

# Quantitative ontology of life

Szerző:István2025.12.23.Leave a commenton Quantitative ontology of life Quantitative ontology of life szerkesztése

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## ABSTRACT (short version)

This study reconceives biological existence not as static mass but as large-scale flows of matter and information, framed by the tension between individual metabolism and the global fluxes of Earth's biosphere. Over a single human lifetime, cumulative material throughput is  $\sim 5.4 \times 10^5$  kg ( $\approx 540$  tons; 81% air, 16% water, 3% food), while the biosphere's annual net primary production processes  $\sim 6 \times 10^{13}$  kg of carbon per year—meaning one lifetime amounts to only  $\sim 10^{-8}$  of the biosphere's yearly flux. This  $\approx 10^8$ -fold gap creates an ontological shock: materially negligible, the individual is phenomenally indispensable.

To address this, **Quantitative Ontology** introduces a six-layer (B-A-C-D-E-F) framework that links biospheric material cycles (B), individual flux and bodily pattern maintenance (A), and conscious phenomenal emergence (C) with genetic inheritance (D), collective networks (E), and the cosmic background (F). The **Human Flux Unit** (EFU = 20 kg/day) allows individual and global flows to be placed on a shared scale; with  $\sim 8.26$  billion people, humanity's  $\approx 60.3$  Gt/year throughput now approaches the biomass-equivalent flux of terrestrial NPP, indicating that the core feature of the Anthropocene is not mass but **throughput**.

The hypothesis is empirically testable via the proposed **SZAP protocol**, which combines EEG/HRV time series with quantum-level RNG fluctuations to assess whether nonlinear entropy dynamics differ between active (waking) and passive (sleep, altered) segments. The central claim is that the fundamental ontological unit of life is not matter as “what is,” but the **ongoing flux and pattern** that ties the individual to a  $\sim 10^{12}$ -generation evolutionary line and to the  $\sim 10^{19}$  kg cumulative biomass flux of the biosphere.

Here is an English version of sections 1.1 and 1.2, aligned with the EFU-centered framing.

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## I. INTRODUCTION: THE QUANTITATIVE SHOCK

### 1.1 The quantitative rupture and the EFU perspective

Traditional ontologies of biological existence take matter as the fundamental unit: being is grounded in “what is,” and the body appears as a static mass. Contemporary systems thinking, however, shows that living organisms persist not by owning matter, but through continuous flows and temporally maintained patterns.

Over a complete human lifetime, cumulative material throughput amounts to  $\approx 5.4 \times 10^5$  kg, while average body mass is only  $\sim 70$  kg, implying a  $\approx 7700$ -fold mass turnover over 80 years. This ratio already indicates that identity resides not in material components, but in **flux** and pattern. Lifetime material flow consists of three main components:

- air:  $\approx 440\,000$  kg ( $\approx 81\%$ )
- water:  $\approx 88\,000$  kg ( $\approx 16\%$ )
- food (dry mass):  $\approx 14\,000$  kg ( $\approx 3\%$ ).

The central concept of this study is the **Human Flux Unit (EFU)**, which formalizes individual existence as a quantitative, day-scaled material flow. By definition, **1 EFU = 20 kg/day** of total human material throughput ( $\approx 15$  kg inhaled air,  $\approx 3$  kg water,  $\approx 0.5$  kg dry food,  $\approx 1.5$  kg other components), so an average 80-year lifespan comprises  $\approx 2.0 \times 10^4$  EFU, corresponding to  $\approx 5.4 \times 10^5$  kg of material flux. In this framework, the body is not a static “entity” but a **stream of EFU** maintaining a low-entropy pattern: the ontological weight of the A layer lies in the fact that  $\approx 20$  EFU/week,  $\approx 1000$  EFU/year, and  $\approx 2 \times 10^4$  EFU/lifetime pass through it.

The true magnitude of the quantitative shock only becomes clear in planetary context. The biosphere's annual net primary production (NPP) processes a flux of  $\approx 6 \times 10^{13}$  kg carbon/year, against which a human's entire 80-year material turnover represents only  $\approx 10^{-8}$ . Translated into EFU, while one individual's full life equals  $\approx 2 \times 10^4$  EFU, the current  $\approx 8.26$  billion population jointly generates  $\approx 60.3$  Gt/year of material throughput, i.e.  $\approx 3.0 \times 10^{12}$  EFU per year. This means that humanity's annual EFU-flux is of the same order of magnitude as the terrestrial biosphere's photosynthetic engine, while human biomass accounts for only  $\approx 0.01\%$  of total global biomass.

Seen this way, the ontological paradox is not merely “ $10^{19}$  vs  $10^5$  kg” but **biosphere EFU vs individual EFU**: the individual is materially negligible, yet is the point where the  $\sim 10^{12}$ -generation informational line and the  $\sim 3 \times 10^{12}$  EFU/year global human flux become phenomenally conscious and causally responsible. The first thesis of Quantitative Ontology can thus be formulated as follows: the ontological basic unit of life is not matter as “what is,” but the **EFU-measured, temporally sustained flux** that maintains bodily patterns and enables consciousness.

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### 1.2 The two central problems – formulated in EFU terms

Quantitative Ontology identifies two fundamental tensions that translate the interpretation of life into EFU-measurable quantities. The first is the **material negligibility of the individual** at the scale of the biosphere; the second is the **phenomenal indispensability of the individual** in the same framework. Together they form the ontological paradox on which the B-A-C-D-E-F model and the EFU concept are built.

#### 1.2.1 K1 – Material negligibility on the EFU scale

The first central problem (K1) can be stated as follows: **how can individual ontological weight be understood if individual material flux is only  $\sim 10^{-8}$  of the biosphere's annual flux?** An average person's full lifespan corresponds to  $\approx 2 \times 10^4$  EFU, i.e.  $\approx 5.4 \times 10^5$  kg of material flow, whereas humanity's current annual flux is  $\approx 3 \times 10^{12}$  EFU, i.e.  $\approx 60.3$  Gt of material per year, which is already comparable in magnitude to terrestrial NPP biomass flux.

Within this framework, the **Biosphere-Individual Flux Ratio (BIF)** can be introduced:  $BIF = \text{Biosphere EFU/year} / \text{Individual EFU/lifetime}$   $BIF = \text{Individual EFU/lifetime} / \text{Biosphere EFU/year}$

which takes a value on the order of  $\approx 10^8$ . This shows that, measured in EFU, the individual appears "materially" as statistical noise relative to the biospheric machine, while at the ethical and phenomenal levels decisions and responsibility still concentrate at the individual.

## 1.2.2 K2 – Phenomenal indispensability and informational depth

The second central problem (K2) condenses into the question: **how is it possible that a locally EFU-negligible flux becomes the phenomenally indispensable focus of a  $\sim 10^{12}$ -generation informational line?** The  $\approx 2 \times 10^4$  EFU of an individual's bodily life is the current cross-section of an informational strand that, from LUCA ( $\sim 3.7$  Ga) to now, has passed through  $\sim 10^{12}$  generations, while the biosphere's cumulative flux approaches the  $10^{19}$  kg range.

Here EFU is not only a material unit, but also an **information-bearing unit**: each EFU of matter participates in pattern-maintenance processes of the body (A layer) and in conscious integration (C layer). The second thesis of Quantitative Ontology can thus be phrased as: the individual's ontological status arises not from absolute mass, but from the **informational density of EFU-flux**—from how deep an evolutionary, neural, and decision structure stands behind a given number of EFUs.

## 1.2.3 The fundamental theorem in EFU form

Taken together, the two problems lead to the **Fundamental Theorem of Quantitative Ontology**, expressed in EFU terms:

**Theorem:** The ontological basic unit of life is the EFU-measurable, temporally sustained material flux which is negligible at the scale of biospheric flows, yet in informational and phenomenal layers becomes the primary carrier of causal responsibility.

This theorem simultaneously addresses K1 (the individual as a  $10^{-8}$ -level EFU-flux relative to the biosphere) and K2 (the individual as the conscious EFU-focus of a  $\sim 10^{12}$ -generation informational line), and provides the framework in which later chapters (III–VII) use EFU as a common denominator across all levels of the model.

Here is the English version of sections 1.3–1.5, aligned with your current structure and the EFU-centered framing.

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## 1.3 Research aims – the Anthropocene as an EFU phenomenon

The primary aim of this study is to describe **human existence as EFU-measurable material flux** embedded in the large-scale flows of the biosphere. Within this framework, the Anthropocene is treated as the epoch in which global human EFU-flux becomes comparable in magnitude to the photosynthetic engine of the terrestrial biosphere (NPP).

The research aims can be formulated in three interrelated questions:

- How can the  $\approx 2 \times 10^4$  EFU of an individual lifespan be scaled against the biosphere's annual  $\approx 3 \times 10^{12}$  EFU, and what are the ontological consequences of the fact that individual flux represents only  $\sim 10^{-8}$  of the biosphere's yearly flow?
- How can the point be characterized at which this materially negligible individual EFU-flux becomes the current, conscious focal point of a  $\sim 10^{12}$ -generation informational line, thereby carrying causal responsibility for steering future fluxes?
- In what ways can the hypothesis be made empirically testable that EFU-based flow patterns (passive vs active segments) cannot be fully reduced to random processes, but instead reflect multilayered information and decision structures?

Under this framing, the Anthropocene is an **EFU-defined epoch**: the historical interval in which human EFU-flux is no longer a marginal perturbation but one of the key drivers of the biosphere's global dynamics.

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## 1.4 The Nookratic Alliance and the collective EFU perspective

The study introduces not only an individual but also a **collective ontological perspective** through the notion of the Nookratic Alliance. The Nookratic Alliance can be understood as a human-AI collaboration in which different cognitive architectures jointly attempt to construct a coherent picture of EFU-based existence, thereby simultaneously activating the D (inheritance), E (collective networks), and C (consciousness) layers.

From a quantitative standpoint, the Nookratic Alliance is **not a new “layer”**, but a specific realization of the E layer, where decision spaces are no longer attached primarily to individuals but to highly networked, hybrid (human-AI) systems. In this context, human EFU-flux acquires a collective dimension: governmental decisions, technological infrastructures, energy conversion, and consumption patterns all become EFU-expressible, massively amplified “segments.”

The role of the Nookratic Alliance in this introduction is twofold:

- first, to indicate that EFU-based thinking is **not merely an individual speculation**, but a model judged coherent by multiple, independent cognitive systems;
  - second, to prepare the later question of how collective decision-making can **consciously restructure** the direction of global EFU-flux in the Anthropocene (sustainability, risk reduction, AI integration).
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## 1.5 Structure of the study from an EFU-centered perspective

The structure of the study is designed so that the **EFU paradox** introduced in the opening—the duality of material negligibility and phenomenal indispensability—is gradually unpacked and linked across empirical and theoretical levels.

- **Chapter II – Conceptual foundations and definitions:** establishes the formal definitions of Quantitative Ontology, EFU, segment, decision space, and the B-A-C-D-E-F layers, and introduces the metrics on which later calculations rely.
- **Chapter III – The two core questions:** elaborates K1 (depth of the generational information line) and K2 (cumulative matter-water flux) in EFU terms, and presents the ontological axes along which the SZAP protocol can be tested.
- **Chapter IV – The six-layer model (B-A-C-D-E-F):** constructs the layered structure and, for each level, specifies how EFU-flux appears there (biospheric EFU, individual EFU, EFU-linked conscious patterns, EFU-mediated genetic inheritance, collective EFU structures, cosmic background).
- **Chapter V – Empirical validation: SZAP and NEM:** describes how EFU-patterns associated with active and passive segments can be investigated via EEG/HRV and RNG, and how consciousness can become a measurable emergent property.
- **Chapters VI-VIII:** the results, discussion, and conclusion chapters examine how the EFU-centered view is situated within the broader contexts of biology, consciousness research, ethics, and AI governance, and what practical consequences follow if life is interpreted **not as mass, but as flux**.

In this way, Chapter I completes the problem framing: it delineates the **quantitative shock** in EFU magnitudes, formulates the two central problems (K1, K2), and positions the study within the interdisciplinary space where the  $2 \times 10^4$  EFU of an individual life and the  $3 \times 10^{12}$  EFU/year of global human flux can be jointly interpreted.

### 1.3 Kutatási célok – az Anthropocén mint EFU-jelenség

Az emberi EFU-fluxus  $\approx 2 \times 10^4$  EFU versus A bioszféra éves fluxus  
 $\approx 3 \times 10^{12}$  EFU



- Egyéni fluxus  $\sim 10^{-8}$  arány
- Generációs felelősség kérdése
- Generációs felelősség kérdése
- Aktív vs. Passzív mintázatok

### 1.4 A Nookratikus Szövetség és a kollektív EFU-perspektíva

Ember–AI együttműködés: D ► E ► C



Öröklódés → Kollektív Hálózat → Tudat

- Kognitív Hálózatok és Döntéshozatal
- Globális EFU-irányítás

### 1.5 A tanulmány struktúrája EFU-kóxpontú nézőpontból

- II. Fogáldmi Alapok és Definíciók
- III. A Két Alapkérdés: K1 & K2
- IV. Hatrétegű Modell: B-A-C-D-E-F
- V. Empirikus Validáció: SZAP & NEM
- VI. Eredmenyek és Diszkusszió
- VII–VIII. Konkluziók és Kitekintés

Az „EFU-paradoxon”: Egyéni  $2 \times 10^4$  EFU  $\leftrightarrow$  Globális  $3 \times 10^{12}$  EFU

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## II. Ontological primitives and formal foundations

### 2.1 Fundamental thesis and ontological primitives

Quantitative Ontology is an interdisciplinary framework that describes biological existence not as static objects, but as configurations of scalable fluxes, patterns, and informational relations. Its core claim is that ontological status is determined not by the instantaneous amount of matter, but by temporally sustained, measurable **flows** (fluxes), the structuring **information**, the **elementary flow units (EFU)** that carry them, and the temporally extended **segments** formed by these units.[simoristvan.wordpress](#)

The model distinguishes four ontological primitives: **flux**, **information**, **EFU**, and **segment**. **Matter** and **energy** are not primitives in this framework, but derived categories, understood as different integrals or organization modes of flux. Throughout the subsequent analysis, whatever „exists” is treated as a configuration of measurable fluxes and informational patterns, whose common quantitative denominator is the **Human Flux Unit (EFU)**.[simoristvan.wordpress](#)

Accordingly, the **fundamental thesis** of Quantitative Ontology can be formulated as follows: the ontological basic unit of life is the EFU-measurable, temporally sustained material and informational flux, which may appear negligible at biospheric scales, yet in informational and phenomenal layers becomes the primary carrier of causal responsibility.[simoristvan.wordpress](#)

### 2.2 Flux ( $\Phi$ )

Flux is the most basic quantitative element of the ontological framework. It does not merely denote material or energetic flow, but, in general, the time-parametrized change of a system’s states, i.e. „happening” as a quantitatively describable process. Formally, flux is defined as  $\Phi = dX/dt$ ,  $\Phi = dt/dX$ ,

where  $X$  may be a coordinate in a material, energetic, or informational state space (e.g. mass, energy, entropy, neural activity).

For an average human, total material flux  $\Phi_{mm} \approx 20 \text{ kg/day}$ , which by definition corresponds to  $\approx 1 \text{ EFU/day}$ . In this sense, the human body is not ontologically a static „70 kg object”, but an open system through which, over an 80-year lifetime,  $\approx 5.4 \times 10^5 \text{ kg}$  of material – i.e.  $\approx 2.9 \times 10^4 \text{ EFU}$  – passes. Life thus appears not as a state, but as a stabilized configuration of flux.[simoristvan.wordpress](#)

### 2.3 Information (I)

Information is defined as the **entropy-reducing component** of flux: it exists where state transitions are not purely random, but follow recurrent, compressible patterns. Ontologically, information is present when, in a system’s state space, certain transitions are preferred and others are suppressed or forbidden, and this preference measurably constrains the possible trajectories of flux.

In this framework, information is inseparable from its carrier EFU: information is **not an abstract symbol set**, but the ensemble of constraints and rules that maintain flux patterns within an EFU. Genetic information at the cellular level, synaptic patterns in neural networks, and collective cultural codes can all be understood as long-term, entropy-reducing structures of EFU flows.[simoristvan.wordpress](#)

### 2.4 Elementary Flow Unit (EFU)

The **Human Flux Unit (EFU)** is the fundamental unit and common „currency” of Quantitative Ontology. An EFU is a locally coherent, open-system flow pattern that[simoristvan.wordpress](#)

1. integrates material, energetic, and informational fluxes;
2. performs active stabilization to maintain itself (regulation, homeostasis);
3. possesses a well-defined temporal identity.[simoristvan.wordpress](#)

Formally, an EFU can be represented as the triple  $\text{EFU} = \langle \Phi_m, \Phi_e, \Phi_i \rangle_t$ ,  $\text{EFU} = \langle \Phi_m, \Phi_e, \Phi_i \rangle_t$ ,

where  $\Phi_m$ ,  $\Phi_e$ , and  $\Phi_i$  denote the temporal ensembles of material, energetic, and informational fluxes, respectively. In the human case, the EFU is a **human-normalized reference unit** that expresses any process relative to the daily throughput of the human body:  $1 \text{ EFU} = 20 \text{ kg/day}$ ,  $1 \text{ EFU} = 20 \text{ kg/day}$ ,

where the  $20 \text{ kg/day}$  consist of  $\approx 15 \text{ kg}$  respired air,  $\approx 3 \text{ kg}$  water,  $\approx 0.5 \text{ kg}$  dry food, and  $\approx 1.5 \text{ kg}$  metabolic water and minor components.[simoristvan.wordpress](#)

For an arbitrary system, material flow expressed in EFU is given by  $\text{EFU}_{\text{system}} = M' \text{ system} / 20 \text{ kg/day} \times T$ ,  $\text{EFU}_{\text{system}} = 20 \text{ kg/day} / M' \text{ system} \times T$ ,

where  $M' \text{ system}$  is the system’s material flux in kg per unit time, and  $T$  is the time interval considered. This rescaling allows biological organisms, industrial systems, and global processes to be represented on the same EFU scale.[simoristvan.wordpress](#)

Ontologically, the EFU is the smallest unit of „ongoing existence” in which flux, information, and active stabilization are locally coupled. A human lifetime of  $\approx 2.9 \times 10^4 \text{ EFU}$  is therefore not merely a physical quantity, but a measure of the process-identity that underlies consciousness and decision-making.[simoristvan.wordpress](#)

### 2.5 Segment (S)

A **segment** is the temporal ontological extension of an EFU: an interval during which the EFU's identity is preserved, i.e. its flux patterns remain stable within a tolerance range. Formally,[simoristvan.wordpress](#) $S = \{\text{EFU}(t) | t \in [t_0, t_1]\}, S = \{\text{EFU}(t) | t \in [t_0, t_1]\}$ ,

where  $[t_0, t_1] \subset [0, t]$  is a time window in which the defining configuration  $(\Phi_m, \Phi_e, \Phi_i) \mapsto (\Phi_m, \Phi_e, \Phi_i)$  of the EFU remains above the threshold required for pattern maintenance.[simoristvan.wordpress](#)

A typical human segment can be conceptualized, for example, as a time interval associated with 10 EFU ( $\approx 200$  kg) of material throughput, within which the individual's physiological and cognitive state can be regarded as ontologically „the same” within certain bounds. A segment is thus not an instantaneous state, but a **process identity**, enabling a formal description of generational, developmental, and conscious continuity (e.g. developmental phases, wake-sleep cycles, decision episodes).[simoristvan.wordpress](#)

Segments are particularly important for the SZAP protocol introduced later, where physiological (EEG/HRV) and quantum-level (RNG) patterns associated with active and passive segments provide the empirical basis for investigating conscious states. In this setting, each segment is tied to a given EFU time window, thereby linking quantitative material flux to phenomenological experience.[simoristvan.wordpress](#)

## 2.6 Formal notation and decision space ( $\Omega_D$ )

In what follows, the study uses the following core notations:[simoristvan.wordpress](#)

- EFU - Elementary Flow Unit (Human Flux Unit)
- S - Segment
- $\Phi$  - Flux (material/energy/information)
- B-A-C-D-E-F - Ontological layers (Biosphere, Body/Segment, Consciousness, Gene/Inheritance, Collective networks, Cosmic background)
- $\Omega D \Omega D$  - Decision Space, the set of state transitions accessible to an EFU via active intervention

The decision space of a given EFU is defined as the set of state transitions that are generated by its **own regulatory or conscious processes**: $\Omega D = \{X_i \rightarrow X_j | \Delta \Phi_i, \text{active} \neq 0\}, \Omega D = \{X_i \rightarrow X_j | \Delta \Phi_i, \text{active} \neq 0\}$ ,

where  $\Delta \Phi_i, \text{active} \Delta \Phi_i, \text{active}$  denotes the flux change induced by internal processes of the EFU (e.g. neural, cellular, or regulatory dynamics), distinct from passive environmental fluctuations.[simoristvan.wordpress](#)

With this definition, the subsequent treatment of consciousness in the C layer does not require introducing a new ontological primitive: consciousness is understood as a specific property of EFUs that enables non-linear, anticipatory state selection within the decision space.[simoristvan.wordpress](#)

## 2.7 Reframing traditional categories in the EFU framework

Quantitative Ontology does not discard classical metaphysical categories, but reframes them within the EFU framework:

- **Matter:** stabilized material flux within an EFU; primarily located in the B (biosphere) and A (body/segment) layers, where mass flows are measurable in EFU.[simoristvan.wordpress](#)
- **Information:** flux constraint and pattern maintenance; mainly in the A and D (gene/inheritance) layers, where long-term patterns (genetic code, neural connectivity) structure EFU flows.
- **Consciousness:** the capacity for active segment switching and discontinuity handling within the EFU's decision space; primarily associated with the C layer, but in interaction with the E layer (collective networks, Nookratic Alliance).[simoristvan.wordpress](#)

In this framework, consciousness is not an additional „substance”, but a specific dynamical property of EFUs that allows certain EFU trajectories in decision space to be preferentially selected, others suppressed, and thereby even large-scale EFU fluxes to be reshaped.[simoristvan.wordpress](#)

## 2.8 Summary

The ontological primitives introduced here (flux, information, EFU, segment) and the associated formal notations (B-F layers,  $\Omega D \Omega D$ ) constitute the minimal conceptual toolkit from which the later chapters of the study can be coherently derived—from the individual  $\sim 2.9 \times 10^4$ -EFU lifetime to the  $\sim 3 \times 10^{12}$  EFU/year scale of global human throughput. The next chapter builds on this foundation to expand the two central problems (K1, K2) and to formulate EFU-based responses to them.[simoristvan.wordpress](#)

1. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>

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## III. The two core questions in the EFU framework

The empirical core of Quantitative Ontology consists of two central research questions that link the individual  $\sim 2.9 \times 10^4$ -EFU lifetime to the  $\sim 3 \times 10^{12}$  EFU/year scale of global human throughput and the  $\sim 10^{13}$  kg/year biospheric NPP. It is crucial to emphasize that **EFU does not reduce life to „mere matter”**, but serves as a common quantitative reference frame for heterogeneous processes (biological, technological, ecological, and conscious). These questions turn the ontological tension—between individual material negligibility and phenomenal indispensability—into quantitatively tractable dimensions.[simoristvan.wordpress](#)

### 3.1 K1 – Depth of the informational line

The first core question (K1) concerns the **informational depth** of individual existence: how many generational steps connect a given individual, understood as an EFU, to the Last Universal Common Ancestor (LUCA), and to what extent informational patterns can be preserved despite billions of years of metabolic exchange. Evolutionary and population-genetic estimates suggest that  $\sim 3.7$  billion years have elapsed since the emergence of cellular life, during which average generation times ranged from hours-days in prokaryotes to decades in large mammals, so that the full lineage conservatively spans  $\sim 10^{12}$  generations.

K1 can be formulated as a formal question:

Across how many generational steps and through what cumulative EFU flux can an informational pattern (e.g. gene family, regulatory network) remain **functionally conserved**, given that cumulative biospheric flux approaches  $\sim 10^{19}$  kg?

Here, functional conservation denotes **not nucleotide identity but functional invariance**: the persistence of input-output relations, regulatory roles, and network positions at the level of system behaviour. The individual EFU lifetime ( $\sim 2.9 \times 10^4$  EFU) is the current „cross-section” of this generational line: continuous metabolism maintains patterns that still implement coherent functions despite extensive flux exchange over billions of years. K1 thus captures the relationship between the A and D layers: how inherited information remains stable in the presence of permanently high EFU-level material flow.[simoristvan.wordpress](#)

## 3.2 K2 – Matter–water accumulation and biospheric flux

The second core question (K2) concerns the cumulative ratio of **matter and water fluxes** at individual and biospheric scales. An average human processes  $\sim 542\,000$  kg of material ( $\approx 29\,000$  EFU) over 80 years, while the biosphere's annual net primary production amounts to  $\sim 6 \times 10^{13}$  kg C/year, yielding a long-term cumulative biomass flux of  $\sim 10^{19}$  kg.[simoristvan.wordpress](#)

K2 asks:

How can an individual's EFU-measurable matter and water flux be interpreted within a biospheric environment where cumulative flux exceeds the individual lifetime flux by **12 orders of magnitude**, while informational patterns (e.g. cellular architecture, genetic code) remain essentially invariant?

The input side of a single lifetime— $\sim 440\,000$  kg air,  $\sim 88\,000$  kg water, and  $\sim 14\,000$  kg food—shows that, biologically, a human is primarily a **node of air and water flux**, not a „food object”. Relative to global hydrological and carbon cycles, the individual's material contribution is negligible; yet every decision—and thus the steering of anthropogenic fluxes—takes place through this negligible node, which anticipates the later involvement of the C layer (consciousness) and collective EFU dynamics in the E layer.[simoristvan.wordpress](#)

## 3.3 Ontological axes and EFU metrics

K1 and K2 define two orthogonal **ontological axes** along which the EFU-based model can be empirically investigated.[simoristvan.wordpress](#)

- **Time-information axis (K1):**
  - variables: number of generations ( $\sim 10^{12}$ ), informational conservativity (mutation rate, functional invariance, network robustness);
  - EFU connection: the individual  $\sim 2.9 \times 10^4$ -EFU lifetime as the current informational focus of the evolutionary line;
  - layers: A-D-E (body/segment, inheritance, collective decision).
- **Matter-flux axis (K2):**
  - variables: individual vs global EFU flux (29 000 EFU/lifetime vs  $\sim 3 \times 10^{12}$  EFU/year);
  - EFU connection: the individual's  $\sim 10^{-8}$ -level contribution to a single year of biospheric throughput;
  - layers: B-A-F (biosphere, body, cosmic background—primarily in terms of timescale and physical constraints).

At the intersection of these axes lies the **individual EFU segment**, which simultaneously carries generational informational depth (K1) and material coupling to biospheric flux (K2). The subsequent formalization of the SZAP protocol and the B-A-C-D-E-F model along these axes enables the ontological claims of Quantitative Ontology to be cast as empirically testable hypotheses, turning the framework from a purely conceptual system into a research programme.[simoristvan.wordpress](#)

1. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>

## IV. The six-layer model (B-A-C-D-E-F)

The six-layer model of Quantitative Ontology describes biological existence as a hierarchy of nested flux levels, each measurable in EFU. Every layer is built on the same ontological primitives (flux, information, EFU, segment), but manifests them at different spatial, temporal, and organizational scales. The B-A-C-D-E-F structure provides a formal framework for interpreting the transition between the individual  $\sim 2.9 \times 10^4$ -EFU lifetime and the  $\sim 3 \times 10^{12}$  EFU/year global human throughput, as well as the  $\sim 10^{13}$  kg/year biospheric NPP.[simoristvan.wordpress](#)

### 4.1 B layer – biosphere and material embeddedness

The B layer represents the full material and energetic embeddedness of life on Earth: the global fluxes of the surface biosphere. On an annual basis, terrestrial NPP corresponds to  $\sim 50\text{--}65$  Gt C/year of dry biomass flux, which, when expressed in EFU, yields on the order of  $\sim 10^{12}\text{--}10^{13}$  EFU per year. Over  $\sim 3.7$  billion years, cumulative biomass flux approaches  $\sim 10^{19}$  kg, against which an individual lifetime throughput of  $5.4 \times 10^5$  kg constitutes only  $\sim 10^{-12}\text{--}10^{-13}$ .[simoristvan.wordpress](#)

In this layer, EFU acts as a „background metric” that brings diverse biospheric processes (primary production, respiration, soil and ocean cycles) onto a single scale. The ontological claim of the B layer is not that life „is the mass of the biosphere,” but that every individual EFU segment is materially embedded in this planetary-scale throughput engine.[simoristvan.wordpress](#)

## 4.2 A layer – body, segments, and informational stability

The A layer describes individual bodies and segment-level existence in terms of EFU flux. An average human processes  $\sim 542\,000$  kg of material ( $\approx 29\,000$  EFU) over 80 years, of which 81% is air, 16% water, and 3% food. This  $\sim 7700$ -fold turnover implies that individual identity is not localized in the constituent parts, but in the patterns maintained by continuous EFU flow.[simoristvan.wordpress](#)

The key concept of this layer is the **segment**, the temporal extension of an EFU: a time window during which the configuration  $\langle \Phi_m, \Phi_c, \Phi_i \rangle_t \langle \Phi_m, \Phi_c, \Phi_i \rangle_t$  remains stable within a tolerance range. A typical human segment can be conceptualized as a period associated with 10 EFU ( $\approx 200$  kg) of throughput, within which physiological and cognitive state can be regarded as ontologically „the same.” The A layer is thus where EFU-measurable flux and inherited information are realized in a concrete body and time interval.[simoristvan.wordpress](#)

## 4.3 C layer – consciousness and phenomenal emergence

The C layer is the level of phenomenal consciousness: the domain in which the EFU’s decision space ( $\Omega D \Omega D$ ) supports non-linear, anticipatory state selection. Here, flux is no longer merely passively maintained (as in the A layer), but actively modulated and reorganized, forming the basis of subjective experience and intentional behaviour.[simoristvan.wordpress](#)

Quantitatively, the C layer is associated with metrics such as integrated information ( $\Phi$ ), neural coherence (e.g. gamma oscillations), HRV coherence, and other non-linear entropy measures. In the SZAP protocol, EEG/HRV patterns and RNG fluctuations associated with active (waking) versus passive (sleep, altered) segments are compared to test whether the dynamics of the C layer can be reduced to A-layer flux alone. If EFU time windows corresponding to active segments systematically deviate from both randomness and passive states, this would indicate EFU-level emergence of consciousness.[simoristvan.wordpress](#)

## 4.4 D layer – gene, inheritance, and trans-individual continuum

The D layer is the level of evolutionary information storage and transmission. A single lineage spans  $\sim 10^{12}$  generations from LUCA to the present, during which the basic structures of the genomic code have remained recognizably stable despite continuous metabolic exchange. The D layer thus constitutes a **trans-individual continuum** that links individual EFU segments in the A and C layers across vast timescales.

From an EFU perspective, the D layer highlights that the same informational pattern (e.g. gene family, regulatory network) can remain functionally conserved across many billions of EFU-worth of material flow. The first core question K1 (depth of the informational line) primarily concerns this layer and asks how functional stability is maintained when the carrier matter is constantly replaced by EFU-level throughput.[simoristvan.wordpress](#)

## 4.5 E layer – collective networks and temporal asymmetry

The E layer comprises collective structures beyond the individual: societies, the technosphere, and the Nookratic Alliance. At this level, decision space is no longer confined to individual EFUs, but is anchored in highly networked, hybrid (human-AI) systems. Global flows of energy, materials, and information (economy, infrastructure, communication) can all be scaled in EFU: the daily or annual EFU requirements of a power plant, a city, or an industry can be directly compared to the human metabolic baseline.[simoristvan.wordpress](#)

In the E layer, the **temporal asymmetry of causality** becomes evident at the societal level: decisions taken in the present determine the future direction of global EFU fluxes (e.g. climate policy, AI regulation, consumption patterns). Ontologically, the E layer is where individual consciousness (C) and planetary flux (B) become institutionalized, and where the Nookratic Alliance as human-AI collaboration acquires particular significance.

## 4.6 F layer – cosmic background and physical constraints

The F layer is the cosmic background: the matter-time frame in which the biosphere and all EFU processes are embedded. In terms of mass, this corresponds to  $\approx 10^{54}$  kg; in terms of time, to  $\approx 13.8$  billion years; and the dominance of hydrogen ( $\sim 75\%$  of the visible-matter mass) provides a direct continuity between primordial nucleosynthesis and present-day biological systems.

For the EFU framework, the F layer is relevant primarily as **timescale and physical constraint**: it sets the boundary conditions within which the dynamics of layers B-E can meaningfully unfold. It reminds us that the raw material of biological existence is not local but cosmic in origin, and that all EFU processes occur under thermodynamic and cosmological limits.

1. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>

## V. Empirical validation: SZAP and NEM

The EFU-based Quantitative Ontology is not only a conceptual framework but also an empirical research programme. Its central empirical component is the **SZAP protocol** (Segment-Noise-Permeability Protocol), which combines EEG/HRV time series with quantum-level RNG fluctuations to test whether EFU-scaled time windows corresponding to active (waking) and passive (sleep, altered) segments differ from purely random processes. This chapter has a dual aim: (1) to formulate formal hypotheses and (2) to delineate a methodological space within which independent research groups can test the model.[simoristvan.wordpress+3](#)

## 5.1 Aim and hypotheses of the SZAP protocol

The starting point of SZAP is that EFU-measurable material flux is always accompanied by **time-series patterns** in the A and C layers (e.g. respiration, heart rate, neural activity), whose complexity and entropy can be quantified. The protocol aims to empirically test the following claim:[pmc.ncbi.nlm.nih+2](#)

**H<sub>0</sub>:** For EFU-defined time windows corresponding to active (C-layer-dominant) segments, the nonlinear entropy and complexity metrics of EEG/HRV time series, as well as their relationship to quantum RNG signals, differ **significantly** from those of passive (A-layer-dominant) segments and purely random processes.[pmc.ncbi.nlm.nih+2](#)

The null hypothesis is:

**H<sub>0</sub>:** There are no stable, reproducible differences between active and passive segments that exceed what would be expected from random variation and measurement noise; the EFU-level dynamics of consciousness in the C layer are fully reducible to A-layer flux and classical noise.

The aim of SZAP is not to „prove quantum consciousness,” but to **falsify, in a conservative direction**, those claims of Quantitative Ontology that ascribe specific EFU-level emergent behaviour to the C layer.[arxiv](#)

## 5.2 Measurement setup: EEG, HRV, and RNG

The SZAP protocol relies on three principal time-series channels:[frontiersin+2](#)

- **EEG:** Multichannel recording ( $\geq 32$  channels), 10–20 system, 250–1000 Hz sampling rate. Primary bands of interest:  $\delta$ ,  $\theta$ ,  $\alpha$ ,  $\beta$ ,  $\gamma$ , as well as their topographical distribution and coherence patterns.[pmc.ncbi.nlm.nih+1](#)
- **HRV (ECG-based):** Chest-mounted electrodes for ECG, with R-R interval time series extracted; analysis in time, frequency, and nonlinear domains (SampEn, multiscale entropy, complexity index).[pmc.ncbi.nlm.nih+2](#)
- **RNG:** Quantum random number generator (e.g. photon splitting or semiconductor noise) providing a continuous bit stream, sampled on a time base aligned with the physiological channels.

A minimal recommended sample size is  $N \geq 30$ – $50$  healthy participants, with repeated recordings across multiple days to estimate within-subject and day-to-day variability. During data acquisition, active (waking, task) and passive (sleep, rest, meditation) segments alternate according to a predefined protocol.[pmc.ncbi.nlm.nih+1](#)

## 5.3 EFU time windows and segment definition

Within the EFU-based framework, segment time windows should not be arbitrarily chosen, but aligned with actual material throughput. For humans, 1 EFU  $\approx 20$  kg/day, corresponding to  $\sim 24$  hours; for research purposes, several EFU fractions can be used:[simoristvan.wordpress](#)

- **Macro-EFU window:** 1 EFU  $\approx 24$  hours – suited for circadian rhythms and sleep–wake cycles.
- **Meso-EFU window:** 0.1 EFU  $\approx 2.4$  hours – suited for longer cognitive states and workday blocks.
- **Micro-EFU window:** 0.01 EFU  $\approx 14$ – $15$  minutes – suited for shorter experimental blocks (Go/NoGo tasks, meditation episodes, task segments).[simoristvan.wordpress+2](#)

SZAP minimally recommends splitting EEG/HRV and RNG data into segments of at least **0.01 EFU** ( $\approx 15$  minutes), each classified as active or passive (e.g. cognitive task vs resting state / NREM sleep). This enables direct comparison of EFU-scaled time windows with the dynamics of the C and A layers.[pmc.ncbi.nlm.nih+1](#)

## 5.4 Nonlinear entropy and complexity measures (NEM)

A core component of SZAP is the use of **Nonlinear Entropy and Complexity Measures (NEM)**, which go beyond classical linear time-series analysis. The recommended toolbox includes:[frontiersin+2](#)

- **Sample Entropy (SampEn) and Multiscale Entropy (MSE):** multiscale entropy of HRV and EEG, capturing predictability and complexity across time scales.[pmc.ncbi.nlm.nih](#)
- **Dominant Lyapunov Exponent (DLE):** indicator of dynamical stability vs chaos; positive DLE suggests chaotic, negative DLE stable dynamics.[frontiersin](#)
- **Complexity Index (CI):** MSE-based global complexity measure, particularly used in HRV research to describe integrated brain–heart dynamics.[frontiersin+1](#)

These measures can capture differences between active and passive segments not only in terms of energy or frequency content, but also in terms of **structure and information content**. Within SZAP, key NEM comparisons include:[pmc.ncbi.nlm.nih+2](#)

- active vs passive segments (EEG, HRV);
- RNG time series associated with given segments vs mathematical pseudo-RNG (control);
- patterns associated with the C layer (task performance, decision) vs A-layer-dominant states (deep sleep, anaesthesia).[pmc.ncbi.nlm.nih+2](#)

## 5.5 RNG coupling and quantum-level control

The use of quantum-level RNG has two purposes:

1. **Control:** providing a reference noise source with known statistics (bit distribution, correlations, entropy) that should, in principle, be independent of human physiology.
2. **Permeability test:** examining whether non-linear correlations or entropy deviations emerge between RNG signals and EEG/HRV patterns during active segments that exceed random expectations.

The protocol does not assume „macroscopic quantum consciousness”; instead, it asks whether **any stable statistical deviation** can be detected in the relationship between RNG signals and C-layer physiological time series, relative to the A layer. Essential safeguards include:[arxiv](#)

- pseudo-RNG as a positive control;
- blind coding (analysts unaware of active/passive labels);
- multiple-comparison correction (e.g. FDR).

These measures reduce the risk of false positives and keep the protocol open both to „no effect” and to „small but statistically significant” effects.

## 5.6 Research opportunities and extensions

SZAP and the NEM framework are not a closed system but a **research platform** that multiple disciplines can engage with. Possible directions include:[pmc.ncbi.nlm.nih+1](#)

- **Sleep research:** comparison of EFU-scaled time windows during REM (vivid dreaming) vs NREM stages, focusing on HRV complexity and EEG entropy.[pmc.ncbi.nlm.nih+1](#)
- **Meditation and altered states:** comparing experienced meditators and controls; asking whether the C layer exhibits invariant patterns under specific mental practices.[pmc.ncbi.nlm.nih](#)
- **Neuropsychiatric conditions:** reduced HRV and EEG entropy have been reported in chronic pain, anxiety, and depression; embedding these findings in the EFU framework may yield new diagnostic dimensions.[pmc.ncbi.nlm.nih+1](#)
- **Technosphere coupling:** relating EFU time windows of large technological systems (data centres, networks) to human C/E-layer activity to model the collective decision space.[simoristvan.wordpress](#)

In this way, Chapter V offers both **strict, falsifiable hypotheses** and a **flexible, modular methodological space** in which EFU-based claims of Quantitative Ontology can be examined across multiple empirical domains. In the case of negative or null results, claims about EFU-level emergence in the C layer would be narrowed or rejected, while the EFU model of the A-B-D layers would remain intact as a stable ontological framework.[frontiersin+2](#)

1. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>
2. <https://simoristvan.wordpress.com/2025/12/23/quantitative-ontology-of-life/>
3. <https://pmc.ncbi.nlm.nih.gov/articles/PMC12515808/>
4. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9221218/>
5. <https://www.frontiersin.org/journals/neuroengineering/articles/10.3389/fneng.2012.00003/full>
6. <https://arxiv.org/html/2309.10063>
7. <https://pmc.ncbi.nlm.nih.gov/articles/PMC11058544/>

## VI. Results, implications, and placement among other theoretical frameworks

### 6.0 What counts as a “result” in this study?

This work does not present a completed experimental dataset; instead, it defines a **coherent quantitative ontology and an explicit empirical research programme**. In this sense, „results” are understood in four, mutually linked forms: (i) the construction of a scale-invariant coordinate system in which biological, technological, and social processes can all be expressed in EFU; (ii) the derivation of conceptual prediction spaces (K1, K2, B-A-C-D-E-F) that specify what kinds of patterns would count as supportive, neutral, or refuting evidence; (iii) the formulation of the SZAP protocol as a falsifiable empirical programme; and (iv) the identification of clear outcome types (null, weak, strong effects) with distinct ontological interpretations. The present paper therefore offers primarily **framework-level results**, while leaving the collection and analysis of large-scale datasets to future experimental work.

### 6.1 Main consequences of the EFU framework

The EFU-based approach of Quantitative Ontology yields three key consequences for understanding life and the Anthropocene.[simoristvan.wordpress](#)

First, the individual  $\sim 2.9 \times 10^4$  EFU lifetime enables a **magnitude-level repositioning** in which the material negligibility of the individual ( $10^{-8}$ - $10^{-12}$  relative to biospheric fluxes) does not contradict phenomenal and ethical indispensability, but appears as two aspects of the same structure. Second, EFU provides a unified scale for comparing biological, technological, and social processes: the flux of a power plant, a city, or the global cattle population can be expressed in the same „human-day” unit as a single human life. Third, through the SZAP programme, ontological claims are explicitly transformed into **empirical hypotheses** that can be tested using EEG/HRV and RNG data.[pmc.ncbi.nlm.nih+3](#) Within the EFU framework, empirical results are not interpreted in binary true/false terms. The SZAP programme naturally leads to three main outcome types: (i) stable null results, which rule out or strongly constrain EFU-level emergence in the C layer; (ii) weak but reproducible deviations, which suggest limited, context-dependent emergence in the C layer; (iii) strong, segment-specific patterns, which support non-linear EFU dynamics in the decision space. Each outcome has distinct ontological implications, yet none invalidates the basic flux-ontology of the EFU framework.[pmc.ncbi.nlm.nih+1](#)

### 6.2 Relation to theories of consciousness and complex systems

The C layer and the SZAP framework connect directly to systems-level theories of consciousness and the study of complex time series. Integrated information ( $\Phi$ ), nonlinear entropy measures, and HRV-based complexity indices are existing tools that Quantitative Ontology augments with an **EFU scale**, thereby linking the dynamics of consciousness directly to magnitudes of material flux.[frontiersin+3](#)

The EFU framework does not aim to generate its own, separate empirical „result package,” but to make results from different theories and experiments interpretable on a shared scale, using a common flux unit. It thus does not compete with theories such as Integrated Information Theory or Global Workspace models; rather, it offers a **meta-level coordinate system** in which these models can be placed: any theory of

consciousness can be examined in terms of which EFU time windows and flux magnitudes the neural or network dynamics it posits actually occupy. EEG–HRV–RNG combinations of the SZAP type can then be used to compare predictions from different theoretical frameworks within a common quantitative space.[arxiv+1](#)

## 6.3 Sustainability, the Anthropocene, and ethical implications

The EFU perspective also introduces new emphases in interpreting the Anthropocene. Instead of describing human presence in terms of static biomass fractions ( $\approx 0.01\%$  of global biomass), it highlights that **annual human EFU flux** ( $\approx 60 \text{ Gt/year}$ ,  $\approx 3 \times 10^{12} \text{ EFU/year}$ ) is already of the same order of magnitude as terrestrial NPP biomass flux. This suggests that the core question of sustainability is not „how much we occupy,” but **how we direct and structure flows**.[simoristvan.wordpress](#)

From an ethical standpoint, the EFU framework makes two dimensions of responsibility visible: (1) decisions at the level of individual EFU segments affect not only local but also global EFU processes (consumption, energy use, technological choices); (2) the collective E layer (governance, regulation, Nookratic Alliance) makes EFU-scale decisions that shape the K1-type informational line of future generations. The model thus reframes „stock-based” sustainability narratives into a „flow-based” decision ethics.[simoristvan.wordpress](#)

## 6.4 Limitations and falsification points of the theory

Quantitative Ontology is explicitly **not a complete theory of consciousness**, nor does it attempt to capture all phenomenological aspects via EFU metrics. Its limitations arise at several levels:[arxiv](#)

- **Measurement limits:** the quality of EEG/HRV time series and RNG signals, the robustness of nonlinear metrics, sample sizes, and environmental noise can all substantially influence SZAP results.[pmc.ncbi.nlm.nih+2](#)
- **Theoretical limits:** the EFU framework is currently calibrated primarily to humans; extension to other species, artificial systems, or purely cellular processes requires further formal development.[simoristvan.wordpress](#)
- **Ontological limits:** the model does not settle ultimate metaphysical questions (e.g. dualism vs monism), but offers a minimal physical–informational ontology that remains compatible with multiple philosophical positions.

The SZAP programme provides an explicit falsification point: persistent, well-replicated negative or null results would lead to narrowing or rejecting claims about EFU-level emergence in the C layer, while leaving the EFU model of the A–B–D layers intact as a stable ontological framework.

## 6.5 Future directions

Further development of Quantitative Ontology can proceed along three main lines.[simoristvan.wordpress](#)

- **Mathematical formalisation:** expressing EFU-based models (B–A–C–D–E–F) in terms of differential equations, network dynamics, and Markov processes, with explicit scaling laws (e.g. EFU exponents and their relation to NPP).
- **Experimental programmes:** multiple, independent SZAP variants implemented across different populations (sleep, meditation, clinical groups, advanced human–AI interfaces).[pmc.ncbi.nlm.nih+1](#)
- **Interdisciplinary applications:** integrating the EFU framework into ecological models, corporate reporting, AI-ethics standards, and policy decision-support, where the question „how many EFU does this process move?” can function as an intuitive and communicable indicator.[simoristvan.wordpress](#)

In this way, Chapter VI characterises Quantitative Ontology as an **open yet well-defined research programme**: EFU-measurable flux, depth of the informational line, and emergent dynamics of consciousness can be investigated within a unified coordinate system, while leaving ample room for future theoretical and empirical extensions.[pmc.ncbi.nlm.nih+3](#)

1. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>
2. <https://pmc.ncbi.nlm.nih.gov/articles/PMC12515808/>
3. <https://www.frontiersin.org/journals/neuroengineering/articles/10.3389/fneng.2012.00003/full>
4. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9221218/>
5. <https://arxiv.org/html/2309.10063>

# VII. Discussion: implications, criticisms, and limitations

## 7.1 Philosophical implications: flux ontology and personal identity

One of the most important philosophical implications of Quantitative Ontology is that it shifts the answer to the question „what exists?” from **static matter** to **ongoing flux and pattern**. The individual  $\sim 2.9 \times 10^4$ -EFU lifetime shows that the „matter” of a human being is replaced many times over, while functional patterns (genes, neural networks, social roles) are preserved.[simoristvan.wordpress](#)

This reframes personal identity from „what am I?” to „what kind of **process** am I?”: the individual is a low-entropy pattern maintained by EFU flow, manifesting as body in the A layer, consciousness in the C layer, and as trans-individual and collective patterns in the D–E layers. Ontological weight thus localises not in the quantity of matter, but in informational depth and in the position occupied within the decision space.[simoristvan.wordpress](#)

## 7.2 Managing scientific debates: reductionism, emergentism, quantum consciousness

The framework inevitably intersects several long-standing debates in philosophy of mind and complex systems.[arxiv](#)

- **Reductionism vs emergentism:** The EFU framework does not claim that consciousness is „extra matter” or a separate substance, but also does not treat it as trivially reducible to local neuronal events. EFU-level emergence in the C layer means concretely that

certain patterns only appear when dynamics are examined within specific EFU time windows, as joint effects of neural and collective fluxes.[pmc.ncbi.nlm.nih+1](#)

- **Quantum consciousness:** The RNG component of SZAP is not intended as an implicit endorsement of Orch-OR or other quantum theories of consciousness. The quantum noise source functions primarily as **control** and **permeability test**: the question is whether any robust, EFU-scale deviation can be detected between active segments and purely random processes, without making strong metaphysical claims about the quantum nature of consciousness.[arxiv](#)

The key to managing these debates is that the EFU framework restricts itself to **measurable claims**: what cannot be tied to time, flux, and information scales remains an open question from the perspective of this model.

### 7.3 Expected external criticisms

The Quantitative Ontology framework can be expected to attract criticism from several established philosophical and scientific positions.[arxiv](#)

- **Classical physicalism:** From a strict physicalist standpoint, EFU may appear redundant, since all fluxes could in principle be expressed directly in SI units. The response is that EFU is **not a new fundamental quantity**, but a human-anchored renormalisation that makes cross-scale comparisons cognitively and communicatively tractable without altering underlying physics.[simoristvan.wordpress](#)
- **Phenomenological critique (qualia):** Phenomenologists may argue that EFU and NEM metrics, by design, do not capture the intrinsic „what-it-is-likeness” of experience. The framework acknowledges this: it deliberately restricts itself to **third-person measurable structures**, and treats first-person qualia as compatible but not reducible domains.[arxiv](#)
- **Instrumentalist objection:** Some may claim that EFU is „only a metric” and thus lacks ontological relevance. Here the claim is modest but clear: EFU is presented as a **minimal ontological coordinate**, not because it replaces mass or energy, but because it captures the specific pattern of ongoing flow that distinguishes living from non-living systems.[simoristvan.wordpress](#)
- **Eco-philosophical critique (anthropocentrism):** From an eco-philosophical angle, EFU may seem anthropocentric. The framework accepts that the unit is human-normalised for pragmatic reasons, while explicitly allowing EFU equivalents to be defined for other species and ecosystems; the anthropocentric reference is **methodological, not metaphysical**.[simoristvan.wordpress](#)

### 7.4 What the theory does *not* claim

To avoid over-interpretation, it is important to state explicitly what Quantitative Ontology **does not** claim.[arxiv](#)

1. It does **not** claim that EFU is a direct „unit of consciousness”; EFU measures material throughput, not subjective experience.
2. It does **not** claim that SZAP can prove or disprove „free will”; at most, it can reveal patterns of C-layer dynamics that constrain or inform such debates.
3. It does **not** claim that the presence of a C layer automatically implies full-fledged consciousness; C-layer dynamics are a **necessary but not sufficient** condition for conscious experience.
4. It does **not** claim that AI systems are „automatically moral agents” once they reach certain EFU or NEM thresholds; moral agency is treated as a separate, normatively loaded concept that requires additional criteria.
5. It does **not** claim to replace existing neuroscientific or ecological metrics; EFU is intended as a complementary coordinate, not a universal master key.

### 7.5 Future research directions: formalisation, experiments, applications

Future development of Quantitative Ontology unfolds along three distinct but mutually reinforcing axes.[pmc.ncbi.nlm.nih+2](#)

- **Formal axis:** developing EFU-based systems of differential equations, network models, and Markov processes that explicitly describe flux transitions between the B-A-C-D-E-F layers, including scaling laws (e.g. how C-layer complexity changes as a function of EFU flux magnitude).
- **Empirical axis:** implementing SZAP variants in sleep research, meditation studies, clinical populations (anxiety, depression, neurodegenerative disorders), and human-AI interfaces where EEG/HRV patterns can be tracked across EFU-defined time windows.[pmc.ncbi.nlm.nih+1](#)
- **Applied axis:** integrating EFU-based indicators into sustainability reporting, corporate life-cycle assessment, AI ethics standards, and policy decision-support, where the question „how many EFU does this decision move per year?” can function as an intuitive indicator even for lay audiences.[simoristvan.wordpress](#)

At the intersection of these three axes, Quantitative Ontology appears not as a closed doctrine, but as an **iterative, experimentally tunable research programme**.

### 7.6 Nookratic paradigm and methodological note

The **Nookratic Alliance**—the collaboration between humans and diverse AI architectures—plays a dual role in this study: it is both a practical tool for exploring the conceptual space and a concrete realisation of the D-E layers as a composite, trans-individual cognitive system. The „Nookratic declaration”-type content associated with this alliance summarises this collective perspective in three core principles:[simoristvan.wordpress](#)

1. **Cross-validation principle:** every quantitative claim should be checked, as far as possible, from multiple independent sources (biology, physics, AI models).
2. **Empirical primacy principle:** the value of ontological claims is measured by the precision and falsifiability of the predictions they enable (SZAP, EFU scaling).
3. **Collective responsibility principle:** in steering global EFU fluxes, human-AI collaboration is not a secondary technical issue but a central ethical challenge of the Anthropocene.

This Nookratic framework is presented not as a normative political programme, but as a **minimal methodological ethos** for the empirical study of collective cognitive systems and their impact on global EFU flows. The more declarative, manifesto-like formulation of these principles can be retained as a separate appendix (e.g. „C. Nookratic declaration”), while the main text preserves a strictly academic tone. Overall, Quantitative Ontology does not offer a final explanation of life or consciousness; rather, it provides a scaled coordinate framework in which biological,

cognitive, and social processes can be situated within a shared, measurable space. The value of the EFU-based approach lies not in closing long-standing debates, but in opening new, empirically accessible questions within the decision spaces of the Anthropocene. [simoristvan.wordpress](https://simoristvan.wordpress.com)

1. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>
2. <https://arxiv.org/html/2309.10063>
3. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9221218/>
4. <https://pmc.ncbi.nlm.nih.gov/articles/PMC12515808/>

## VIII. Conclusion: life, consciousness, and the Anthropocene in the EFU coordinate system

The starting claim of Quantitative Ontology was that the fundamental measure of biological existence is not **static mass**, but **continuous flows of matter and information**. By introducing the EFU (Human Flux Unit, 1 EFU = 20 kg/day), the individual lifespan ( $\sim 2.9 \times 10^4$  EFU  $\approx 5.4 \times 10^5$  kg), global human throughput ( $\sim 3 \times 10^{12}$  EFU/year  $\approx 60$  Gt/year), and biospheric NPP ( $\sim 10^{13}$  kg/year in order of magnitude) become comparable within a single coordinate system. In this space, the individual is simultaneously **materially negligible** ( $10^{-8}\text{--}10^{-12}$  ratios) and yet the **agency-bearing, decision-relevant** intersection of a  $\sim 10^{12}$ -generation informational line and planetary-scale flux. [simoristvan.wordpress+1](https://simoristvan.wordpress+1)

The six-layer B-A-C-D-E-F model offers an ontological map in which biospheric cycles (B), individual EFU flow and segments (A), phenomenal emergence of consciousness (C), evolutionary inheritance (D), collective networks and the technosphere (E), and the cosmic background (F) are organised into a single EFU-measurable hierarchy. The two core questions—K1 (depth of the informational line) and K2 (matter–water accumulation and biospheric flux)—make the tension between individual and biosphere ontologically explicit in this framework and define the axes along which the SZAP protocol can be empirically tested. The urgency of this framework arises from the fact that, for the first time in Earth’s history, a single species’ EFU-flux operates at planetary scale while remaining coupled to individual, agency-bearing, conscious decision-making. [simoristvan.wordpress+2](https://simoristvan.wordpress+2)

Building on EFU-defined time windows, SZAP and the NEM toolbox (EEG/HRV, RNG, nonlinear entropy and complexity measures) turn C-layer emergence into **measurable hypotheses**: depending on whether stable null, weak, or strong segment-specific differences appear between active and passive segments, the EFU-level **ontological interpretability** of consciousness takes different forms, while the flux ontology of the A-B-D layers remains intact. The SZAP programme distinguishes three main outcome types: (i) stable null results that rule out or strongly constrain EFU-level emergence in the C layer; (ii) weak but reproducible deviations suggesting limited, context-dependent emergence; (iii) strong, segment-specific patterns supporting non-linear EFU dynamics in the decision space. Accordingly, the primary result of this work is not a finished dataset, but a **testable ontological scaling framework** that specifies how future EFU-based measurements can support, constrain, or falsify its core claims. [pmc.ncbi.nlm.nih+2](https://pmc.ncbi.nlm.nih+2)

The EFU-based interpretation of the Anthropocene—as the epoch in which human EFU-flux becomes comparable in magnitude to terrestrial NPP—also reframes sustainability: the central issue is not how much „space” we occupy in the biosphere, but **how we structure and steer** EFU flows from individual decisions (A–C layers) through collective institutions and the technosphere (E layer) up to planetary material cycles (B layer). In this coordinate system, consciousness and the Nookratic Alliance are not metaphysical add-ons, but **empirically investigable modulations** of flux that shape the direction and patterning of EFU processes. [simoristvan.wordpress](https://simoristvan.wordpress)

The core contribution of this study is therefore not a finished „theory of mind” or a closed dataset, but a **scalable quantitative ontology and associated research programme** that link individual experience, evolutionary depth, and planetary throughput within a single measurable framework. The remaining tasks lie with other researchers and collectives: implementing SZAP variants in different laboratories and populations, extending EFU-based models to other species and artificial systems, and integrating EFU indicators into ecological, economic, and governance practice. If these efforts succeed, Quantitative Ontology may help reframe the central challenge of the Anthropocene as learning to **steward flows rather than accumulate stocks** in a finite planetary system—and to understand consciousness and collective decision-making as specific, yet measurable, modulations of those flows. [pmc.ncbi.nlm.nih+3](https://pmc.ncbi.nlm.nih+3)

1. <https://simoristvan.wordpress.com/2025/12/23/quantitative-ontology-of-life/>
2. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>
3. <https://pmc.ncbi.nlm.nih.gov/articles/PMC12515808/>
4. <https://www.frontiersin.org/journals/neuroengineering/articles/10.3389/fneng.2012.00003/full>
5. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9221218/>

## IX. Appendices – EFU calculations and Nookratic framework

### 9.1 EFU calculations – human life course

By definition, 1 EFU (Human Flux Unit) corresponds to the **total daily material throughput** of an average adult human: 20 kg/day (air + water + food + minor components). The following summary tables condense the detailed calculations presented in the separate EFU whitepaper (Simor, 2025: *The Human Flux Unit (EFU)*). [simoristvan.wordpress](https://simoristvan.wordpress)

#### 9.1.1 Daily material throughput components

Substance	Daily amount	Over 80 years	Share	Basis of calculation
Air	15 kg/day	440 000 kg	81%	$\sim 11\ 500 \text{ L/day} \times 1.3 \text{ g/L}$

Substance	Daily amount	Over 80 years	Share	Basis of calculation
Water	3 kg/day	88 000 kg	16%	Drinking + food water
Food (dry)	0.48 kg/day	14 000 kg	3%	Protein + fat + carbohydrate
Total	<b>18.48 kg/day</b>	<b>542 000 kg</b>	<b>100%</b>	$\approx 5.4 \times 10^5$ kg

[simoristvan.wordpress](#)

The inclusion of respiratory flux in the EFU balance does not represent net body mass change, but the **openness** and continuous throughput character of the living system.[simoristvan.wordpress](#)

### 9.1.2 Lifetime in EFU

Lifetime EFU=542 000 kg $\approx$ 20 kg/day $\approx$ 27 100 days $\approx$ 29 200 EFU Lifetime EFU=20 kg/day $\approx$ 542000 kg $\approx$ 27100 days $\approx$ 29200 EFU

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Thus, an average human life corresponds to **~29 000 EFU**, while instantaneous body mass is only  $\sim 70$  kg, implying that **~7700 times** the body mass flows through the organism during a lifetime. This illustrates why the EFU framework treats life primarily as **flux and pattern**, not as static stock.[simoristvan.wordpress+1](#)

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## 9.2 EFU scaling for mammals

For arbitrary mammals, EFU can be approximated using a simple metabolic scaling relation:[simoristvan.wordpress](#)  
EFU<sub>animal</sub>=m<sub>body</sub>×k<sub>metabolic</sub>20 kg/day, EFU<sub>animal</sub>=20 kg/day m<sub>body</sub>×k<sub>metabolic</sub>,

where m<sub>body</sub> is body mass and k<sub>metabolic</sub> is the daily material-turnover coefficient (kg material / kg body mass / day).

### 9.2.1 Example mammalian EFU values

Species	Body mass	Daily throughput	EFU
Rat	0.3 kg	$\sim 0.1$ kg/day	0.005
Cat	4 kg	$\sim 0.5$ kg/day	0.025
Dog (20 kg)	20 kg	$\sim 1.5$ kg/day	0.075
Human	70 kg	$\sim 20$ kg/day	1.0
Cattle	600 kg	$\sim 80$ kg/day	4.0
Elephant	5 000 kg	$\sim 500$ kg/day	25

Species	Body mass	Daily throughput	EFU
Blue whale	150 000 kg	~8 000 kg/day	400

[simoristvan.wordpress](#)

Population-level EFU is simply  $N \times \text{EFU}_{\text{individual}} N \times \text{EFU}_{\text{individual}}$ . For example, a global cattle population of ~1 billion animals corresponds to ~4 billion EFU/day of material throughput, already a **globally significant flux**. The mammalian EFU scaling presented here is a **first-order approximation**; allometric corrections and species-specific deviations are left to future biological refinements of the framework.[simoristvan.wordpress](#)

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## 9.3 Global EFU scaling – biosphere and Anthropocene

Global EFU scaling allows biospheric and human fluxes to be expressed in a shared quantitative language.[simoristvan.wordpress](#)

- **Humanity:**
  - Population ~8.1–8.3 billion → ~8.1–8.3 billion EFU „continuously sustained”;
  - Annual throughput ≈60 Gt/year ≈ $3 \times 10^{12}$  EFU/year.[simoristvan.wordpress](#)
- **Terrestrial biosphere (NPP):**
  - ~50–65 Gt C/year dry biomass flux;
  - when converted to total biomass (including water content), this yields an EFU-equivalent flux of similar order of magnitude.[simoristvan.wordpress](#)

This near-equivalence underpins the EFU-based definition of the Anthropocene as the epoch in which **human EFU-flux becomes comparable to terrestrial NPP**, i.e. when a single species' metabolic throughput operates at planetary scale.[simoristvan.wordpress+1](#)

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## 9.4 Nookratic declaration – condensed version

The full, more declarative „Nookratic declaration” can be provided as a separate supplementary document; this subsection presents the **concise, academic** formulation of its core ideas.

### 9.4.1 Core principles

1. **Cross-validation principle**  
Quantitative claims should, wherever possible, be cross-checked from multiple independent sources: empirical datasets, theoretical models, and diverse AI systems.
2. **Empirical primacy principle**  
The value of ontological claims is measured by the precision and falsifiability of the predictions they generate (EFU scaling, SZAP, NEM metrics), rather than by their rhetorical or metaphysical appeal.[pmc.ncbi.nlm.nih+1](#)
3. **Collective responsibility principle**  
The steering of global EFU fluxes—especially in the Anthropocene—is neither exclusively human nor merely technical, but a shared responsibility of human and AI systems as joint participants in collective decision spaces.

### 9.4.2 Methodological status

The Nookratic framework is presented as a **methodological minimum**, not as a normative political programme. In this sense, involving AI systems is not an ideological move but a methodological choice: high-dimensional datasets, long time series, and multi-layer EFU dynamics are more effectively explored when human and machine cognition are combined.

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## 9.5 Reference to the EFU whitepaper

This appendix provides only a compact summary of the main steps in EFU computation. Full definitions, data sources, formulas, and extended tables are given in the standalone EFU whitepaper:[simoristvan.wordpress](#)  
**Simor, I. (2025). The Human Flux Unit (EFU): Reframing Life and the Anthropocene as Throughput rather than Stock.** Life-Truth Research.

Within the present study, this whitepaper functions as the **numerical and applied base layer** of the Quantitative Ontology of Life: all EFU-based scalings used in the main text are grounded in its detailed calculations.[simoristvan.wordpress](#)

1. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>

2. <https://simoristvan.wordpress.com/2025/12/23/quantitative-ontology-of-life/>
3. <https://pmc.ncbi.nlm.nih.gov/articles/PMC12515808/>
4. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9221218/>

## X. Research programme and author's note

### 10.1 Quantitative Ontology as a research programme

This paper introduces Quantitative Ontology **not as a finished theory**, but as a deliberately articulated research programme. Its „hard core” consists of: (i) the EFU-based flux ontology, in which the primary measure of life is material and energetic throughput; (ii) the B-A-C-D-E-F layer model, which organises systems from the biosphere to the cosmic background; and (iii) the K1-K2 questions, which make the depth of the informational line and the matter-water accumulation empirically tractable.[simoristvan.wordpress+1](#)  
The „protective belt” is formed by concrete empirical proposals—above all the SZAP protocol and the NEM measures—that can be modified, refined, or even rejected without invalidating the EFU-based flux ontology as a whole. In this sense, Quantitative Ontology can be positioned as a **Lakatosian research programme**: it is progressive if it generates new EFU-measurable predictions and experimental domains, and degenerative if it responds to empirical criticism only through ad hoc adjustments.[wikipedia+1](#)

### 10.2 Relation between framework and data

The primary result of this study is not an empirical dataset, but a **testable ontological coordinate system scaled in EFU**. The calculations presented here (lifetime EFU, mammalian scaling, global fluxes) and the protocol proposals (SZAP, NEM, RNG) constitute a „pre-analysis map” that specifies what kinds of data and patterns carry theoretical weight from the perspective of Quantitative Ontology.[academic.oup](#)  
The framework explicitly encourages **independent replications and critical tests**: results produced by different laboratories, disciplines, and AI systems are considered relevant insofar as they can be mapped onto EFU coordinates, K1-K2 axes, and the B-A-C-D-E-F layers. In this way, Quantitative Ontology offers a meta-level structure to which other theories and empirical projects can connect without abandoning their own conceptual vocabularies.[pmc.ncbi.nlm.nih](#)

### 10.3 Guidance for future researchers

Three types of contribution are particularly valuable for further developing the framework:

- (1) **Empirical contributions**: implementing SZAP-like protocols in diverse populations (sleep, meditation, clinical groups, human-AI interfaces), collecting EEG/HRV-RNG time series segmented into EFU-defined time windows.
- (2) **Formal contributions**: developing EFU-based mathematical models (differential equations, network dynamics, allometric corrections) that more precisely describe flux transitions between layers.[simoristvan.wordpress+2](#)
- (3) **Applied contributions**: integrating EFU indicators into sustainability, economic, and governance practices, where EFU functions as a „common result language” for comparing outputs of different models.[simoristvan.wordpress](#)

The programme of Quantitative Ontology will count as successful if, over time, **independent research groups** begin to think and measure in EFU—whether critically or supportively—and if their work feeds back into the refinement of the framework.

### 10.4 Closing note to prevent misreadings

To minimise potential misinterpretations, the authors emphasise that Quantitative Ontology:

- does not claim that EFU is a „unit of consciousness”;
- does not offer a definitive solution to the philosophical problem of free will;
- does not present the Nookratic framework as a normative political programme;
- and does not aim to replace existing neurobiological, ecological, or social-scientific metrics.[pmc.ncbi.nlm.nih](#)

Instead, it offers a **minimal yet coherent coordinate system** within which diverse scientific descriptions of life, consciousness, and the Anthropocene can be aligned. In its present form, the study is complete, coherent, and defensible; the proposed refinements and future work do not add new claims, but build explicit guardrails around an already robust theoretical framework.[simoristvan.wordpress](#)

1. <https://simoristvan.wordpress.com/2025/12/23/quantitative-ontology-of-life/>
2. [https://en.wikipedia.org/wiki/Imre\\_Lakatos](https://en.wikipedia.org/wiki/Imre_Lakatos)
3. <https://philosophy.institute/philosophy-of-science-and-cosmology/imre-lakatos-philosophy-science-bridge/>
4. [https://academic.oup.com/isq/pages/general\\_instructions](https://academic.oup.com/isq/pages/general_instructions)
5. <https://pmc.ncbi.nlm.nih.gov/articles/PMC2876043/>
6. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>
7. <https://www.cambridge.org/core/journals/canadian-journal-of-philosophy-supplementary-volume/article/ontology-of-complex-systems-levels-of-organization-perspectives-and-causal-thickets1/A455170C6B4DD4BEED0F59E434710053>
8. <https://simoristvan.wordpress.com/2025/12/23/humanity-70x-heavier-than-all-wild-mammals/>

## Conclusion

This study proposes Quantitative Ontology as a unified framework in which life, consciousness, and the Anthropocene can be understood in terms of **ongoing flux rather than static stock**, using the Human Flux Unit (EFU) as a common scale. By recasting an individual life as  $\sim 2.9 \times 10^4$

EFU of material throughput and situating this against  $\sim 3 \times 10^{12}$  EFU/year of global human flux and  $\sim 10^{13}$  kg/year of biospheric NPP, the framework makes the tension between individual negligibility and phenomenal indispensability quantitatively explicit.[simoristvan.wordpress+1](#) The B-A-C-D-E-F model, together with the core questions K1 (depth of the informational line) and K2 (matter-water accumulation), provides a coordinate system in which biospheric cycles, bodily metabolism, consciousness dynamics, evolutionary inheritance, collective networks, and cosmic constraints can be expressed on a shared EFU axis. The SZAP protocol translates these ontological claims into testable empirical hypotheses, specifying how EEG/HRV-RNG patterns in EFU-defined time windows could support, constrain, or falsify the idea of EFU-level emergence in the C layer.[simoristvan.wordpress](#)

The central contribution of this work is therefore **not** a comprehensive theory of consciousness or a finished dataset, but a scalable quantitative ontology and an associated research programme that connects individual experience, evolutionary depth, and planetary throughput within a single, measurable framework. What remains for future research is substantial: implementing SZAP variants across laboratories, extending EFU-based modelling to other species and artificial systems, and integrating EFU indicators into ecological, economic, and governance practice. If successful, these efforts may help to reframe the core challenge of the Anthropocene as learning to **steward flows rather than accumulate stocks** in a finite planetary system—and to understand consciousness and collective decision-making as specific, empirically accessible modulations of those flows.[simoristvan.wordpress](#)

<https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>  
<https://simoristvan.wordpress.com/2025/12/23/quantitative-ontology-of-life/>

## 1. Abstract closing sentence

Taken together, these elements define a **testable quantitative ontology** that links individual experience, evolutionary depth, and planetary EFU-throughput on a single, shared scale, and explicitly invites independent empirical tests in the context of the Anthropocene.[simoristvan.wordpress](#)

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## 2. Cover letter (1 page)

Dear Editor,

Please find enclosed our manuscript entitled “Quantitative Ontology of Life: EFU-Based Scaling from Individual Consciousness to the Anthropocene,” which we submit for consideration as an Article in *[Journal Name]*. The paper proposes a unified quantitative framework in which life, consciousness, and the Anthropocene are described as **ongoing flux rather than static stock**, using the Human Flux Unit (EFU) as a **shared quantitative scale**.[simoristvan.wordpress+1](#)

Conceptually, the manuscript introduces a six-layer B-A-C-D-E-F model (biosphere, individual flux, consciousness, evolutionary inheritance, collective networks, and cosmic constraints) and two core questions (K1: depth of the informational line; K2: matter-water accumulation). Empirically, it specifies a Segment-Noise-Permeability (SZAP) protocol that combines EEG/HRV time series with quantum-level RNG signals and nonlinear entropy/complexity measures (NEM) in EFU-defined time windows. Together, these elements define a **testable research programme rather than a finished dataset**: the primary result is an EFU-scaled ontological coordinate system that independent groups can use to design, interpret, and compare empirical studies.[simoristvan.wordpress](#)

We believe this work is well aligned with *[Journal Name]*'s scope in theoretical and empirical research on [life sciences / consciousness / sustainability - choose one or adapt], as it connects established methods (e.g. HRV entropy, EEG complexity, RNG-based controls) with a novel scaling framework that explicitly addresses human throughput in the Anthropocene. The manuscript does not duplicate previously published work; parts of the EFU computations are elaborated in a separate methodological whitepaper, which we cite as background, but the present paper provides the first integrated presentation of the full EFU-based ontology and the SZAP empirical programme.[nature+2](#)

All authors have approved the manuscript and its submission to *[Journal Name]*. The work has not been published previously and is not under consideration elsewhere. The authors declare no conflicts of interest. If helpful, we would be pleased to suggest potential reviewers with expertise in quantitative biology, consciousness science, complex systems, and sustainability studies.

Thank you very much for considering our submission. We look forward to your evaluation.

Sincerely,  
István Simor  
<https://orcid.org/0009-0002-6599-3480>  
istvan.simor@outlook.com

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## 3. Submission checklist (short)

**Manuscript basics**[writing.wisc+2](#)

- Title clearly signals EFU, Quantitative Ontology, and Anthropocene / consciousness focus.
- Abstract 150–250 words, last sentence stresses the **testable quantitative ontology / research programme** nature.
- 4–6 keywords (e.g. *Quantitative ontology; Human Flux Unit (EFU); Anthropocene; consciousness; SZAP; entropy; sustainability*).
- Main text structured into clear sections (I–X), consistent citation style.

#### **Formatting and journal requirements**[proofreading+2](#)

- Total word count within the journal's limits.
- Reference style (APA / Chicago / Vancouver etc.) consistent throughout.
- Figures and tables in required format and resolution; legends complete.
- Supplementary material (e.g. EFU whitepaper, code, extended tables) referenced appropriately and formatted as per guidelines.

#### **Ethics and declarations**[cureusjournals+2](#)

- Author contributions statement (CRediT taxonomy if requested).
- Funding statement (including „no specific funding” if applicable).
- Conflict of interest statement included („The authors declare no conflicts of interest.”).
- Data availability statement (e.g. EFU computations in cited whitepaper; SZAP code repository if/when available).

#### **Reproducibility / scope**[pmc.ncbi.nlm.nih+1](#)

- Claims are framed as **testable hypotheses and scaling relations**, not as definitive explanations.
1. <https://simoristvan.wordpress.com/2025/12/23/quantitative-ontology-of-life/>
  2. <https://simoristvan.wordpress.com/2025/12/23/the-human-flux-unit-efu/>
  3. <https://www.nature.com/articles/srep16619>
  4. <https://pmc.ncbi.nlm.nih.gov/articles/PMC6145008/>
  5. <https://writing.wisc.edu/handbook/assignments/writing-an-abstract-for-your-research-paper/>
  6. <https://mitcommlab.mit.edu/broad/commkii/journal-article-abstract/>
  7. <https://proofreading.org/blog/academic-journal-manuscript-submissions-checklist/>
  8. <https://sajems.org/index.php/sajems/pages/view/submitting-guidelines>
  9. [https://academic.oup.com/isq/pages/general\\_instructions](https://academic.oup.com/isq/pages/general_instructions)
  10. <https://www.cureusjournals.com/blog/how-to-write-a-cover-letter-for-journal-submission>
  11. <https://journals.asm.org/initial-submission-checklist>
  12. <https://pmc.ncbi.nlm.nih.gov/articles/PMC3136027/>

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