Tractatus Logico-Universalis

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Abstract

We read Wittgenstein's *Tractatus Logico-Philosophicus* alongside the Universal Model [2], proposition by proposition. The Tractatus's ontology admits a precise formalization in UM terms. The central observation is that Wittgenstein's "world" corresponds to X (reality), not to the data stream D. The event space E is the map, not the territory; D is a finite sample of X as seen through E. Wittgenstein's decision to begin from facts (*Tatsachen*) rather than objects (*Dinge*) is the projection $X \to E$: an epistemic commitment that determines what can be known. The propositions trace the chain $X \to E \to T \to P \to f \to \omega$, and Proposition 7 marks the boundary of E.

1 Provenance

This paper is the third version. The first two—*Tractatus Logico-Universalis* (v1) and *The Tractatus in UM Terms: A Systematic Translation* (v1)—were written by Claude in parallel, prompted on source material and structure (TLP → UM, point by point). Both are preserved in this directory. They share a fundamental error: they equate Wittgenstein's "world" with the data stream D. This is the natural reading for a language model, whose world really does begin at the data stream. But Wittgenstein is operating one level deeper.

MJC's commentary identified the correction:

1. X is the world (reality, the territory). It sits to the left of E in the UM and is normally omitted from the formalism.
2. E is the map: the dimensions along which X becomes knowable.
3. D is a finite sample of X filtered through E.
4. Proposition 1.1 ("the world is the totality of facts, not of things") is a profound epistemic stance, not a triviality: it is the projection $X \to E$.
5. Proposition 7 ("whereof one cannot speak, thereof one must be silent") uses *kann* (cannot), not *darf* (may not). It states a fact about the boundary of E.
6. Scientific revolutions are factor maps: embeddings of coarser event spaces into finer ones with quantifiable residuals.

The second version (v2) incorporated these corrections but imposed too much UM interpretation on propositions that deserve to be heard in their own terms. This version aims for greater formality and restraint.

Dissenting note (MJC). Much of what follows still reflects a gap in understanding. Wittgenstein is largely talking about how language is represented in the deeper event spaces that we reach via the lexicon and grammar maps—the ESes where words, sentences, and meanings live. But our empirical work is still making baby steps up from Markov models on characters. We have not yet built the bridge from byte-level skip-bigrams to the linguistic event spaces where the Tractatus really operates. It will save time to come back to this commentary once we have more empirical results to anchor it.

One example of the gap: early in the research I asked "where are the nouns?" The UM appears to have only propositions (patterns over events), no objects. It turns out this is correct—there *are* no nouns in the model. Nouns are a shared property of sets of propositions that have something in common (e.g. being about Paris). They distribute over the propositions; the model discovers event spaces that represent *attention* to those shared properties. This is exactly the kind of insight that needs empirical grounding before we can do justice to it in a Tractatus commentary.

2 Notation

We use the UM five-tuple $u = (e, t, p, f, \omega)$ where e names the event space E, $t \in T$ is the total thought (support vector over E), p is the pattern matrix, f is the forward pass, and ω is the learning function. We write X for reality (the territory), $D = (d_1, \ldots, d_N)$ for the observed data stream, and $s(e)$ for the support of event e. Causation in the five-tuple flows left to right: E determines T, which fixes P, then f, then ω.

3 1. Die Welt / The World

1. *Die Welt ist alles, was der Fall ist.*
The world is everything that is the case.

Formalization. Let X denote reality. X is everything that is the case. X is not D (which is finite and filtered) and not E (which is the instrument of observation).

1.1 *Die Welt ist die Gesamtheit der Tatsachen, nicht der Dinge.*
The world is the totality of facts, not of things.

Formalization. This is an epistemic commitment. Objects (*Dinge*) would be elements of an unstructured set. Facts (*Tatsachen*) are events: structured, relational, expressible. To say the world is facts is to say that X admits a projection into an event space E. The choice to begin from facts rather than objects restricts all subsequent discourse to what can be expressed in E—everything to the right of E in the five-tuple—while leaving X itself outside the formalism.

The Kantian reading: X is the thing-in-itself. All we have is D, which is X as seen through E. Wittgenstein's position is that the world—whatever it is in itself—presents as a set of facts. This is not a metaphysical claim about X (which would be unsayable) but a definition of what "world" means for a knowing agent.

1.11 *Die Welt ist durch die Tatsachen bestimmt und dadurch, dass es* ***alle*** *Tatsachen sind.*
The world is determined by the facts, and by these being *all* the facts.

Formalization. X is determined by the complete population of E: not a sample D but the totality. This is the complete model—the mind-of-God view in which every event has been observed and the support function over E is total.

1.12 *Denn, die Gesamtheit der Tatsachen bestimmt, was der Fall ist und auch, was alles nicht der Fall ist.*
For the totality of facts determines both what is the case and also all that is not the case.

Formalization. In the complete model, $s(e) > 0$ determines what obtains and $s(e) = 0$ determines what does not. The open-world correction ($s = 0$ as ignorance rather than falsity) applies to our finite D, not to the totality. Wittgenstein is correct for the complete model.

1.13 *Die Tatsachen im logischen Raum sind die Welt.*
The facts in logical space are the world.

Formalization. Logical space $= E$. The world is the population of E: the assignment of support to each event.

1.2 *Die Welt zerfällt in Tatsachen.*
The world divides into facts.

Formalization. $E = \prod_i E_i$. The product structure is the division. Each factor E_i is one dimension along which the world varies independently.

1.21 *Eines kann der Fall sein oder nicht der Fall sein und alles übrige gleich bleiben.*
Any one can either be the case or not be the case, and everything else remain the same.

Formalization. Each factor E_i is independent of the others: changing e_i does not change e_j for $j \neq i$. This is the product structure.

4 2. Sachverhalte / States of Affairs

2. *Was der Fall ist, die Tatsache, ist das Bestehen von Sachverhalten.*
What is the case, the fact, is the existence of atomic facts.

Formalization. A fact is the existence of an atomic fact: a joint event $(e_1, \ldots, e_k)$ with $s > 0$. The atomic fact (*Sachverhalt*) is the co-occurrence itself.

2.01 *Der Sachverhalt ist eine Verbindung von Gegenständen (Sachen, Dingen).*
An atomic fact is a combination of objects.

Formalization. An event in a product space $\prod E_i$ is a tuple $(v_1, \ldots, v_k)$ of values from the component spaces. The values are the objects; the tuple is the combination.

2.0124 *Wenn alle Gegenstände gegeben sind, so sind damit auch alle* ***möglichen*** *Sachverhalte gegeben.*
If all objects are given, then thereby all possible atomic facts are also given.

Formalization. If X is given, then E and T are given. This is the full projection of X into the "true" E and T: given the alphabet of reality, the space of possible combinations is determined. The actual facts are the populated subset; the possible facts are the full product $\prod E_i$.

2.02 *Der Gegenstand ist einfach.*
The object is simple.

Formalization. An atomic event in E_i has no internal structure within E_i. It may have structure from a finer event space (the factorization tower), but at the chosen level of description it is atomic.

2.0272 *Die Konfiguration der Gegenstände bildet den Sachverhalt.*
The configuration of objects forms the atomic fact.

Formalization. A pattern $P = \{(d_1, v_1), \ldots, (d_k, v_k)\}$ is a configuration: which value at which position. The configuration is the structure.

2.04 *Die Gesamtheit der bestehenden Sachverhalte ist die Welt.*
The totality of existing atomic facts is the world.

Formalization. $X = \{e \in E : s(e) > 0\}$ in the complete model.

2.06 *Das Bestehen und Nichtbestehen von Sachverhalten ist die Wirklichkeit.*
The existence and non-existence of atomic facts is reality.

Formalization. *Wirklichkeit* (actuality) is the support function over all of E: both the positive and zero values. Wittgenstein distinguishes *die Welt* (the world: what exists) from *die Wirklichkeit* (actuality: what exists together with what does not). Actuality is the map from T back to reality: the knowable content of X. These are still different things—X and its projection into E—but for the complete model they determine each other.

5 2.1–2.2. Bilder / Pictures

2.1 *Wir machen uns Bilder der Tatsachen.*
We make to ourselves pictures of facts.

Formalization. The pictures are elements of T: total thoughts, representations of the world within the event space structure.

2.12 *Das Bild ist ein Modell der Wirklichkeit.*
The picture is a model of reality.

Formalization. A model shares the form of representation (the event space structure) with what it models. The picture is a model because it is indexed over the same E as the data.

2.141 *Das Bild ist eine Tatsache.*
The picture is a fact.

Formalization. The model is itself data about data. A count $c(i, o) = 42$ is a fact. Pictures are part of reality.

2.172 *Seine Form der Abbildung aber kann das Bild nicht abbilden; es weist sie auf.*
The picture, however, cannot represent its form of representation; it shows it.

Formalization. T does not contain the choice of E. The event space is the index set of the count table, not an entry in it. This is the showing/saying distinction:

- **Saying**: the values in the count table (predictions, statements about X).
- **Showing**: the structure of the count table (which events are distinguished, which offsets are used).

The connection to Gödel incompleteness: E cannot contain the factorization of E recursively. But E can be extended—each extension makes new things sayable and reveals new silences.

6 3. Gedanken / Thoughts

3. *Das logische Bild der Tatsachen ist der Gedanke.*
The logical picture of the facts is the thought.

Formalization. The thought is the factored representation: the world as decomposed through E. The decomposition of a sentence into event spaces (not raw 256^ℓ ASCII but the structured representation via grammar) is the formalization of what Wittgenstein calls the logical picture.

3.001 *"Ein Sachverhalt ist denkbar" heisst: Wir können uns ein Bild von ihm machen.*
"An atomic fact is thinkable" means: we can make a picture of it.

Formalization. An event is thinkable iff it is in E: both as gestalt (unfactored) and as analysis (factored into components). Whether it has support is a separate question from whether it is thinkable.

3.03 *Wir können nichts Unlogisches denken, weil wir sonst unlogisch denken müssten.*
We cannot think anything illogical, for otherwise we should have to think illogically.

Formalization. This constrains T to be closed under the operations of E. "Colorless green ideas sleep furiously" does not map onto the factors of E: the conjunction of those event values has no representation in the factored structure, not because it is unobserved but because the events themselves are incoherent within the factorization.

3.05 *Wir könnten nur dann a priori wissen, dass ein Gedanke wahr ist, wenn aus dem Gedanken selbst (ohne Vergleichsobjekt) seine Wahrheit zu erkennen wäre.*
We could know a priori that a thought is true only if its truth were recognizable from the thought itself (without an object of comparison).

Formalization. This defines a priori truth: support recognizable without comparison to data. In the UM, these include the tautologies of the semiring ($\min(s, 255) = s$, etc.) and any patterns explicitly committed to P (axioms, beliefs). We can also put patterns into P for structural commitments we choose to make—the law of excluded middle, for instance, can be written into P as self-knowledge.

Note: even the tautologies derive from the rules of event spaces, not from nothing. Strong support simultaneously for A and $\bar{A}$ creates surprise—the event space structure determines what counts as tautological.

7 4. Der Satz / The Proposition

4. *Der Gedanke ist der sinnvolle Satz.*
The thought is the significant proposition.

Formalization. A thought with sense (*Sinn*) is a non-trivial element of T: one that says something about X, as distinct from a tautology (which says nothing about X) or a contradiction (which says too much). Significance = positive support for a non-tautological pattern.

4.01 *Der Satz ist ein Bild der Wirklichkeit.*
The proposition is a picture of reality.

Formalization. A proposition is a statement about X expressed in E. It asserts that certain events obtain or do not obtain. A prediction (statement about $t > t_{\text{now}}$) is one kind of proposition, but

propositions are not limited to predictions: they include statements about the past, counterfactuals, and general claims. All are pictures of reality in Wittgenstein's sense—they share the form of representation (E) with what they depict (X).

4.11 *Die Gesamtheit der wahren Sätze ist die gesamte Naturwissenschaft (oder die Gesamtheit der Naturwissenschaften).*
The totality of true propositions is the total natural science.

Formalization. The complete T (in the complete model, of which we do not know E) is the total natural science. Natural science is the search for non-trivial true propositions—statements about X with support. This is a definition, not a claim.

4.12 *Sätze können die gesamte Wirklichkeit darstellen, aber sie können nicht das darstellen, was sie mit der Wirklichkeit gemein haben müssen, um sie darstellen zu können—die logische Form.*
Propositions can represent the whole of reality, but they cannot represent what they must have in common with reality in order to represent it—the logical form.

Formalization. Propositions (elements of T) can represent all of X as projected into E, but they cannot represent E itself. E is the logical form: the precondition for representation. E cannot contain the factorization of E recursively. But E can be extended at any time (Gödel's treadmill): each extension makes new propositions expressible and reveals that the previous E was not the whole story.

4.121 *Der Satz kann die logische Form nicht darstellen, sie spiegelt sich in ihm.*
Propositions cannot represent the logical form; it mirrors itself in them.

Formalization. E is mirrored in T: the dimensions of the count table, the number of distinct events, the factorization into components—all structural features that reflect E without asserting it.

8 5. Wahrheitsfunktionen / Truth-Functions

5. *Der Satz ist eine Wahrheitsfunktion der Elementarsätze.*
Propositions are truth-functions of elementary propositions.

Formalization. Compound propositions are $(\max, \min)$ compositions of elementary propositions. The forward pass $f_p(t)_j = \max_i \min(t_i, p_{ij})$ computes compound support from elementary supports.

5.6 *Die Grenzen meiner Sprache bedeuten die Grenzen meiner Welt.*
The limits of my language mean the limits of my world.

Formalization. The boundary of E is the boundary of what can be expressed. Events outside E are not merely unknown but unrepresentable.

But note: the agent is in the world, and the world exceeds the agent's language. What lies beyond E can be gestured at but not stated.

5.61 *Die Logik erfüllt die Welt; die Grenzen der Welt sind auch ihre Grenzen.*
Logic fills the world; the limits of the world are also its limits.

Formalization. This is about what T can express, not about any particular inference. The $(\max, \min)$ structure fills E: every inference within E is expressible. The boundary of E is the boundary of the logic.

5.62 *Diese Bemerkung gibt den Schlüssel zur Entscheidung der Frage, inwieweit der Solipsismus eine Wahrheit ist.*
This remark provides the key to the problem, how much truth there is in solipsism.

Formalization. The model's world is E. But E is not private: it is the same for any agent with the same factorization. E is the channel that lets agents learn about X via D and also—when shared—lets them communicate. The solipsism is structural (relative to E), not personal.

5.632 *Das Subjekt gehört nicht zur Welt, sondern es ist eine Grenze der Welt.*
The subject does not belong to the world: rather, it is a limit of the world.

Formalization. The five-tuple u is not an event in E. It is the structure that organizes events. The subject is the factorization: the lens through which X becomes knowable.

9 6. Die allgemeine Form / The General Form

6. *Die allgemeine Form der Wahrheitsfunktion ist:* $[\bar{p}, \bar{\xi}, N(\bar{\xi})]$.
The general form of truth-function is $[\bar{p}, \bar{\xi}, N(\bar{\xi})]$.

Formalization. The general form in the UM is:

$$(f_p(t))_j = \max_{i \in I} \min(t_i, p_{ij}).$$

Both are universal: Wittgenstein's N-operator generates all Boolean truth-functions; the UM forward pass generates all tropical polynomials.

6.1 *Die Sätze der Logik sind Tautologien.*
The propositions of logic are tautologies.

Formalization. The tautologies of the $(\max, \min)$ semiring—$\min(s, 255) = s$, distributivity, absorption—hold for all support values, independent of data. They say nothing about X.

Structural commitments (e.g. excluded middle) can be written into P as self-knowledge: the model encodes its own structural assumptions as patterns, making them introspectable.

6.3 *Die Erforschung der Logik bedeutet die Erforschung aller Gesetzmässigkeit. Und ausserhalb der Logik ist alles Zufall.*
Logical research is the exploration of all regularity. And outside logic everything is accidental.

Formalization. The study of the semiring and event space structure is the study of what holds necessarily. Outside this structure—the specific data, the specific counts—everything is contingent.

6.41 *Der Sinn der Welt muss ausserhalb ihrer liegen.*
The sense of the world must lie outside the world.

Formalization. E is not X. The sense (meaning, purpose) of X is not representable in E. The factorization—the choice of how to decompose reality into events—comes from outside the current model.

6.5 *Zu einer Antwort, die man nicht aussprechen kann, kann man auch die Frage nicht aussprechen. Das Rätsel gibt es nicht.*
When the answer cannot be put into words, neither can the question. The riddle does not exist.

Formalization. When an answer is not representable in E, the question is not expressible in E. There are no "unsolvable problems"—only questions that presuppose event spaces the agent does not have.

10 7. Schweigen / Silence

7. *Wovon man nicht sprechen kann, darüber muss man schweigen.*
Whereof one cannot speak, thereof one must be silent.

Formalization. The left of E is unavailable to language. *Kann* (cannot), not *darf* (may not): this is a statement about the boundary of expressibility, not a recommendation.

Three sources of silence:

1. Events outside E: not representable, no support function defined.
2. Events in E without support: $\min(0, p) = 0$ for all p; the forward pass yields zero.
3. The architecture itself (E, the factorization): shown, not said (2.172).

Silence is broken by adding evidence (observation), belief (axiom), or abduction (pattern commitment). Each requires energy in the information-theoretic sense.

11 The Chain $X \to E \to T$

Wittgenstein		UM
Die Welt (X)	$\to$	Reality (the territory)
Tatsachen (facts)	$\to$	Events in E (the map)
Sachverhalte (atomic facts)	$\to$	Joint events with $s > 0$
Bilder (pictures)	$\to$	T (total thought)
Sätze (propositions)	$\to$	Statements about X in E
Wahrheitsfunktionen	$\to$	$(\max, \min)$ compositions
Logische Form	$\to$	Event space structure E
Das Mystische	$\to$	X as not projected into E
Schweigen (silence)	$\to$	The boundary of E

12 Factor Maps and Scientific Revolutions

The factorization of X into E is not unique. Different factorizations capture different aspects of X. A scientific revolution is a change of factorization.

Definition 1 (Factor map)**.** *A* factor map $\phi : E' \to E$ *is a surjection from a finer event space E' to a coarser one E such that the coarse model embeds into the fine one: every proposition expressible in E is expressible in E'.*

Newton's mechanics uses event space E_N. Einstein's uses E_E. There exists a factor map $\phi : E_E \to E_N$: every Newtonian proposition is expressible in Einsteinian terms. Newton was not wrong but right to a degree quantifiable as $I(E_E) - I(E_N)$—the mutual information captured by Einstein but not by Newton. The precession of Mercury's perihelion (43 arcseconds per century) is a proposition in $E_E \setminus \phi^{-1}(E_N)$: real, measurable, and inexpressible in Newtonian terms.

This extends Wittgenstein's framework: the factorization tower applied to the history of physics. Each scientific revolution is a tock step—the discovery of a finer event space.

13 Surprise and Self-Knowledge

Wittgenstein's 3.05 raises the question of a priori knowledge. The UM provides a concrete mechanism for one form of it: self-knowledge via named event spaces.

When the support function assigns high values to both A and $\bar{A}$ simultaneously, the result is surprise: the event space structure is in tension with the data. If the event space is named (its events have linguistic labels), this tension can be expressed as a proposition: "there is strong support for both A and its complement."

This is the recognition of surprise—an element of T about T itself, made possible by pulling the model's own epistemic state into E (representing self-knowledge as events rather than leaving it implicit). In CMP's SN notation, this is the "want pulled into E": the model's own states become events it can reason about using the same $(\max, \min)$ machinery.

14 Proposition 7 Revisited

Die Grenzen meiner Sprache bedeuten die Grenzen meiner Welt.—But I am in the world, and the world is larger than my language. Beyond E, I can only gesture and hope the reader looks past the finger.

E cannot contain its own factorization (2.172, 4.12). But E can be extended: Gödel's treadmill. Each extension makes new propositions sayable and reveals new silences. The Tractatus is written at the boundary of one E, pointing outward.

Wittgenstein later moved from the rigid logical form of the Tractatus to the plurality of language games in the *Investigations*. In UM terms: from a single E to a factorization tower of event spaces, each with its own grammar. The tock step formalizes this move.

References

[1] Ludwig Wittgenstein. *Tractatus Logico-Philosophicus*. 1921. Trans. C.K. Ogden, 1922.

[2] Michaeljohn Clement. *CMP*. `https://cmpr.ai/cmp.pdf`, 2026.