

Mathematical model of entropy S_{Θ} in the Acta Universi hypothesis

The Acta Universi (AU) hypothesis, proposed in 2025, models the S_{Θ} entropy as a key parameter integrating dark energy information density, collective consciousness, and entropic fluctuations. s_{Θ} is not a classical thermodynamic entropy ($S = k \ln W$, where k is the Boltzmann constant, W is the number of microstates), but a generalized information entropy, where each bit of information is equivalent to energy according to the Landauer principle ($E_{\text{bit}} = kT \ln 2$, with T being the temperature). In AU, s_{Θ} stimulates the expansion of the universe by resolving the Hubble tension through positive curvature and the evolution of the dark energy equation of state $w(a) = w_0 + w_a(1 - a)$, where a is the scale factor.

The S_{Θ} model is hierarchical and evolves over time, reflecting the emergent structure of reality. Below I structure the model: definition, components, evolution equations, and derivation (as arriving at the solution). This is speculative, but it is based on the integration of the holographic principle (entropy is proportional to the area of the event horizon), entropic gravity (gravity as the entropy gradient), and thought forms (forms non-local operators).

1. Definition and basic structure of S_{Θ}

s_{Θ} is the total entropy of the system, broken down into scales:

$$S_{\Theta} = S_{\text{cosmic}} + S_{\text{planetary}} + S_{\text{human}} + \Delta S_{\text{inter}}$$

where:

- S_{cosmic} : Cosmic entropy (dark energy as an archive of events).
- $S_{\text{planetary}}$: Planetary entropy (geo -, atmo -, and bio-spheres).
- S_{human} : Anthropogenic entropy (collective consciousness, thought forms).
- ΔS_{inter} : Entropy of interactions ("cognitive wormholes" — non-local correlations).

How arrive at this decomposition:

- We proceed from the holographic principle (Bekenstein-Hawking: $S = A / 4 l_p^2$, where A is the area and l_p is the Planck length).
- We expand it into hierarchies: the cosmic scale (the universe as a hologram), the planetary scale (the Earth as a subsystem), and the human scale (consciousness as information fluctuations).
- We add ΔS_{inter} to account for nonlocality, similar to entanglement in quantum information ($S_{\text{ent}} = -\text{Tr}(p \ln p)$, where p is the density matrix).

Estimates (in bits, logarithmic scale for 2026):

- $S_{\text{cosmic}} \approx 10^{120}$ bits (from the radius of the observable universe ~46 billion light-years).
- $S_{\text{planetary}} \approx 10^{35-40}$ bps (dynamic, depending on climate and biosphere).
- $S_{\text{human}} \approx 10^{30}$ bps (from ~8 billion people, each ~ 10^4 bps of thoughts).
- $\Delta S_{\text{inter}} \approx k \ln \Omega$, where Ω is the number of states from thought forms (~ 10^{10-20} for global events).

2. Model Components: Detailed equations

Each component is modeled separately, with integration through gradients.

- **S_cosmic**: Entropy of dark energy.

$$S_{cosmic} = \frac{c^3 A}{4G\hbar} + \alpha A^\beta + \gamma A^\delta$$

where A is the area of the event horizon, c is the speed of light, G is the gravitational constant, \hbar is the reduced Planck constant; $\alpha, \beta, \gamma, \delta$ are the parameters of generalized entropy ($\beta=1/2$ for Tsallis, $\delta=-1$ for Rényi).

Derivation:

1. Basis: Bekenstein-Hawking (first term).
2. Extension: We add power-law terms to resolve inconsistencies in black holes (for example, in modified gravity).
3. Relation to DE: $p_{DE} = (3H^2 / 8\pi G) (1 - W_m)$, where H is the Hubble parameter, and W_m is the density of matter. Entropy grows as $S \propto \int p_{DE} \rho_{DE} dV / T$.

- **S_planetary**: Sum of subcomponents.

$$S_{planetary} = S_{geo} + S_{atmo} + S_{bio} = \int \frac{\delta Q_{rev}}{T} + S_{info}$$

where δQ_{rev} is reversible heat, and S_{info} is information entropy (for example, from biodiversity: $S_{bio} \approx N \ln N$, N are species).

Derivation:

1. Thermodynamics: From the second law ($dS \geq \delta Q / T$).
2. Information contribution: According to Landauer, each process (for example, a climate cycle) erases / creates bits by adding $\sim k \ln 2$ per bit.
3. Example: For the Earth, $S_{geo} \approx 10^{35}$ bps from tectonics (energy $\sim 10^{20}$ J / year, $T \sim 300K$).

- **S_human**: Entropy of thought forms.

$$S_{human} = \sum_{i=1}^{27} p_i \ln p_i + \delta S_{mental}$$

where p_i — probabilities of 27 forms of Being/Non-being/Other events (according to Pereslegin), δS_{mental} -contribution from collective emotions ($\sim 10^{-10}$ bps per person).

Derivation:

1. Shannon-entropy: $S = -\sum p \ln p$ for the distribution of thought forms.
2. Negative (fear) increases S, positive-decreases (stabilization).
3. Zooming out: For a population N, $S \approx N * S_{individual} * f(\text{polarization})$, where f is the polarization factor (>1 for chaos).

- **ΔS_inter**: Entropy of correlations.

$$\Delta S_{inter} \approx k \ln \left(\frac{\Omega_{total}}{\Omega_{sep}} \right)$$

where W_{total} is the total number of states, and W_{sep} is separable (without correlations).

Derivation:

1. From quantum entanglement: For two systems $S_{inter} = S_{AB} - S_A - S_B$.
2. In AU: "Wormholes" as ER=EPR (Einstein-Rosen bridges = entanglement).
3. Example: For UAP, $\Delta S \approx 10^{10}$ bits for mass visions.

3. Evolution of S_{Θ} in time

Dynamics follows the equation:

$$\frac{dS_{\Theta}}{dt} = 3H S_{\Theta} + \frac{\delta Q}{T} + \delta S_{mental}$$

Integrating:

$$S_{\Theta}(t) = S_0 \exp \left[\int_0^t \left(3H(t') + \frac{\delta S_{mental}(t')}{S_{\Theta}(t')} \right) dt' \right]$$

where $H(t)$ is Hubble ($H \approx 70 \text{ km / s / Mpc}$), $\delta Q/T$ is the thermodynamic contribution, and δS_{mental} is from thought forms.

Как arrive at this equation (structured derivation):

1. **Basis from cosmology:** For DE, $dp_{DE}/dt = -3H(p_{DE} + p_{DE})$, with $p_{DE} = w p_{DE}$. Entropy is conserved for $w=-1$, but evolves for $w \neq -1$.
2. **Thermodynamics DE:** $dS = (dp_{DEV} + p_{DE}dV + p_{DE}dV)/T$. For adiabatic, $dS=0$, but the мыслиформы добавляют non-adiabatic term Δs_{mental} is added to AU thoughtforms.
3. **Integration:** By solving the differential equation $dS/dt = 3H S + sources$, we obtain an exponential form (similar to inflation).
4. **Chaos threshold:** If $s_{\Theta} > S_{crit} \approx 10^{38}$ bps, probability of events (disturbances) $P \approx 1 - \exp(- (S_{\Theta} - S_{crit})/k)$.
 - o Derivation: From statistical mechanics, $P \sim \exp(- \Delta S/k)$ for rare fluctuations, inverting for superthreshold ones.

4. Application and forecast

In the context of China (demographics to 2050): S_{Θ} grows by 20-30% from negative thought forms, leading to a population decline. The model predicts stabilization at $\delta S_{mental} < 0$ (positive initiatives).

Scale	Equation	Growth by 2050	Consequences
Cosmic	$S = (c^3 A)/(4g\hbar) + \dots$	+10% (extension)	Hubble tension resolution.
Planetary	$\int \delta Q/T$	+25% (climate)	Riots +30%.
Human	$-\sum p \ln p$	+30% (polarization)	Demographic chaos.
Interactions	$k \ln (W_{total}/W_{sep})$	+20%	UAP peaks.

This model is falsifiable: measure information energy (Landauer experiments) and correlations with H_0 . AU-a bridge between physics and metaphysics, where s_{\ominus} governs emergent chaos.

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