Information Allows Better Operation*

If an organism cannot process everything, reducing complexity can cease to be a limitation and become a solution. But there is a condition: losing details without losing what still makes a difference for action.

> **Ho and colleagues (2022)** demonstrated this in planning tasks. Faced with mazes containing multiple obstacles, participants prioritized those relevant to reaching the goal and simplified the rest. Planning became more manageable when the representation retained only what mattered for the route. But if a discarded detail later became relevant, performance suffered.

> **What this corroborates in the TMC:** a representation does not need to be complete to be useful. It can lose details and still guide action more effectively, provided it preserves the differences that can actually change what will be done.

> **Leong and colleagues** found a similar logic in learning. The stimuli varied simultaneously in color, shape, and texture, but at each stage of the task, only one of these features — for example, color — indicated which choice was more likely to yield a reward.
>
> Participants learned to focus on that feature and leave the others in the background.
>
> When the rule changed and another feature became relevant, however, the same filter could generate errors until it was updated.
>
> **What this corroborates in the TMC:** reducing information requires a criterion of relevance. What matters guides what receives processing; when what matters changes, selection must change too.

> **Gigerenzer and colleagues** took this logic further: in uncertain and noisy environments, strategies that consider only a few cues can, under certain conditions, predict better than models that combine all available information. More information can also mean more noise and poorer generalization. Yet oversimplification also fails when several cues are needed.
>
> **What this corroborates in the TMC:** more information does not necessarily mean more intelligence. Under certain conditions, operating well depends precisely on knowing when to stop searching and which differences can be left out without losing direction.

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**Ho:** shows that it is possible to represent less and plan better.

**Leong:** shows that this reduction depends on relevance.

**Gigerenzer:** shows that more information can even worsen a decision.

The principle, therefore, is not simply **“less is more”**:

> **less can be better when what disappears costs more than it contributes to guidance.**

For the TMC, the mind does not need to construct a complete snapshot of the world. **It needs to preserve the differences capable of changing what it will do next.**

To compress is to reduce. When that reduction is guided by a criterion of relevance — preserving what must continue to make a difference — compression becomes part of abstraction.

> The next question becomes unavoidable: **how can a system select, abstract, compress, and forget without eliminating precisely what may matter later?**

> None of this demonstrates phenomenal experience. It reveals the prior functional problem: **a finite mind can operate only because it does not carry the entire world with it.**

### 8.4.3 — THE TIP OF A PIN: NO ACT OF ACCESS TAKES IN THE WHOLE WORLD

Look at the tip of a pin. It seems like a simple, small, perfectly delimited object. Yet it contains an immense number of atoms and can be observed at different scales, from different angles, at different temperatures, under different lighting, and at different moments. **The object is finite; the ways of encountering and investigating it are practically inexhaustible.**

We could surround it with cameras, microscopes, spectrometers, and every available instrument. We would obtain ever more precise images, measurements, and records. Yet none of them would be the pin’s tip in its entirety. They would always be ways of accessing it.

Kant placed this limit at the heart of philosophy by distinguishing what appears to us from what he called the “thing in itself” (Ding an sich): we do not know the thing as it would be independently of the conditions

through which we can know it; we know the phenomenon — that is, what can appear to us. The TMC need not adopt Kant's entire philosophical system to retain this caution.

Before asking how the mind abstracts, then, there is a prior limit: no organization receives the whole world. It receives what, in that encounter, was able to make a difference to it. When we give something a name — "the tip of a pin" — we do not capture the entire thing: we stabilize a selective delineation of it in a form we can operate with.

We are not saying that reality does not exist, nor that every representation is equally valid. We are saying something simpler and more defensible: there is a reality; our systems can access it only through selective delineations. It is precisely in the gap between the thing and the aspects of it on which we can operate that abstraction begins.

### 8.4.4 — ABSTRACTING AND FEELING: WHEN REDUCTION ACQUIRES DIRECTION

If no organization receives the whole world, every operation begins with a selective delineation. The next question is what we do with what we manage to access.

Many understand abstraction as stepping away from what is being investigated. Not to abandon the object, but to cease depending on its full presence and become able to operate on some of its relations. The "tip of a pin" already contains this movement: a name gathers into a manageable form something we could never apprehend in all its differences.

A maze makes this clearer. Inside it, each corridor forces us to face one turn after another, a territory of countless paths.

Stepping away from the maze, we see a map that distances us from that immediate experience: it loses walls, textures, odors, and countless details, but precisely for that reason reveals relations that the corridor concealed.

We do not need to traverse the entire territory to operate on its organization through the map.

> Here the central question emerges. To abstract is to reduce, reorganize, or condense differences.
>
> Feeling, however, seems to present the outcome already formed: fear, pain, hunger, or pleasure arrive in experience as an integrated direction, without our having to consciously reconstruct every difference that participated in their formation.
>
> For the third person at the ledge, feeling is using the map rather than the territory to act.

> Observing the tip of a pin already requires abstraction.
>
> When it pierces the skin, however, an additional demand arises: among countless possible differences, some begin to matter directly to the state of the organization itself.
>
> The question then ceases to be only how to reduce the world and becomes how that reduction acquires direction. It is at this point — and not before — that the problem of feeling begins.

Fear, acute pain, attraction, and nausea do not present themselves to consciousness as descriptive tables for deliberate calculation; they erupt as integrated directions that immediately incline behavior. Feeling, at the limit, is navigating the territory guided by a compass whose directions were traced on the map constructed by the organism's own history.

A direction felt in an instant may carry selection, history, comparison, loss, and condensation produced long before it. If this is possible, abstracting and feeling may not occupy opposite ends of a spectrum. The relationship between them is precisely what remains to be investigated.

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05 **TOPOLOGY I** | Exclude and Compress

# 8.4.5 TOPOLOGY I

Exclude and Compress

**WHAT IT IS**

Introduces the first two operators of abstraction: excluding and compressing.

**QUESTIONS**

- Is excluding the same as erasing?
- How can much be represented through less?

**KEY INSIGHTS**

- Exclusion removes differences from the operation without requiring their deletion from the record.
- Compression preserves a larger structure in a smaller representation.

IN THIS BLOCK


8.4.5 THE TOPOLOGY OF ABSTRACTION

a) Exclude — Remove

b) Compress — Condense


## 8.4.5 — THE TOPOLOGY OF ABSTRACTION

In the TMC, abstraction designates the transformation through which an organization no longer needs to retain or reproduce in full what it encountered in order to continue operating on it.

This transformation can involve four operations:

**a) Exclude — remove**

**b) Compress — condense**

**c) Combine — bring together**

**d) Reconstruct — create a configuration**

They are neither mandatory stages nor a fixed sequence. They can operate separately, combine, and operate again on the results they themselves have produced.

`In its minimal form:`

**Excluding removes.**

**Compressing condenses.**

**Combining brings together.**

**Reconstructing creates a configuration.**

### a) EXCLUDE — REMOVE

To exclude is to make certain differences cease to participate in an operation.

Excluding removes something from the operation. Deleting removes it from the record: a difference ceases to be retained or available in that form for later use. Put simply: to exclude is to stop using; to delete is to stop having.

**Example:** when recording a maze, we may cease to retain the smell of the corridors, the texture of the walls, the temperature, and countless details of the route.

Exclusion reduces what must continue to be carried. Its risk is equally clear: **what was left out may become relevant again.**

`EMPIRICAL EVIDENCE`

Neuroscience shows that exclusion does not correspond to a single mechanism and can occur at different points in processing.

> **Wimmer and colleagues (2015)** demonstrated this already at the level of sensory selection. In mice trained to shift attention between visual and auditory stimuli, circuits involving the prefrontal cortex, the thalamic reticular nucleus, and thalamic pathways modulated which modality was given passage according to the task. Before all information is processed equally, the participation of some competing information can already be reduced.

**Exclusion can also act on something already learned.** In the Think/No-Think paradigm of Anderson and Green (2001), participants memorized associations and were subsequently instructed to prevent some of them from being retrieved. With repetition, those memories became harder to retrieve. Something already recorded could be prevented from participating in the current operation, without having to conclude that the record was literally erased.

**Wimber and colleagues (2015)** demonstrated another form of exclusion. During the selective retrieval of a memory, competing representations showed a progressive reduction in their activation patterns, associated with reduced later access to them. Here an especially important relationship emerges: for one difference to gain priority, another may need to lose participation.

These studies do not demonstrate phenomenal experience, nor do they warrant saying that the brain has a single mechanism for "deleting information." They demonstrate something more precise at the functional level: differences can be restricted, suppressed, or made less accessible at different points in an operation.

### TAXONOMY OF EXCLUSION

Exclusion can take different forms depending on when a difference ceases to participate:

**Input exclusion:** its passage is reduced before it reaches broader processing.

**Attentional exclusion:** the difference is available but is not given priority.

**Recording exclusion:** the difference is processed but is not stabilized as a record for later use.

**Access exclusion:** a record exists, but its retrieval is blocked or made more difficult.

**Competitive exclusion:** giving one representation priority reduces the participation of competing ones.

> **Expression exclusion:** a previously learned relationship remains available but no longer governs that response.

The distinction matters because excluding does not necessarily mean erasing. A difference may continue to exist at some level of the organization and yet cease to participate in that particular operation.

The same strategy that produces efficiency also creates a risk. The radiologists' experiment by Drew, Võ, and Wolfe (2013) makes this especially intuitive: specialists searching for small lung nodules often failed to notice a gorilla figure inserted into the images, even though it was much larger than the targets they were looking for. The filter that favored what the task made relevant could also prevent an unexpected difference from gaining access.

> **Exclusion works as long as what has been excluded remains dispensable.**

#### WHAT THIS SUPPORTS IN THE TMC

For the TMC, the results support a simple proposition:

> **an organization operates not only through what it incorporates and preserves. It also operates through what it allows to cease making a difference.**

Exclusion reduces competition, limits the number of differences competing for processing, and allows finite resources to be concentrated on what, at that moment, has greater operational relevance.

But excluding comes at a price. A difference considered irrelevant now may become decisive later. That is why exclusion is not functional simply because it reduces information.

> **It is functional as long as it removes differences without eliminating precisely the one that guidance will need again.**

The next question, then, is not merely how the brain excludes, but by what criterion some differences remain while others cease to participate.

### b) COMPRESS — CONDENSE

To compress is to represent a larger set through a smaller form, reducing what needs to be carried or operated on.

**Example:** from a maze, we can retain only a few landmarks capable of guiding us or form a schema of its organization without preserving every wall, turn, or distance.

> **The difference from exclusion is fundamental: excluding removes; compressing makes much remain operable through less.**

`EMPIRICAL EVIDENCE`

Cognitive research shows that reduced representations can preserve what an operation needs.

> **Ho and colleagues (2022)** investigated how people plan in environments containing obstacles. Participants did not treat all elements as equally necessary: their choices and subsequent memory were compatible with simplified representations in which obstacles relevant to reaching the goal were given greater prominence. The problem remained solvable without having to represent the entire configuration at the same level of resolution.

> Spatial navigation shows something similar. In geometrically distorted virtual environments, Warren and colleagues (2017) found behavior compatible with representations organized by relations between locations, without requiring an exact metric reproduction of all available geometry. This does not demonstrate that the brain never produces more complete maps, but it shows that, under certain conditions, a reduced relational structure is enough to guide navigation.

Spatial landmarks make this principle more intuitive still. A few distinctive elements can anchor orientation systems, and manipulating them can shift an organism's orientation. A local fragment can thus participate in an operation concerning a much larger space.

> **Tse and colleagues (2007)**, in turn, showed in rodents that repeated experiences can establish relational schemas that facilitate the later incorporation of compatible new information. Many individual

> encounters can sustain a more general structure on which new operations become possible.

These experiments do not identify a single brain mechanism called "compression." They show distinct phenomena that share a functional property: a larger structure remains operable through a smaller representation.

#### TAXONOMY OF COMPRESSION

For the TMC, two basic forms can be distinguished.

> **Fragment-based compression.** A few preserved elements act as anchors for a larger whole. In the maze, some landmarks or forks may be enough to situate the organism and guide its next movement without retaining every detail of the route.
>
> **Schema-based compression.** Many individual elements, episodes, or relationships come to be represented by a more general structure. In the maze, its organization — which regions connect and where the decisive passages lie — can be retained without reproducing its entire configuration.

The difference from exclusion remains decisive. If a particular wall simply ceases to participate, that is exclusion. If fewer elements or relations allow the organization to continue operating on a larger structure, that is compression.

> **Excluding makes something cease to participate. Compressing makes much continue to participate through less.**

This economy comes at a price. A reduced representation works as long as it preserves the differences needed to distinguish situations requiring different responses. If a previously dispensable detail becomes decisive, the advantage may turn into error.

> **Compressing means losing resolution. When that loss preserves the relations necessary for an operation, compression participates functionally in abstraction.**

WHAT THIS SUPPORTS IN THE TMC

For the TMC, a trajectory does not need to preserve its differences in the form and resolution in which they originally occurred for them to continue participating in the present.

> **Much can continue to make a difference through little.**

A broad set of experiences can remain operational through a few fragments; many individual relations, through a schema. What is retained need not reproduce the earlier encounter, but must preserve what can still change the operation.

This separates the amount of information from the capacity for guidance. A representation can contain fewer differences and still make a larger whole more operable.

The condition is that what remains must preserve the differences capable of altering action, prediction, or choice when needed.

If exclusion asks what can cease to participate, compression asks:

how much of a structure can cease to be represented directly without what matters ceasing to remain operable?

> **It is in this sense that, for the TMC, to compress is to make much continue to make a difference through less.**



CH 08 · BLOCK 06

# 8.4.5 TOPOLOGY II

Combine and Reconstruct

> **WHAT IT IS**

Introduces the combinatorial operators: combining and reconstructing.

**QUESTIONS**

- How do relationships arise that no single encounter contained?
- How are configurations formed that were never experienced?

**KEY INSIGHTS**

- Combination establishes relationships between separate elements.
- Reconstruction produces a novel configuration from what is available.

IN THIS BLOCK

c) Combine — Bring Together

d) Reconstruct — Create a Configuration

## c) COMBINE — BRING TOGETHER

To combine is to make elements or records that were previously separate operate in a new relationship.

Example: after traversing different mazes, we may notice that right turns tend to be followed by longer corridors. No single route contained this rule. It arises from the relationship among several encounters.

Combination shows that abstracting does not mean only losing or reducing. An organization can also produce new relationships from what was previously separate.

EMPIRICAL EVIDENCE

Memory integration experiments show that relationships learned separately can support inferences that were never directly presented.

> In associative inference paradigms, participants first learn A–B and then B–C.
>
> They can subsequently relate A to C, even though those elements were never presented together. Studies such as that of Zeithamova, Dominick, and Preston (2012) associate this performance with

> interactions between the hippocampus and prefrontal regions involved in integrating overlapping memories.
>
> Two separate encounters come to support a relationship that neither contained on its own.

Transitive inference provides another example. Dusek and Eichenbaum (1997) trained rats on successive relationships — A>B, B>C, C>D, D>E — and then tested B>D, a relationship never directly presented. Lesions affecting the hippocampal system impaired this inference despite learning of the individual relationships. Retaining the pairs was not enough; it was necessary to operate on the relationships between them.

> Combination can also emerge from many distributed encounters. In statistical learning tasks, Schapiro and colleagues exposed participants to sequences organized by a hidden relational structure.
>
> Although that organization was never explicitly presented, elements belonging to the same structure came to acquire more similar representations. Regularities distributed across experience can produce an organization that no single encounter contains.

There is also motor chunking. Movements initially treated as distinct steps can, with practice, form larger functional units. The resulting reduction in load may be compressive, but its formation is combinatorial: elements that were previously separate become part of a common organization.

These studies do not reveal a single brain mechanism called "combination." They show different phenomena with a common property: relationships built along a trajectory change what separate elements become capable of when they operate together.

#### TAXONOMY OF COMBINATION

For the TMC, three basic forms can be distinguished.

> **Relational combination.** Relationships acquired separately become integrated into a structure that makes it possible to establish indirect relationships between its elements.

A–B and B–C, for example, can make A and C related without their ever having been encountered together.

**Statistical combination.** Many encounters make it possible to construct a regularity that none of them contained on its own.

In the maze, different routes may reveal that a certain type of turn tends to precede longer corridors.

**Structural combination.** Elements or operations that were initially separate come to form a higher-order unit.

A sequence of movements can cease to function merely as independent steps and begin to operate as a learned whole. When that new unit also reduces the load required for the operation, combination and compression begin to work together.

The distinction between the operators is simple:

| | | |
|---|---|---|
| Excluding makes something cease to participate. | Compressing makes much remain operable through less. | Combining gives what was separate a relationship it did not previously have. |

But combining also comes at a price. The same capacity that makes inference and generalization possible can construct relationships that do not exist. Inappropriate integrations can produce false inferences, unwarranted generalizations, and confusion between what was directly experienced and what was related afterward.

**Combination is functional as long as the relationship constructed remains supported by the structure of the encounters that gave rise to it.**

#### WHAT THIS SUPPORTS IN THE TMC

For the TMC, a trajectory does not preserve isolated contents alone. What happened at different moments can become mutually relevant in the present.

The novelty relative to exclusion and compression is that it is not only how much is preserved, or the form of its preservation, that changes. The relationships between records themselves can change.

The organization may encounter A at one moment, B at another, and C later still. No single encounter needs to contain the relationship that will subsequently guide a decision. That relationship can arise from the articulation of differences accumulated along the trajectory.

> **The new, then, need not arrive ready-made as a new external object. It can arise as relational novelty produced by the organization's own history.**

This extends the reach of accumulated experience: relationships built across encounters make it possible to infer, generalize, and recognize structures never presented in their entirety.

The condition is that those relationships remain constrained by the elements and regularities that support them. Otherwise, combination becomes spurious association.

The boundary with the next operator also becomes clear:

> **Combination produces a new relationship between available elements. Reconstruction uses available elements and relationships to produce a configuration that has never been experienced in that form.**

Discovering a regularity between turns and corridors is combination. Using it to imagine a route never taken is already reconstruction.

> **It is in this sense that, for the TMC, to combine is to make differences that were previously separate begin to make a difference to one another.**

### d) RECONSTRUCT — CREATE A CONFIGURATION

To reconstruct is to produce, in the present, a configuration that has not previously been experienced in that form.

Example: within a maze, we can imagine a route through corridors we have never traversed, composing a possible path that does not correspond to any complete prior experience. We can also construct a future trajectory that has not yet happened.

> **Dreams, imagination, and certain false memories make this capacity intuitive: the mind is not limited to repeating what it encountered. It can produce configurations that never existed as encounters in that form.**

#### EMPIRICAL EVIDENCE

Research on episodic memory and imagination shows that elements from previous experiences can be reorganized to form novel events.

> Martin and colleagues (2011) used a particularly direct paradigm. Autobiographical elements — such as people, places, and objects — were drawn from different episodes in participants' lives and then presented in new combinations.
>
> The task was to mentally construct a plausible event bringing those elements together.
>
> The components had already been experienced; the configuration bringing them together had not. The anterior hippocampus was particularly involved in this recombination of episodic details during the construction of new events.

> Hassabis and colleagues (2007) approached the problem from another direction. Patients with amnesia associated with hippocampal lesions were given enough elements to imagine fictional scenarios but had difficulty constructing spatially coherent scenes.
>
> They produced isolated elements yet struggled to organize them into an integrated configuration. Having the parts, therefore, is not equivalent to being able to construct a whole that has never been experienced.

> Navigation offers a nonverbal expression of this capacity. Pfeiffer and Foster (2013), recording place cells in the hippocampi of rats,

> observed sequences of activity during pauses that were prospectively oriented toward reward locations.
>
> These patterns were related to the trajectories the animals would subsequently follow. The result is compatible with the capacity to organize prior spatial knowledge into prospective trajectories rather than merely passively reactivating a sequence already performed.

Reconstruction also appears when a system changes what has already happened. In counterfactual thinking tasks, participants begin with a real autobiographical episode and produce an alternative version — what could have happened if some condition had been different. The original event remains a reference, but the configuration produced does not belong to the history actually lived.

> The same flexibility carries a risk. Studies of false memories and conjunction errors show that details from different episodes can be brought together in a memory of something that did not occur in that form.
>
> Not all false memories correspond to the same mechanism, but these phenomena show that producing new configurations can also compromise the distinction between what was experienced and what was subsequently constructed.

These results do not identify a single brain mechanism called “reconstruction.” They show a more general property: content available in the present can serve as material for configurations that have no complete counterpart in any previous encounter.

#### TAXONOMY OF RECONSTRUCTION

For the TMC, three basic forms can be distinguished.

> **Prospective reconstruction.** Available elements and relationships are organized into a possible configuration that has not yet occurred.
>
> In the maze, this means imagining or planning a route that has never been taken.

> **Counterfactual reconstruction.** A configuration that actually occurred is used as the basis for producing an alternative that did not happen.
>
> In the same maze, we can mentally reconstruct the route we took and ask: what would have happened if I had chosen the other passage?

> **Retrospective reconstruction.** In representing the past, the system produces a configuration that does not correspond in full to any previous encounter.
>
> This is where certain false memories and conjunction errors become especially illuminating: true parts can participate in a reconstructed episode that, as a whole, never existed.

These types distinguish the direction of reconstruction, not necessarily exclusive neural mechanisms. The same capacity to reorganize elements can be used to project a future, hypothetically alter the past, or fill in a representation of what has already occurred.

The boundary with the other operators remains important.

| | | |
|---|---|---|
| Excluding makes something cease to participate. | Compressing makes much remain operable through less. | Combining makes separate elements acquire a new relationship. |
| Reconstructing uses available elements and relationships to produce a configuration that has never been experienced in that form. | | |

The difference between combination and reconstruction is especially subtle. Learning A–B and B–C and then relating A to C is combination. Using those relationships to imagine a concrete scene involving A, B, and C that never happened is reconstruction.

> **The advantage of this operation is clear: it makes it possible to explore possibilities before encountering them in the world. Its risk is equally structural: a possible configuration can be mistaken for an actual one.**

#### WHAT THIS SUPPORTS IN THE TMC

For the TMC, a trajectory supplies the present with more than records to be retrieved. It provides material for producing configurations that the trajectory itself never contained in that form.

This introduces a decisive novelty relative to the earlier operators.

| | | |
|---|---|---|
| In exclusion, something ceases to participate. | In compression, a larger structure remains operable in a smaller form. | In combination, separate elements come to acquire new relationships. |
| In reconstruction, however, those differences and relationships become material for a novel present configuration. | | |

An organization can thus operate not only on what happened, but also on what could happen, could have happened, or seems to have happened.

This radically extends the functional reach of a trajectory. An organism need not experience every possible route for some of them to participate in its guidance. It can use what it has already encountered to produce a possibility and act on it.

> **But this advantage depends on a distinction that is never trivial: a constructed configuration is not a configuration that occurred.**

The same process that makes it possible to plan a new route, anticipate a situation, or imagine an alternative can also produce a false memory, an inadequate prediction, or a possibility incorrectly taken as fact.

Reconstruction, therefore, is not unrestricted freedom from experience. It remains conditioned by the elements, relationships, and constraints that the trajectory has made available, although it can reorganize them into a form that never existed before.

> **It is in this sense that, for the TMC, to reconstruct is to make what has already made a difference enable a configuration that had not yet existed as an encounter.**

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CH 08 · BLOCK 07

# 8.4 STRATEGY

Combinations, Lemon, and Smurgelis

**WHAT IT IS**

Explains combinations and the strategy of abstraction conditioned by the records of a trajectory.

**QUESTIONS**

- How do the operators combine?
- What determines how the familiar and the new are delineated?

**KEY INSIGHTS**

- Trajectory inclines strategies without requiring a hidden strategist.
- The present encounter transforms the conditions of future encounters.

IN THIS BLOCK

8.4.6 THE COMBINATIONS OF ABSTRACTION

8.4.7 WHO DETERMINES HOW TO ABSTRACT? — LEMON × SMURGELIS

## 8.4.6 — THE COMBINATIONS OF ABSTRACTION

The four operations do not work in isolation. Much of the richness of mental life emerges precisely when they are combined.

> **Exclusion + compression —** many details cease to participate in the operation, and what remains is condensed into a form that enables rapid recognition.

> **Compression + combination —** different reduced records are brought together and may form categories, concepts, or general rules.

> **Combination + reconstruction —** previous experiences are brought together to produce a situation that never occurred in that form, such as imagining a future route.

> **Exclusion + reconstruction —** gaps in a record can be filled by a configuration produced in the present, sometimes giving rise to inaccurate memories.

> **Compression + reconstruction —** a few fragments may be enough to anticipate a situation far larger than what is available at that moment.

> **Exclusion + compression + combination + reconstruction —** parts of many experiences may be removed, condensed, brought together, and reorganized into an entirely new configuration.

The number of combinations grows rapidly. With them, increasingly complex mental forms arise: concepts, expectations, recollections, anticipations, plans, hypotheses, fantasies, dreams, narratives, beliefs, suspicions, possible scenarios, and images of futures that have never occurred.

The mind, then, does not merely retain what it encounters. It removes, condenses, brings together, and reconstructs — and then operates again on the products of those very operations.

> **This is what makes abstraction recursive: one abstraction can become the raw material for another.**

## 8.4.7 — WHO DETERMINES HOW TO ABSTRACT? — LEMON × SMURGELIS

If there are so many possible ways to exclude, compress, combine, and reconstruct, what determines which of them will acquire Weight and direction for a given organization?

The criterion does not come from Abstraction in isolation. It emerges from the encounter between what arrives, the State historically shaped by the organization's trajectory, and what is at stake at that moment.

The record preserved in the Inside is necessarily an abstraction: there is no raw record prior to abstraction. What remains from previous encounters forms a composition of Forms, marks, Weights, and relationships that may incline the target of a new delineation. When the encounter is felt, the mark can be investigated as Texture (Weight and Valence); for operational purposes, its direction can be represented in simplified form by Polarity.

This means that the same object may participate in the operation through different aspects, without all of them having the same relevance in that encounter.

> **Consider a lemon.**

The unpleasant experience of bitterness may give greater Weight to acidity and incline the organism to withdraw. Its green color may activate another record associated with a preference. The system may preserve the outline of the lemon and exclude the texture of its peel before that texture becomes a usable record. It may also schematize relationships:

**lemon → eat → bitter**

or associate it with another trajectory:

**lemon → skin → sun → spots**

The same lemon permits different abstractions because what has already been recorded inclines which differences will go on making a difference.

> **Where, then, does the strategy of abstraction come from?**

It emerges from the Forms, marks, and relationships built in previous encounters — with lemons and with other objects — that remained in the Inside and now participate in the present encounter. Their Weights and operational directions guide the delineation; in felt encounters, the TMC also investigates their Textures and Valences.

> **What is familiar, therefore, does not arrive at a neutral organization. It encounters paths that are already inclined.**

But what happens when the object does not yet have a specific record?

Imagine being given a Smurgelis: a hypothetical, nonexistent, reddish fruit covered in blue spheres.

There is no specific, dominant abstraction called “Smurgelis” in the Inside that can rapidly guide the encounter. This does not mean abstraction is absent.

The organization begins seeking references among abstractions it already possesses. Form, color, texture, smell, touch, and taste may activate records associated with pineapple, banana, lemon, sweetness, bitterness, and countless other previous encounters.

Different references compete. Some are excluded; others remain. Relationships are compared, compressed, and combined. When no previous configuration is sufficient, reconstruction may play a greater role.

Even before tasting the Smurgelis, the organization may imagine what it will be like: perhaps sweet like one fruit, acidic like another, with a texture inferred from its appearance. It thus produces a configuration it has never encountered in that form.

A certain initial investigative chaos emerges — not because abstractions are lacking, but because no configuration is yet sufficiently dominant to incline rapidly which of them will prevail.

> **The familiar encounters paths already inclined. The new encounters paths still in contention.**

#### THE SAME SIGNAL, A DIFFERENT DELINEATION — Goold & Meng, 2016

Mooney images are high-contrast figures that may initially look like patches without clear organization. When participants are first shown a corresponding unambiguous version, the same target can subsequently be detected much more efficiently.

In the TMC: an earlier encounter modified the Inside. The next encounter already finds records capable of inclining the delineation and making dominant a configuration that previously competed with several possibilities.

Limit: this paradigm shows how prior experience participates in perception; on its own, it does not demonstrate the operators or Weights posited by the TMC.

#### NOT EVERY DIFFERENCE CARRIES EQUAL WEIGHT — Garcia & Koelling, 1966

In classic aversive learning experiments, gustatory and audiovisual cues present in the same situation did not acquire equivalent associations. Visceral consequences favored learning associated with taste; external shock favored audiovisual cues.

In the TMC: what is at stake for an organization helps determine which differences from an encounter will continue making a difference. The record does not preserve everything that was present on equal terms.

Limit: the experiment demonstrates selective associations between cues and consequences; it does not demonstrate a conscious choice of abstraction strategy.

#### STRATEGY WITHOUT A STRATEGIST

None of this requires a little entity inside choosing “now I will exclude,” “now I will compress,” or “now I should reconstruct.” The strategy is the very result of the encounter.

The object presents differences. The State provides a trajectory already transformed. Weights, Polarities, and relationships incline which differences will participate. The operation produces a new abstraction,

and whatever remains as a record will modify the State that receives the next encounter.

**ABSTRACT → RECORD → INCLINE → ABSTRACT AGAIN**

> **The strategy of abstraction is not ready-made in the object, nor stored as a rule external to the organization. It emerges from the encounter between what arrives and what previous encounters have made of the one receiving it.**

> *Whereas the lemon encounters clearer paths for abstraction, with greater emphasis on excluding, compressing, and combining, the Smurgelis demands a greater role for reconstruction, creating a provisional concept for a fruit that does not yet have a record of its own.*

> The dimensions are already present: Form and Texture (Weight and Valence). In an operational representation, Weight and Polarity can simplify part of the analysis. The question, therefore, should not simply be which abstraction to use, but which combinations of excluding, compressing, combining, and reconstructing make it possible to operate more efficiently, with the lowest processing cost compatible with what must continue to make a difference in that encounter.

> **The most efficient abstraction is not necessarily the one that loses the most, but the one that can lose the most without losing what must still guide the operation.**

CROSS-CHAPTER NOTE

### TERMINOLOGY STANDARDIZATION NOTE

*To investigate feeling and its relationship to records along a trajectory, the TMC uses a common analytical structure.*

GENERAL STRUCTURE

**S(feeling) ≈ Form + Texture (Weight and Valence)**

This representation organizes dimensions relevant to investigating feeling. It does not claim to exhaust the complexity of the event or fully explain the subjective character of *"what it is like to have the experience"*, although these dimensions are related. The investigation of that question, associated with *qualia*, is developed further in **Chapter 2C — TMC Theory**.

---

**Feeling**
It refers to the character of experiencing, to the felt event itself — not merely the capacity to have experiences. Here, the focus is on feeling in its more recognizable manifestations, not on its more subtle and ontological dimension.

---

**Form**
It is the reduced and/or compressed configuration of an encounter. It does not correspond to a complete photographic, auditory, or sensory reproduction. It can preserve outlines, relationships, patterns, and characteristics sufficient for something to remain operable and recognizable along a trajectory.

> *Observation: Texture may exist without Form, but Form cannot exist without some degree of Texture.*

---

**Abstraction**
It is the process of transforming differences into operable configurations. It can include groups of signals, compress, combine, and reconstruct elements and relationships, producing composite inclinations that may participate in new encounters.

---

**Texture**
It characterizes how the encounter left its mark on a trajectory in its character as felt experience. In this representation, it is analyzed through two intrinsic dimensions: Weight and Valence.

---

**Weight**
It expresses the relative relevance and intensity with which a mark participates in operations and is recorded through them. It can be quantified for purposes of relative analysis.

---

**Valence**
It refers to the dimension of states characterized by gradations such as pleasant and unpleasant, pain and pleasure, joy and sadness, giving affective tones to what is felt.

---

**Composite feeling**
This formula for feeling represents a minimally distinguishable unit. Complex feelings may arise from the composition of different units of feeling.

Complex, contradictory, subtle, or indeterminate emotions are structured into a composite feeling.

**Representation by Polarity**
The direction of Valence can be represented in simplified form by negative, neutral, or positive signs, sometimes numerically graded. This representation can help model tendencies toward approach or withdrawal, but it does not exhaust what is felt or automatically determine an action. It enables algorithmic analyses of states and makes them easier to manipulate operationally.

*Complementary conceptual reference: Chapter* **02c — TMC Theory**.



CHAPTER 08 · BLOCK 08

# 8.4 ARCHITECTURE

Cognitive Ecosystem and the Architecture of the Middle

**WHAT IS IT?**

Integrates the operators into an explanatory architecture under energy constraints and formulates the Architecture of the Middle.

**QUESTIONS**

- How does cognition allocate work under energy constraints?
- What intermediate language does the TMC seek to construct?

**KEY INSIGHTS**

- The architecture integrates input, operators, marks, and plasticity.
- The Architecture of the Middle is a conceptual proposal to be submitted to testing.

IN THIS BLOCK

8.4.8 COGNITIVE ECOSYSTEM

8.4.9 ARCHITECTURE OF THE MIDDLE

## 8.4.8 — COGNITIVE ECOSYSTEM

*Operational strategy under available energy*

Cognition can be viewed as an ecosystem in which an organization must operate on differences in the world using finite material resources. The problem is not merely how much processing capacity it has, but how it allocates the processing available under energy constraints.

For explanatory purposes, this architecture can be separated into four functions:

> **BETWEEN — SELECTIVE INPUT:** brings certain differences into a position to participate in the operation. The Cup establishes possibilities and limits of discrimination; the Water is the actual configuration the encounter takes at that moment.

> **ABSTRACTION — OPERATIONAL CORE:** transforms the available material through four operations: **excluding, compressing, combining, and reconstructing**. Here, the organization ceases to carry certain differences, condenses others, establishes new relationships, and produces configurations that were not ready-made in the encounter.

> **FORM + TEXTURE (WEIGHT AND VALENCE) — EXPLANATORY CODE:** Form preserves an operable configuration; Texture characterizes how the encounter left its mark as felt experience, analyzed through Weight and Valence. At the operational level, Weight and Polarity can be represented as variables, without that representation exhausting experience or demonstrating phenomenality.

> **FIVE MOVEMENTS — DYNAMICS:** creation, decay, rewriting, dissociation, and reassociation describe how these marks continue to change. **To store, here, does not mean to freeze: it means to remain subject to the trajectory.** There is no mental hard drive on which records simply wait, intact, to be retrieved.

For explanatory purposes, the relationship can be represented as follows:

> **INPUT → CORE → CODE → DYNAMICS**

*Everything operates under energy constraints.*
*Adult human brain: metabolic power on the order of 20 W.*

This sequence should not be understood as a rigid line. Operations may occur in parallel, feed back into one another, and participate in simultaneous processing networks.

All this must operate within a physical budget. In Homo sapiens, the brain operates at a metabolic power on the order of tens of watts, often approximated as about 20 W. Simply increasing or reducing the available energy does not automatically transform cognitive capacity: the architecture must be adapted to use that budget.

Homo sapiens makes this constraint particularly visible. For an animal of our body size, we sustain an exceptionally large and energetically expensive brain: about 2% of adult body mass accounts for approximately 20% of resting metabolism. Even so, we cannot process everything, store everything, or consider every possibility at once.

The brain must therefore select. Some differences cease to participate; others are condensed; separate experiences are related; and new possibilities are reconstructed from what has already occurred.

There is also a suggestive evolutionary convergence. We carry one of the most metabolically expensive brains relative to our body size, but we are not particularly extraordinary in explosive power: many mammals run faster, jump better, and produce greater instantaneous force.

Our advantage also appears in another regime. The human body can walk with considerable economy, dissipate heat, and sustain prolonged travel.

Rather than concentrating its entire advantage in the instant, it became capable of distributing resources over time.

Body and cognition thus seem to have advanced side by side in human Darwinian history: one makes limited energy reach farther across space and time; the other makes limited differences reach farther in prediction, decision, and possibility.

The TMC need not claim that one adaptation directly caused the other. The strategic convergence is enough: in the human lineage, reach seems to have been achieved less through instantaneous power than through managing what is finite.

> **Cognition, then, does not seem to overcome its limits by trying to carry the entire world. It selectively transforms what it can keep relevant.**

## 8.4.9 — ARCHITECTURE OF THE MIDDLE

*The gap between neuron and mind*

There is a quiet epistemological irony in the convergence of neuroscience, philosophy, and artificial intelligence.

> The programmer looks at the brain and translates it into the tools their discipline has made tractable: inputs, weights, matrices, and outputs.

> The neuroscientist, impressed by how tractable this language is in the face of the complexity of biological networks, borrows the machine's terms: code, storage, processing, input, and output.

> The philosopher, in turn, receives these already institutionalized technical metaphors and elevates them into ontological theories of mind.

> *A closed circuit of echoes emerges: a methodological simplification crosses three disciplines and returns to its starting point with the false solemnity of an independent discovery.*

> **The problem was never the construction of simplified models — every science needs them. The problem is forgetting what was left out along the way: what we removed to make computation tractable may be precisely what we still need to explain.**

> **It is in this still insufficiently integrated interval that the abyss opens.**

On one side, we know the biophysics of matter in dazzling detail: ion channels, synapses, connectomes, neurotransmitter dynamics, and synaptic plasticity.

On the other, we catalog the operational endpoints of cognition with sophistication: language, reaction times, working memory, heuristics, and behavior.

But between the electrical firing of a cell and the terror of a body before an abyss, a conceptual vacuum remains. The question is still unanswered: how does a historically formed material organization assign Weight, discard what is dispensable, reconstruct possible worlds, and transform itself as it operates?

> **We do not lack data below; we do not lack taxonomies above. What we lack is the Architecture of the Middle.**

Chapter 8 began to build this intermediate structure by bringing together, under an energy budget on the order of twenty watts, Between, the Topology of Abstraction, the dimensions of Form and Texture (Weight and Valence), and the plasticity of the Five Movements.

This observation also exposes a possible limitation of contemporary engineering. Multiplying billions of parameters, extending context windows, attaching external memory banks, or optimizing processing flows may erect impressive statistical monuments — but does not necessarily change the premise on which they stand.

Optimizing an architecture does not prove that its fundamental categories are true.

If, in living systems, perception, value, memory, and action form a dynamic in which present operation continually changes the conditions of subsequent operations, refining isolated boxes may mean only refining a division the organism does not exhibit in that form.

> **It is precisely here that the Theory of Continuous Mind reaches its next critical point.**

> **So far, we have outlined a conceptual and operational architecture. But intuition and biology are not enough unless its propositions can be confronted and translated into testable requirements.**

The next movement will subject it to the contemporary problem of artificial intelligence and AGI: asking what current architectures already achieve, where they converge with this dynamic, and where they still preserve separations the TMC has called into question. Only then will Chapter 10 face the next step: translating Between, Form, Texture and their operational representations through Weight and Polarity, historical trajectory, and the operations of Abstraction into formal states, operators, and transitions.

> **Perhaps the gap between neuron and mind lies not only in what we have yet to discover, but in the absence of a language capable of connecting what we already know.**

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