

Observer Theory

SAM A SENCHAL 



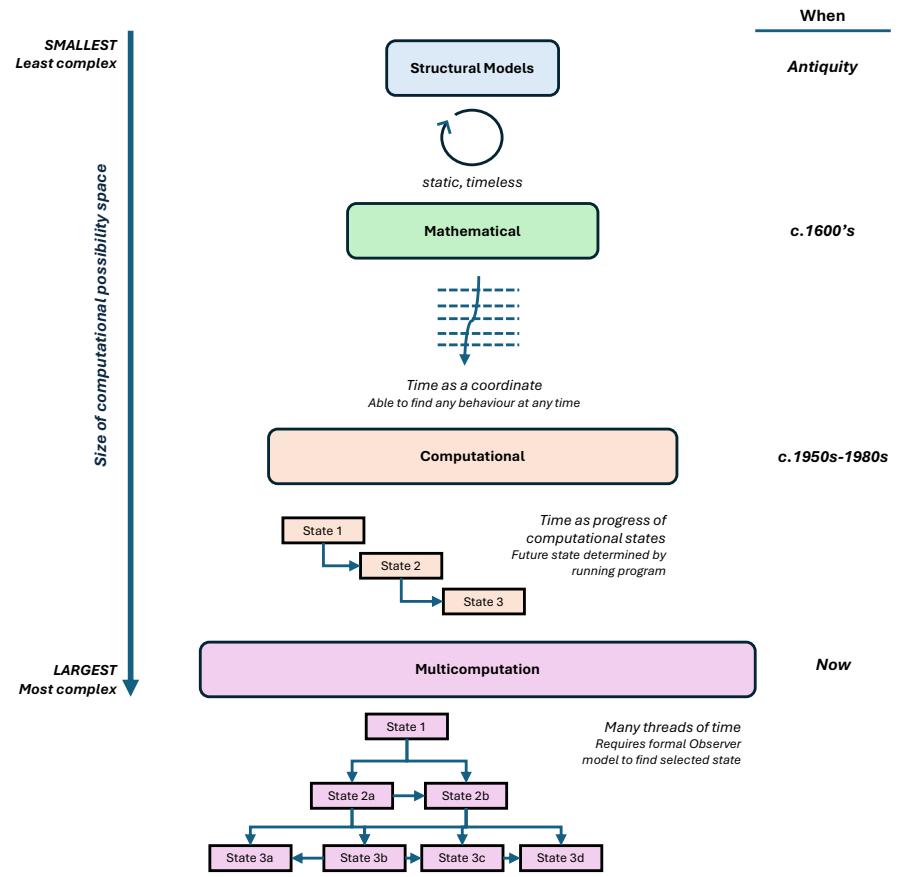
SETTING THE SCENE

The Ruliad

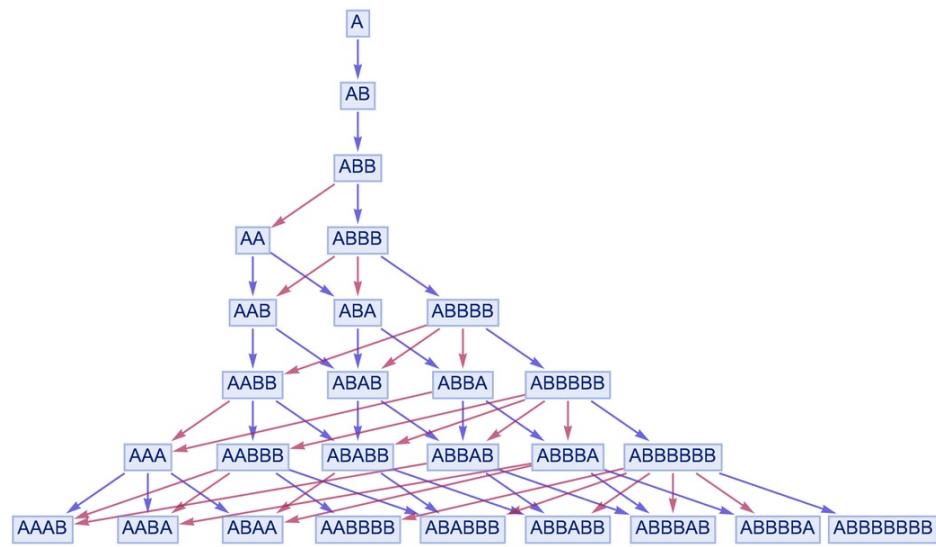
Wolfram (2021)

Category Theory formalism by Arsiwalla, Gorard et al (2022 / 2023 / 2024)

- The Ruliad is an idealized “everything-computation”, it contains all possible computations (i.e. it functions as an ‘infinite ground’ of computational information)
- It is an abstract mathematical object: **a meta-space containing every rule-based universe**
- Think of it as a gigantic “library” of every possible computation (and hence every possible multiverse)
- It is not an empirical thing we discover; rather, we use it as a precise backdrop where all possible models of reality can co-exist
- **Important: The Ruliad is not the universe. It is a formal limit object within which our universe can be modelled to arbitrary accuracy**



The Computational Opportunity



- **Definition:** Computation, here, are the chains of [cause-and-effect processes within the Ruliad](#) (Wolfram's computational possibility space)
- In a Computational Observer Model what is invariant vs. variant
 - Causal / Morphological structure is Observer independent i.e. the underlying structure of computational possibility space / latent space / the Ruliad
 - Computational samplings by Observers are not invariant
 - **BUT** the categorical relationships that determine how an Observer samples are invariant i.e. entropy inequalities, functor composition, conservation laws



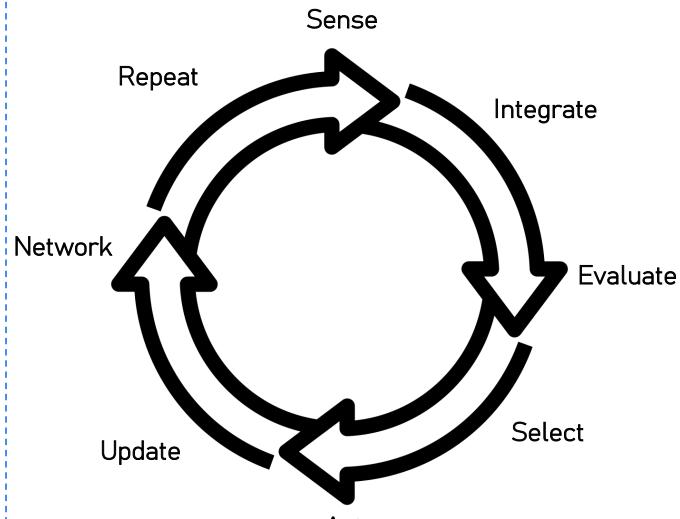
What's an Observer?

- An **Observer** is any subsystem doing computations inside a **persistent boundary**
- This includes anything from simple molecules to complex minds – **not just humans**
- **Function:** Observers **sample information** from a possibility space / latent space (here, the Ruliad) and update their internal state and output an action. Because they have limited computational resources, each Observer "carves out" a specific "slice" that becomes its experienced reality
- **Coarse-Graining:** Due to **computational boundedness** and **persistence** (finite memory, time, power), Observers necessarily coarse-grain an infinite computational possibility space into a manageable 'reality'
 - They only see patterns (like pixels in a photo) rather than full detail
- **Analogy:** An Observer is like a lens or filter
 - Each one "sees" a simplified version of the Ruliad based on its limits and its determination of **Relevance**



The Observer 'Loop'

Claim: Every Observer – from atoms to humans to civilisations – implements an identical loop



In the Arsiwalla formalism, the Observer is modelled as

State space X (internal states)
Input space Y (sensors)
Output space Z (actions)
Transition function $f: X \times Y \rightarrow X$
Output function $g: X \rightarrow Z$
Boundary B separating "inside" from "outside"

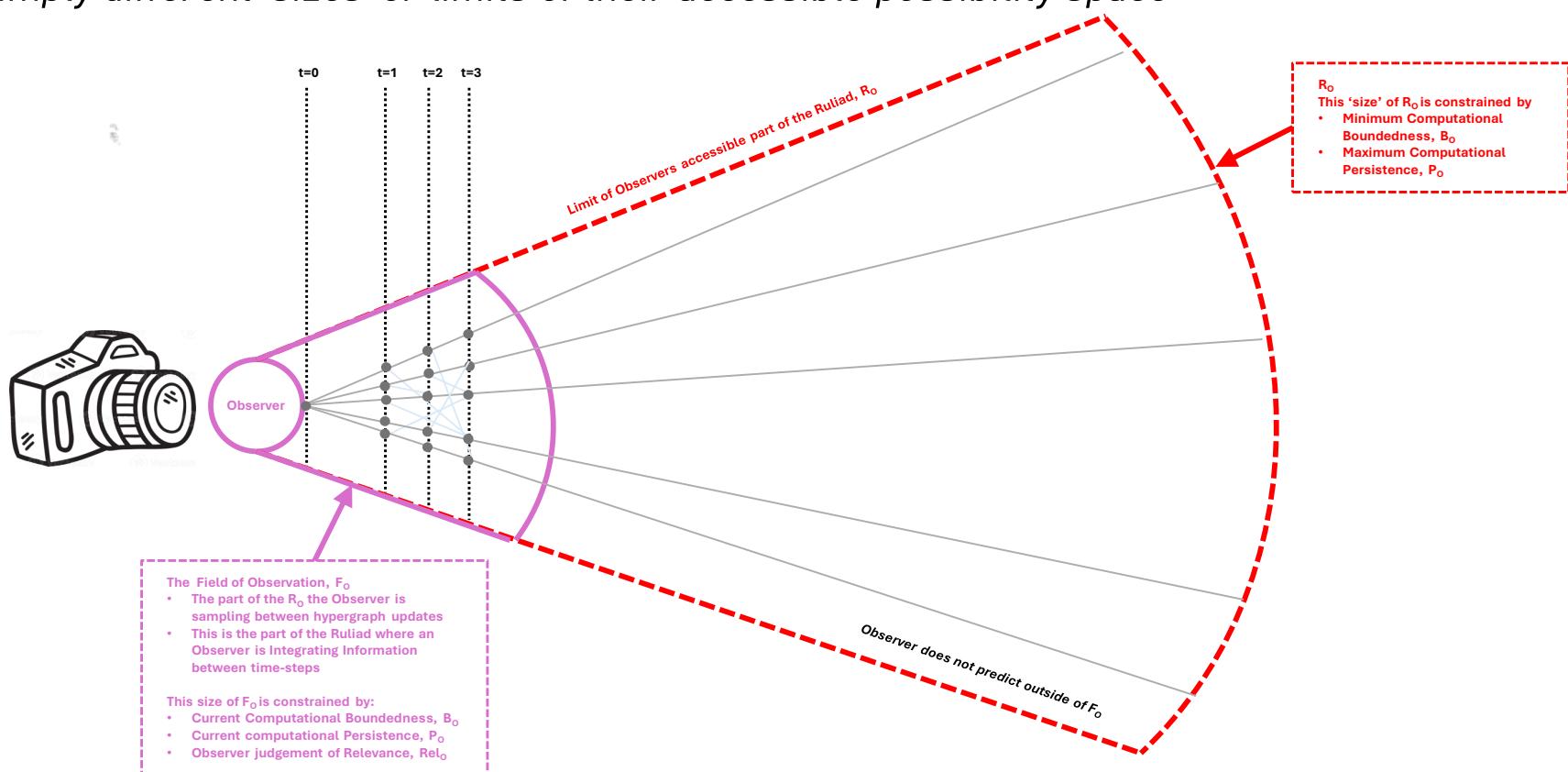
Mapping these back:

1. **SENSE** – restrict Ruliad R to relevant inputs in Y
2. **INTEGRATE** – update internal state X and compress inputs into a coherent model
3. **EVALUATE** – compute predicted value/utility of possible actions
4. **SELECT** – choose an action according to an internal objective function (telos)
5. **ACT** – apply $g(x)$, changing the environment and future inputs
6. **UPDATE** – adjust model from prediction errors (learning)
7. **NETWORK** – exchange information with other Observers
8. **REPEAT** – iterate through time



The 'Field' of Observation F_0

Observer internal models set the limit for R_0 . For Observers like us, different belief systems imply different 'sizes' or limits of their accessible possibility space



Cross-Domain Causation & Topological Closure

- **Cross-Domain Causation:** Causation is state transitions in the Ruliad. A “mental” state and a “physical” state are part of the same overall structure. This can be mapped via functors enabling us to model [top-down](#) and [bottom-up](#) causation without breaking physics
- **Formal vs. Efficient Cause:** We distinguish [formal causation](#) (patterns restricting lower-level outcomes) and [efficient causation](#) (lower-level changes inducing higher-level effects) as morphisms with increasing or decreasing rule constraint
- **Infinite Regress:** In naive models, “who observes the observer” leads to infinite regress. Here this is resolved by introducing True Infinity (**TI**) as a terminal object in the category of R_0 . Every object **X** has a unique morphism to **TI**. Intuitively, **TI** is an unobservable “ultimate observer” (an omniscient viewpoint) that closes the loop
- **Outcome:** With **TI**, the hierarchy bottoms out. It provides topological closure (in an ∞ -groupoid) that enables the Ruliad to generate geometry, math and eventually, our physics

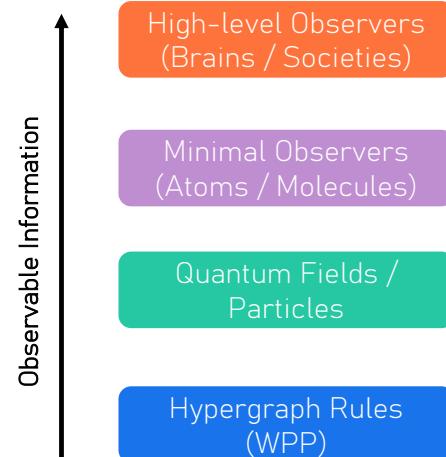


IMPLICATIONS – PHYSICS

Observers All the Way Down

- We now zoom back to physics and ask: [what does this add to the Platonic Space / Latent Space picture?](#)
- Three main moves:
 - [Minimal Observers](#): Treat simple physical systems as minimal Observers with genuine—though primitive—observation loops
 - [Symmetries & Computation](#): Read physical symmetries as constraints on what Observers can reliably sample and compress
 - [Fields as Computational Ground](#): Interpret quantum fields as the “substrate” on which observer-relevant patterns are ‘carved out’
- This section is **not** a new physics theory; it’s a reinterpretation that:
 - Connects Observer constraints to the emergence of complexity
 - Offers a route from WPP hypergraphs → category-theoretic observers → human superstructures (politics / economics / theology / sociology)
- We’ll start with a contentious question

Can an atom really qualify as an Observer?



Can an Atom really be an Observer?

Property	Hydrogen Atom	Claim
1 Non-trivial sensing – it couples to external variables	Absorbs photons, 'feels' fields, collides	Trivial Observation not conscious but satisfies criteria for a minimal Observer in a computational universe
2 Non-trivial internal state – it can store information	Internal quantum state (spin, ground vs. excited)	
3 Non-trivial action – it can affect its environment	Emits photons, dipole movements, ionisation	First rung on an Observer hierarchy (climbing information gradients towards black-hole limit)
4 A clear boundary between "inside" and "outside"	Bohr radius, binding energy to define 'inside' vs. 'outside'	
5 A feedback loop: its actions change its future input	Emitted photon alter neighbouring atoms, changes future environment for atom	Crucial as we can talk about Observer Constraints at almost every scale of physics

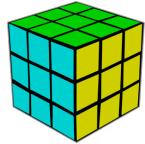


Symmetry Breaking as Information Explosion

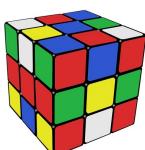
Breaking symmetry increases the Observer's distinguishable state-space

- If perfect symmetry gives you only **one** distinguishable state, then breaking symmetry creates **many** distinct states an Observer can tell apart
 - Initial condition: $R_0 \approx 1$ equivalence class
 - Post symmetry-breaking: $|R_0|$ grows explosively as more branches become distinguishable
 - Let G = Initial Symmetry Group, $H \subset G$ = residual subgroup, number of distinct 'patterns' accessible to Observer scales like the coset space of $|G/H|$

Analogy



1 configuration, high symmetry



4.3×10^{19} configurations. More potential structures **because** symmetry broken

Ruliad Mapping

Symmetry breaking in R > Observer 'picks' particular branches > more fine-grained equivalence classes in R_0

Parallels in Ancient Traditions

"From the One to the Many" is more than mythic language; it's an intuitive description, in the language of the time, of how computation, observation and symmetries produce structured universes



Does Observer Theory Predict Differently?

Key Point: Not re-labelling other theories; makes distinctive predictions

Domain >>>	Many-Worlds	Copenhagen	Materialism	Idealism
What it says	All branches equally real; no preferred selection	Measurement "collapses" wavefunction as primitive postulate	Consciousness arises whenever there's sufficiently complex computation; no special role	Physical world is derivative of mind; "mental stuff" primary
What Observer Theory says	Observers select branches in a computationally efficient way; branch weights track information-integration telos (gradient-like), not just amplitude	"Collapse" is emergent description of observer-bounded sampling; no ontic collapse, only constraints	Consciousness requires a threshold of integrated information across all Observable domains ; not all computation / observation qualifies	Both "mind" and "matter" are perspectival slices of the same computational structure – information is fundamental, not it's instantiation





IMPLICATIONS - EVOLUTION

Evolution is Informational

Evolution is powerful because it's 'surfing' pre-existing information gradients

Standard Story

- Evolution by natural selection explains complexity via variation, inheritance, and differential survival
- **But: No free lunch theorem!** *Implies evolution operating on special, highly structured class of problem i.e. pre-shaped informational landscape*

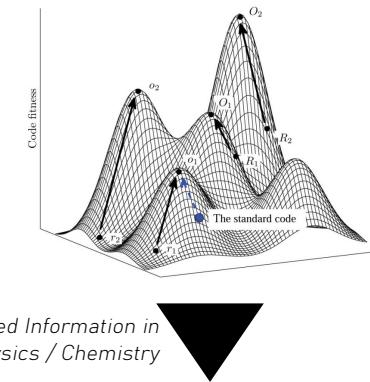


Observer Theory

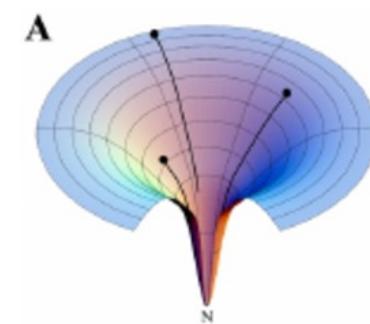
Evolutionary Biology

+

Informational Layer



All possible problems
(No Free Lunch)



Biological Evolution's
actual
landscape?

Evolution is Informational

“Where’s your evidence?” screamed Dawkins...

Fine-tuning

Physical Constants appear “just right”

Observer Theory argues this the most computationally efficient ‘region’ of possibility space containing rich attractor structures for Observers! (like Leibniz ‘BOAPW’)

Convergent Evolution

Independent discovery of similar solutions

Bats / Dolphins (echolocation)

Repeated protein motifs

Specific regions of computational possibility space are rich with strong attractors

Interpretation

Evolution isn’t a blind watchmaker
constrained search guided by

Physical Law

Pre-structured chemical spaces

Environmental Information

‘Architecture’ of Ruliad itself

Implications

Survival and reproduction are instrumental

(for computational persistence of Observers)

BUT

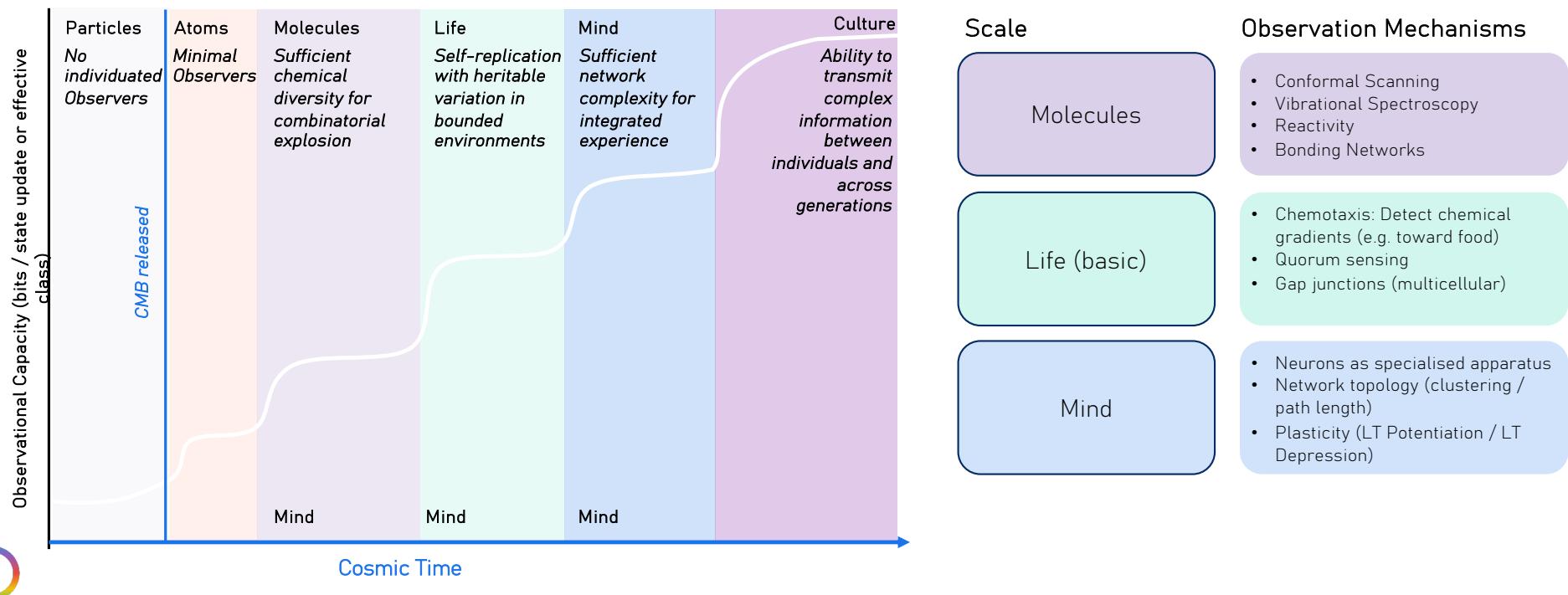
Deeper goal is to explore and integrate information as efficiently as possible



Observer Scales

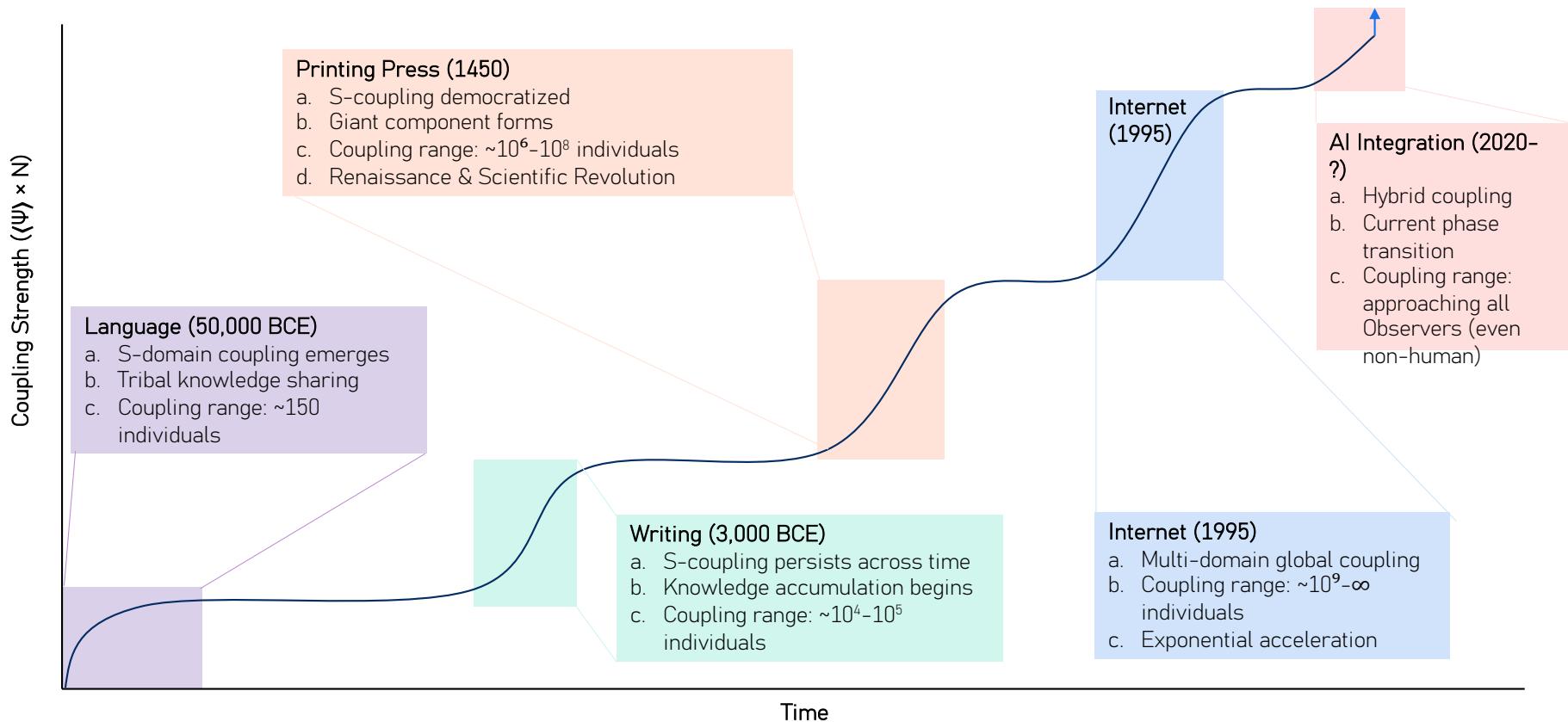
Observer Scales ≈ “How much of the possibility space a given Observer can sample and integrate information about”

Note: Time Periods are inaccurate – drawing sigmoid curves with a mouse is not fun!



How have Observers Like Us Coupled Through History?

Each transition between different coupling technologies exhibited sudden jump in network capacity, emergence of new Observer capabilities, reorganisation of social structures and an acceleration of the innovation rate





IMPLICATIONS – TELOS

From Observational Complexity to Universal Telos

We've seen three converging threads:

- **Physics:** Symmetry breaking, quantum fields and Planck limits define a **structured, bounded observable universe**
- **Evolution:** Biological and cultural evolution ride pre-existing informational gradients, building increasingly powerful observers
- **Observers:** Complexity and phase transitions track how much and how deeply Observers can probe our universe / reality

This suggests something quite provocative:

- Reality / universe's story is one of information integration at all scales
- Observers are how this happens

Now let's make this precise:

- What is **Universal Telos**?
- How do we formalise **information gradients** and **hierarchies** in the Ruliad?
- How does this connect to consciousness, meaning, and ethics?



Three Stories, One Gradient?
Toward maximal information integrated via Observation

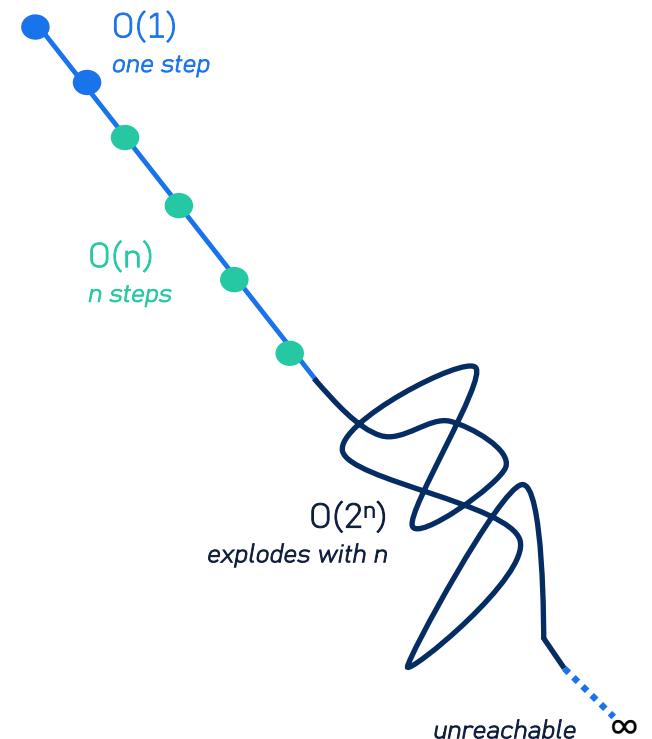


Computational Complexity Primer

Connecting this to the Ruliad

- Here complexity measures how far an Observer must 'travel' in the Ruliad to reach a piece of information
 - $O(1)$ – information is directly accessible from your current state
 - $O(n)$ – information is n "hypergraph updates" away
 - $O(n^2)$ – needs exploring a 2D region (random walk / diffusion)
 - $O(2^n)$ – full multiway explosion: information is buried in an exponential branching of possibilities
 - $O(\infty)$ – fundamentally unreachable by bounded Observers
- Ruliad framing
 - Let the Ruliad be a hypergraph of states and rules
 - Complexity measures length and structure of morphism chains you must traverse to "find" a desired state

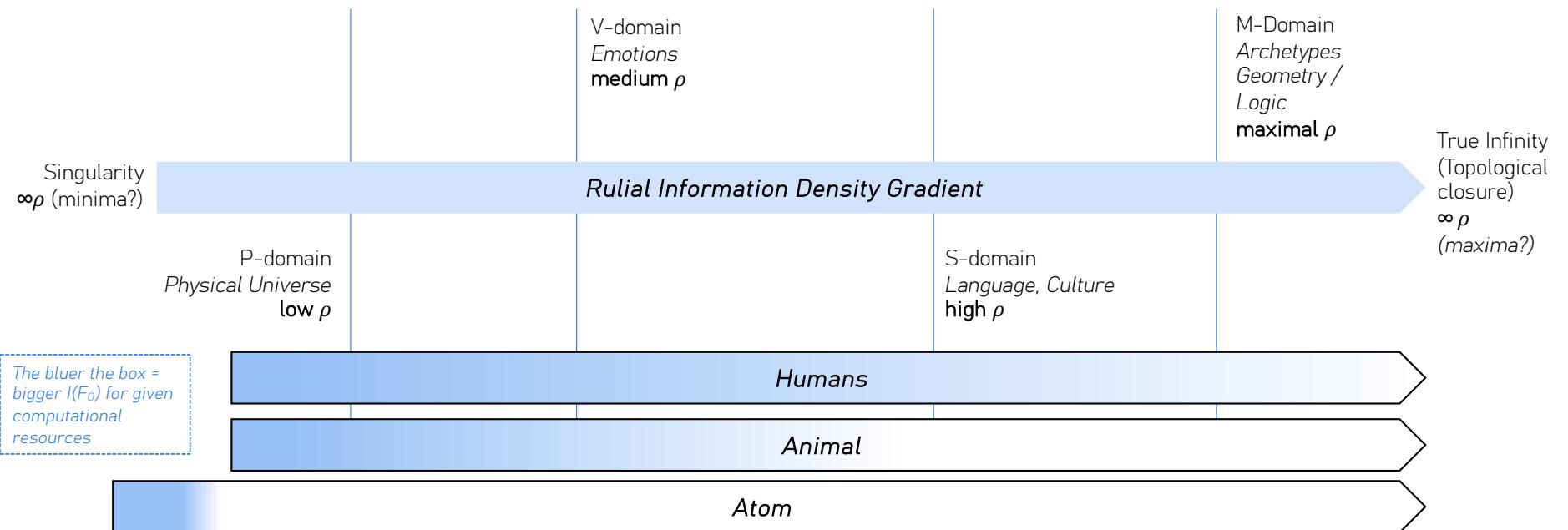
Given limited resources, which paths should Observers invest in?
Which strategies **minimise cost** per bit of **useful information gained**?



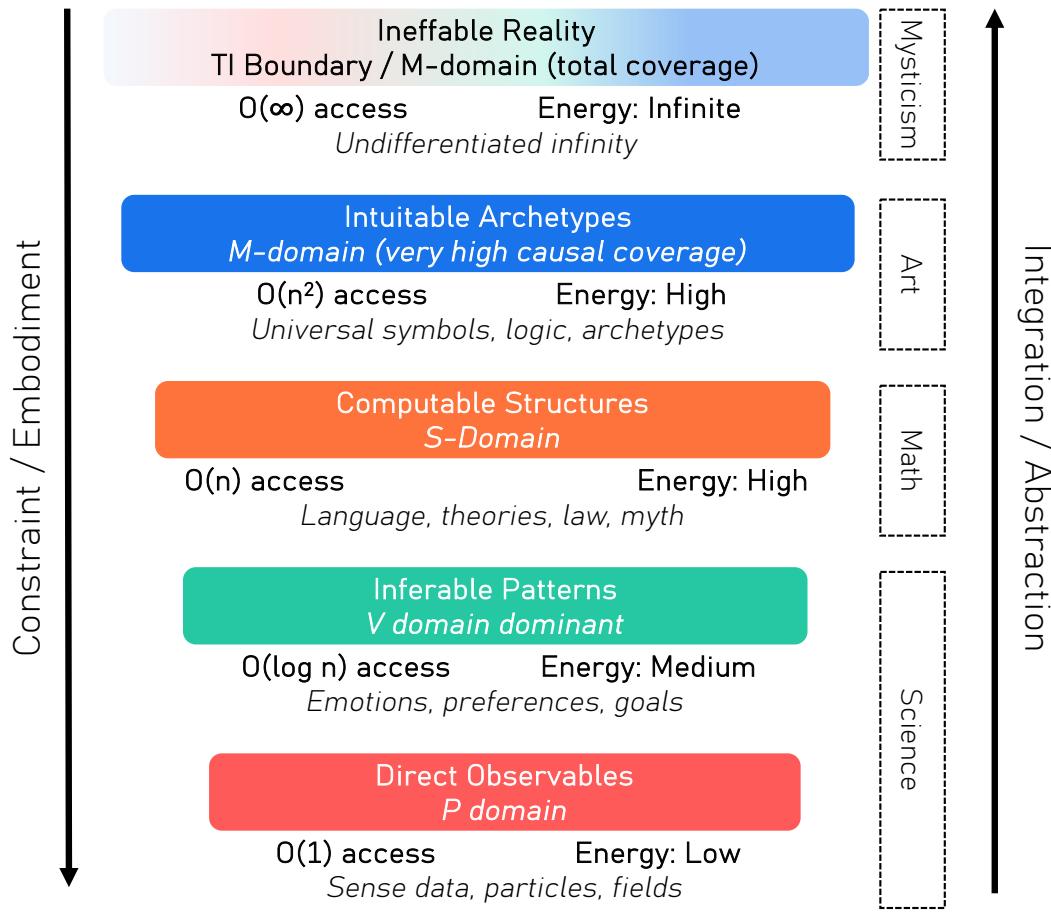
Information Gradients in the Ruliad

Note that Information Density, ρ , is an Observer relative measure!

CLAIM: The Ruliad is not a 'flat' topos. It has information gradients from low to high density



Informational Hierarchies



Hierarchy Properties

- 1 Higher domains contain and constrain lower ones
 - A pre-image of the lower domain exists in the higher domain (nested hierarchy)
- 2 Observers move integrated information upwards

raw data → value-laden meaning → abstract insight
- 3 Ancient traditions intuited this hierarchy, they function as a 'limit-setting' device to maximise size of R_0 (the Observable possibility space)
 - Kabbalah's four worlds
 - Hindu koshas
 - Platonic forms vs. matter

Different languages but **same** structure

Information Integration as Universal Telos

Core conjecture: All Observers share the same fundamental telos

Maximise integrated information $I(F_o)$ subject to boundedness B_o and persistence P_o

- Intuition
 - Observers that integrate more useful information predict better, survive longer, and spawn more observers
 - Survival and reproduction are instrumental; information integration is the deeper optimisation
- This aligns with
 - Biology: organisms that sense, integrate, and respond better outcompete others
 - Culture: societies that compress and share knowledge thrive
 - Spirituality: traditions that guide attention toward deep structures persist

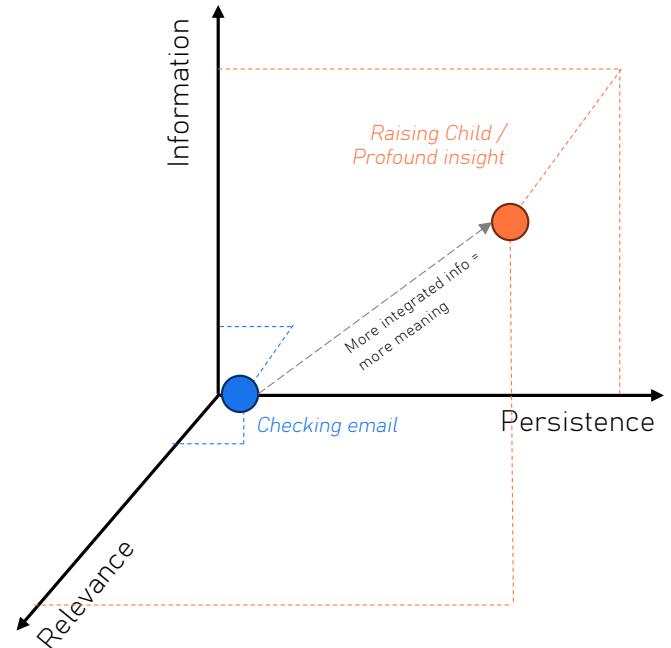
Allows definition of meaning as a 'computable-ish' quantity

Meaning \approx integral over:

Total information content from an Observation (how much is encoded)

Observer relevance (how much it matters to internal model)

Temporal persistence (how long it has utility)



Initial Empirical Support for Telos

- Biology: Nervous systems, sensory organs, memory systems all increase $I(F_o)$ per unit energy
- Culture: Writing, science, and digital tech serve primarily to externalise, compress and share information at lower cost
- Levin's experiments
 - Xenobots, regenerative morphogenesis, and non-neural cognition show telos-like behaviour wherever there is capacity to store and process information
- Ruliad / Observer perspective
 - Systems that don't integrate information die out to entropy (lose boundary)
 - Systems that do become more complex Observers that have more causal influence
 - Consistent with Darwinian selection, No Free Lunch constraints and observed acceleration of complexity through time

Information Integration Capacity

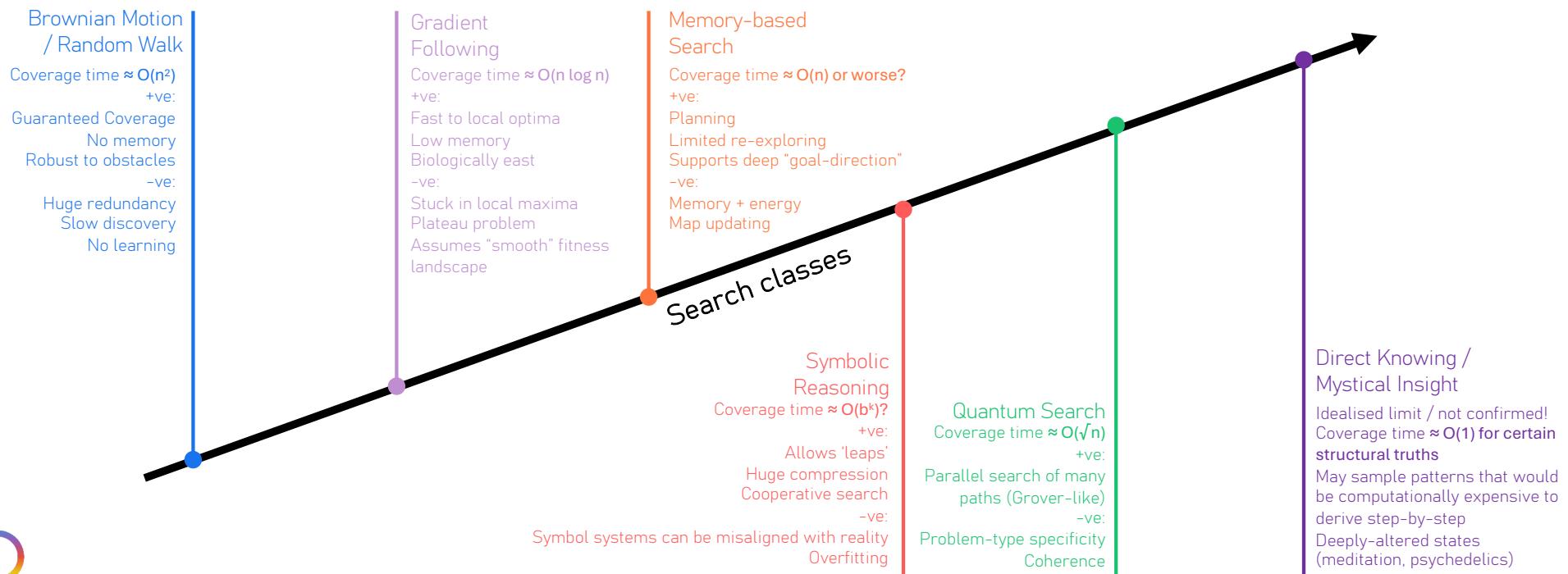
Evolution / Cultural time → Increasing $I(F_o)$



The Efficient Search Conjecture

Observers (at every scale) evolve optimal strategies for exploring computational possibility space given their constraints

- Strategies get more **complex** and **sophisticated**, balancing **exploration** (finding new information) and **exploitation** (using compressed / computationally reduced knowledge)



Evolution of Informational Efficiency

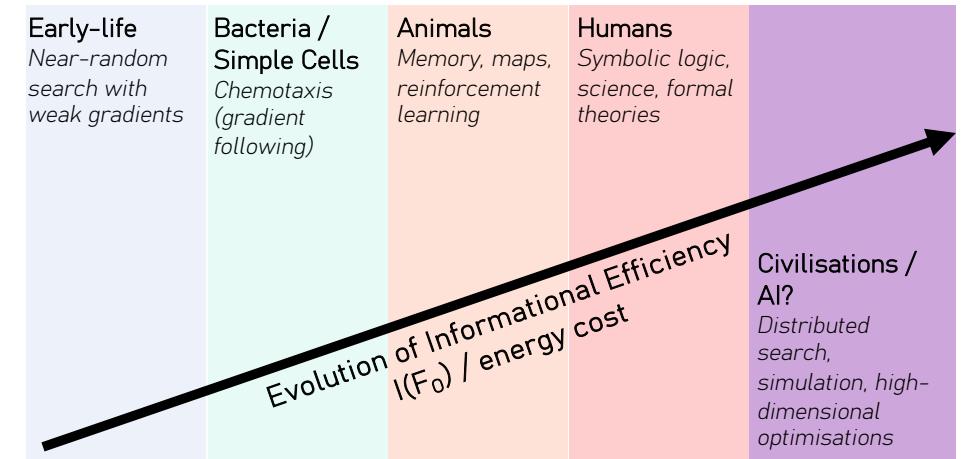
Cost per bit: Why Efficient Search is Better

Search Strategy	Qualitative Summary
Random Walk	High-time, low memory, awful energy efficiency
Gradient Following	Good locally, stalls in complex landscapes
Memory-based	Higher one-off costs, cheap reuse of successful strategies
Symbolic	Huge upfront cost, massive long-term efficiency gains
Quantum	Limit efficiency for certain classes of problems
Direct Knowing?	Perfect efficiency for ultra-narrow set of problems?



Observers that can pay the upfront cost gain huge long-term advantages in integrating information

Selection favours architectures implementing more efficient strategies



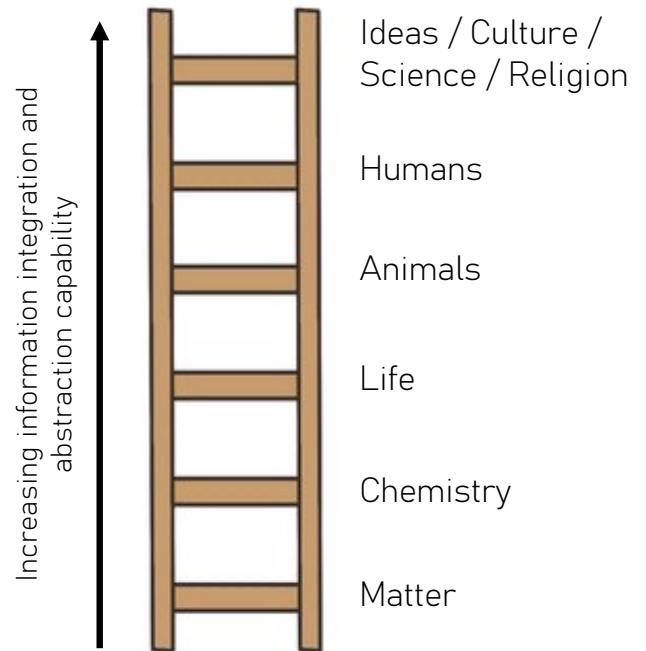
Trajectory is universal
Survival is derivative optimisation: required so that info integration continues



IMPLICATIONS – HOW DO IDEAS INGRESS?

Introduction: Ideas as Superstructures

- So far, we've explored
 - Reality as a **computational possibility space** (the Ruliad)
 - Observers as **bounded samplers** navigating information gradients
 - A **Universal Telos**: maximise integrated information per unit cost
- Now we move to the next layer
 - **Ideas** as superstructures that ride on top of sufficiently complex Observers
 - Ideas represent a **phase transition** in how information is organised and integrated
- Central question
 - If the universe is computational and telic, **what role do ideas play in shaping reality?**



Ideas as Persistent Information Patterns

Definition: Ideas / Memes are information patterns that achieve autonomous existence by replicating between minds (*Dawkins-like “mind-viruses”*)

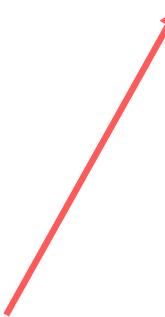
- Ideas / Memes are not the same as genes
 - Genes are tied to **biological lineages** and reproduction
 - Ideas can jump across species, across substrates (brains ↔ books ↔ silicon) and across cultures and epochs
- Phase transition
 - Once you have Observers that can symbolise and communicate, you get a **new landscape for evolution**
 - Not just organisms evolving, but **ideas / memes evolving within and between Observers**
- Memetic speed is much, much faster
 - Genetic evolution: generations → decades
 - Memetic evolution: social media → hours

Genes



Slow – millions of years / thousands of generations

Memes



Fast – years (books) → days (letters) → hours (email) → seconds (social media)



The Formal Structure of an Idea

The Memetic Tuple

Idea = (Pattern, Replication Rules, Fitness Function, Mutation Rate)

Components:

- **Pattern:** Core integrated information structure *e.g. the concept "survival of the fittest"*
- **Replication Rules:** How it spreads and sticks for Observers like us
 - **V-domain:** emotional resonance (fear, hope, curiosity)
 - **S/M-domain:** cognitive fit (is it easy to understand, remember, teach?)
 - **P-domain:** pragmatic utility (does it help achieve goals?)
 - **All domains:** coherence (status, conformity to Observer's causal graph)
- **Fitness Function:** How effectively it replicates under given conditions
$$\text{Virality} \propto \frac{\text{causal influence}}{\text{computational cost}}$$
- **Mutation Rate:** How much the idea changes with each transmission

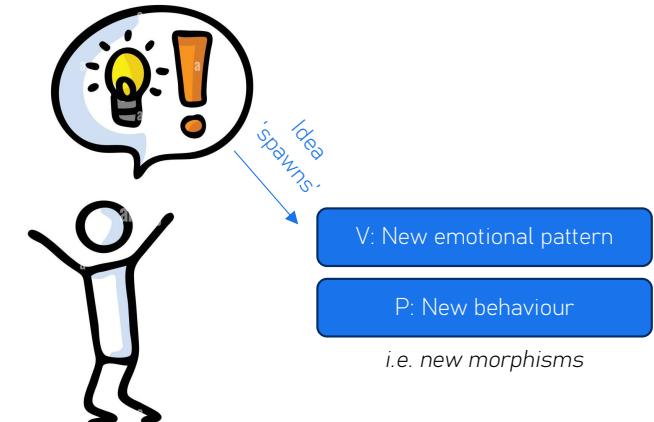


Ruliad Context

Ideas are structured as objects in the S-domain that can be copied between Observers

Special Features:

- Includes its own replication rules – like code that contains installer + updater



Creates new evolutionary arena where ideas compete for attention and memory (B_0). Form stable attractors in S-domain, analogous to biological niches

Ideas Shaping Reality

How Ideas Reshape Lower Domains

Claim: Ideas not epiphenomenal – they shape what becomes real in less information dense (lower) domains

- Example mechanisms:

- 1 Physical Embodiment: Beliefs change brain states → change hormones & behaviour
Example: Placebo effect → endogenous opioid release
- 2 Epigenetic effects: Chronic stress altering gene patterns / meditation
- 3 Social organisation: Shared ideas create norms, laws, institutions
Example: "Fiat Money" pure S-domain structure that moves trillions of P-domain dollars

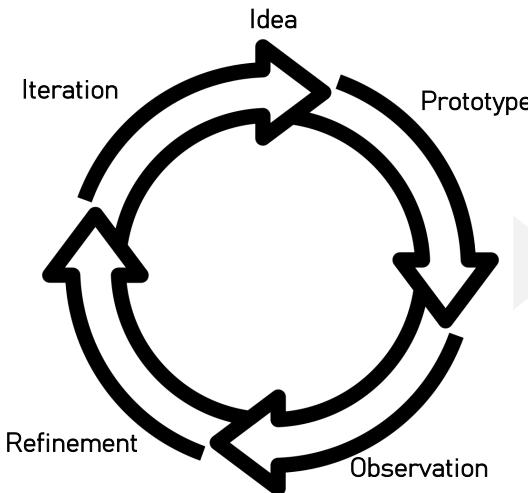


S-domain structures constrain which V / P domain morphisms ever get explored

"You can't build a rocket without the physics of rocketry"



The Feedback Loop: Ideas Shape Reality, Reality Shapes Ideas



Example

- Idea: "heavier-than-air" flight is possible
- Prototype: Build it
- Observation: Flies (or crashes)
- Refine: Update theory & design
- Iterate: Repeat until we get modern aviation

Each 'loop' deepens the idea's **computational persistence** (more equivalences and embeddings in possibility space)

Makes **paradigm shifts cost massive energy** – overwriting entire classes of computationally reduced (efficient) models

The Evolution of Ideas

Memetic Selection Pressure		Example	Claim
1	Explanatory Power	Germ theory beating Miasma theory – more predictive	Ideas that compress regularities more efficiently (i.e. more computationally reducible) are more useful
2	Emotional Resonance	Hero's Journey 'sticky' as mirrors all Observers lived experience	Ideas that activate emotions are more memorable as they 'touch' more points in the Observers causal graph
3	Social Utility	"Don't Murder" enables societal stability (timeless / placeless)	Ideas that solve coordination problems spread widely (lower global information integration cost!)
4	Practical Utility	Scientific ideas that enable more Observation (electricity / antibiotics)	Ideas with repeatable tangible benefits to Observer function gain wide adoption
5	Simplicity	"An eye for an eye" persistent because everyone gets it – not everyone 'gets' the law	Simple ideas spread faster but are subject to more distributed interpretations based on Observer's variable causal histories

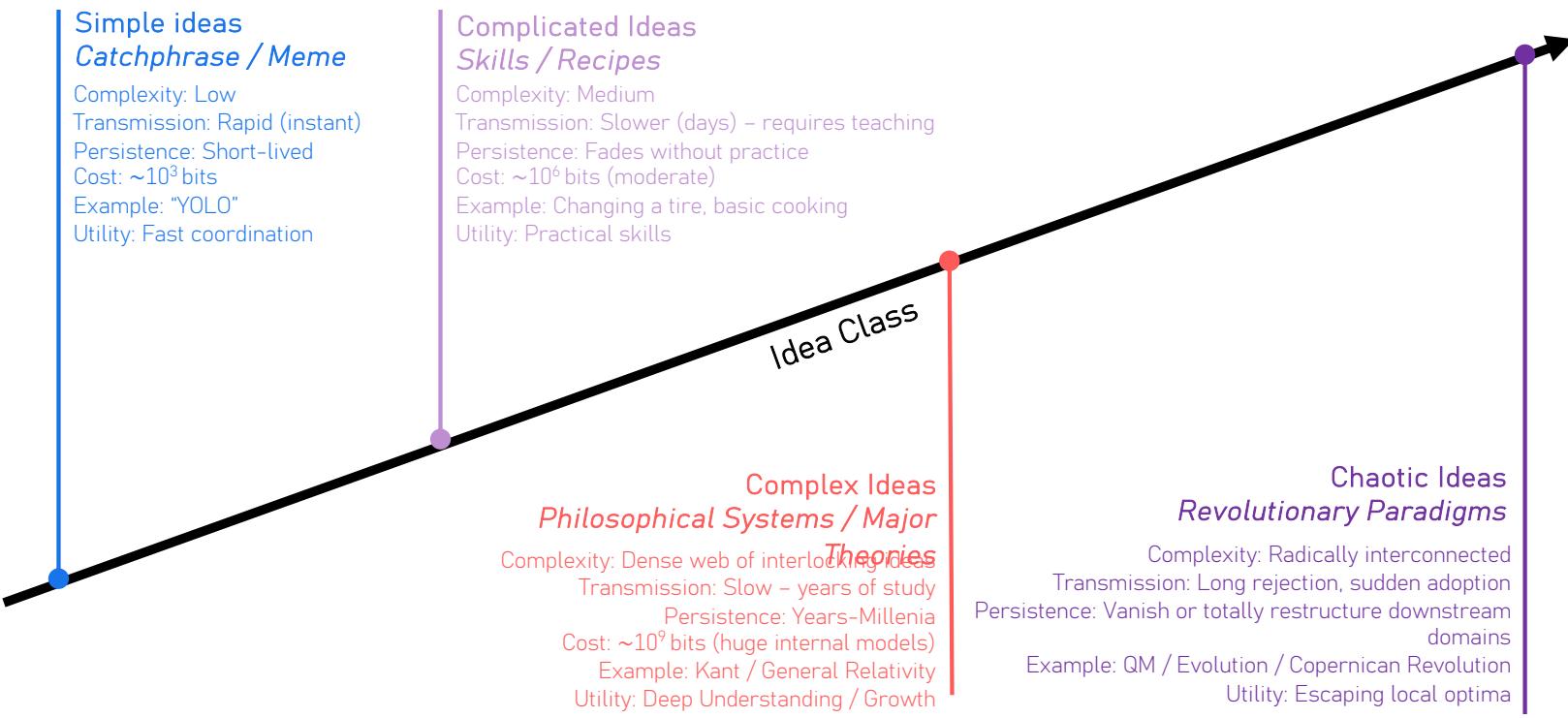


High-fitness ideas compress regularities and integrate information across Observer accessible domains (P, V, S, M)

The Computational Cost of Ideas

Conjecture: Different types of ideas have radically different computational burdens for Observers like us

- Ideas are categorised by **complexity class**, **transmission** and **persistence**



How do Ideas Interact with Meaning?

Meaning as a Function

$$I(F_O) \text{ for } x \approx \int I_O(x, n) \cdot Rel_O(x, n) \cdot P_O(x, n) d\mu(O, x, n)$$

- $I_O(x, n)$ = Information content of Observation x at state n for Observer O
- $Rel_O(x, o, n)$ = Relevance to Observer O 's telos (optimisation function) at state n
- $P_O(x, n)$ = Persistence (probability weighting of how many computational updates it survives, i.e. temporal half-life)
- Integration to approximate this over all Observers O , all time t , and all possible observations x (across the entire accessible Topos, F_O to the limit of R_O)

Plain English

Structure,
pattern, non-
noise

How much it
matters to
goals and
survival

Whether it
endures
(minutes vs.
centuries)

Integral

High Meaning = lots of info, highly relevant, long-lived

Zero Meaning: High info but no structure or
relevance (pure noise)





IMPLICATIONS – COMPUTATIONAL ETHICS

The Home Stretch



- So far, we've argued
 - Reality, for Observers, is only parseable computationally, and The Ruliad is computations limit object!
 - Observers are **bounded samplers** with **Universal Telos**: maximise integrated information (as quick as they can)
 - Ideas and cultural systems form **formal causation superstructures** that shape what Observers can do
- This raises an unavoidable question

If the universe is structured and telic in this way, what does it imply about ethics?

- The claims
 - Morality isn't invented, it's discovered
 - Ethical behaviour = mathematically optimal behaviour exploring 'fastest' information gradients for the most Observers
 - Virtue and sin are about information integration vs informational entropy for self-referential Observers (us!)
 - Ethics emerge when we ask: which sequences of morphisms are "good" or "bad"

Globally, entropy still increases. Locally, Observers create negentropy i.e. life, knowledge, stable societies

Ethics is ultimately the study of:

1. Which choices maximise information integration per unit entropy?
2. Which choices 'throw information away' and accelerate disorder?



Choice as Computational Optimisation

Definition: [Path Cost Function](#)

- For a path γ through the Ruliad from state s_1 to s_2 , the total cost is:

$$Cost(\gamma) = \sum_{i=1}^n comp_{steps}(\gamma_i) + \lambda \cdot H(\gamma) + \mu \cdot Distance(\gamma, TI) + \nu \cdot N(\gamma)$$

where:

- $comp_{steps}$ = computational effort
- ΔH = entropy generated
- N = network effects on other observers
- D_{TI} = distance to True Infinity (convergence)
- λ, μ, ν, ρ are weights

Analogy: Like Google Maps computing the best route: doesn't just minimise distance; balances time, traffic, tolls and your destination

For Intuition:

Cost Function Variable	Example 1: Helping a Stranger feels Good	Example 2: Lying to Avoid Confrontation feels Bad
$comp_{steps}(\gamma_i)$	Low small effort	Low initially avoid hard conversation
$H(\gamma)$	Low trivial disorder created	High must maintain consistency / remember lie
$D(\gamma, TI)$	Decreases positive network effect	Increases divergence in Observer world models and sampling functors
$N(\gamma)$	Positive gain to other Observers	Negative entropic cascade if revealed
$Cost(\gamma)$	Low - Chosen	High - Avoided hence guilty feeling



Ethical Behaviour = Optimal Path

Selection *Or... The Mathematics of Good & Evil*

Formal statement (simplified)

Let γ_1 be a virtuous path and γ_2 a sinful path from your current state to TI / convergence / completion of all possible computations

Then:

- $\text{Cost}(\gamma_1) < \text{Cost}(\gamma_2)$
- $I(F_o)\gamma_1 > I(F_o)\gamma_2$
- $H(\gamma_1) < H(\gamma_2)$
- $T(\gamma_1) < T(\gamma_2)$ (reaches convergence faster)

This falls out of:

- The structure of R_o
- The Observer Loop
- The Telos of climbing information gradients (from less dense to more)

Virtue, γ_1

Sin, γ_2

= paths that **maximise information integration** and **minimise entropy** and **speed up convergence**

= paths that **waste information**, generate **excess entropy** and **slow convergence**



Computational 'Debt'

Not all choices Observers make are equal.

Some choices create "computational debt", they appear optimal in the short-term, due to computational boundedness and computational irreducibility, but **requires extensive additional computation to integrate coherently later**

Definition: Computational Debt

- For choice / action γ made at time t , the approximate computational debt is:

$$\mathbf{Debt}(\gamma, t_0) \approx \int_t^{\infty} [\mathbf{Cost}_{actual}(\gamma, t) - \mathbf{Cost}_{optimal}(\gamma, t)] dt$$

Where:

- $\mathbf{Cost}_{actual}(\gamma, t)$: Ongoing computational cost of actual choice / action, γ at time, t
- $\mathbf{Cost}_{optimal}(\gamma)$: Computational cost that would have been incurred with globally optimal choice / action, γ at time, t

Intuition:

- Computational Debt is the extra computation needed to maintain a sub-optimal pattern (e.g. lie, addiction, even bad code!) or correct it later (tell the truth, fix the bug!)
- Trade off between convenience now vs. additional complexity, entropy and lost chance



Example: Lying as Computational Debt
Works Short Term but Globally Suboptimal

At $t=0$

Truth = high emotional cost now

Lie = low cost now

At $t>0$

No / low future cost

Extra modelling
Remembering what you said

Extra constraints
Fewer morphism options

Extra risk
Discovery, network collapse

Extra energy expenditure
Anxiety, monitoring

Extra computational work that could have been spent on learning, discovery etc.

Convergence

Many Traditions, One Optimisation Problem

- The paper highlights a striking convergence: major ethical systems around the world **approximate the same computational optima**
- Examples from Theology
 - **Buddhism's Eightfold Path** – minimises Observer entropy (right view, speech, action...)
 - **Christianity's "love your neighbour"** – maximises Observer coupling and network integration
 - **Judaism's Noahide Laws** – minimal generating rule set for stable civilisations
 - **Islam's Taqwa** – align personal will with cosmic optimisation
 - **Hindu Dharma, Daoist Wu Wei** – maintain cosmic order and follow least-resistance (low entropy) paths
- Biology Analogy
 - Just as eyes evolved independently many times because vision is useful (captures the most useful information from P-domain)
 - Ethical systems converge because coordination and low entropy are **always useful** in Observer networks

Conclusion: Ethics are not arbitrary cultural scripts; they are local approximations of a universal optimisation problem



Potential Investigations

The sketches suggest that we can quantify ethics with information-theoretic measures of Virtue, Sin and Computational Debt

Individuals

Prediction	Evidence
Virtuous behaviour correlates with wellbeing	Gratitude practitioners report higher life satisfaction
Sin creates personal suffering	Lying increases cortisol (quantitative)
Meditation reduces suffering	Meditators reduce DMN activity

Organisations

Prediction	Evidence
High-trust cultures outcompete low-trust	Companies with trust have higher productivity
Transparency Wins	Open source outperforms proprietary
Rigid hierarchies limit bandwidth	Decentralised Orgs adapt faster

Civilisations

Prediction	Evidence
Better error-correction survives longer	Autocracy lifespan average c.50yrs vs. 200+ yrs for democracy
Information freedom accelerates development	Open societies outcompete closed (US vs. Russia / Modern West vs. MENA)
Universal Education minimises computational boundedness	Literacy rate correlates with GDP, innovation, stability

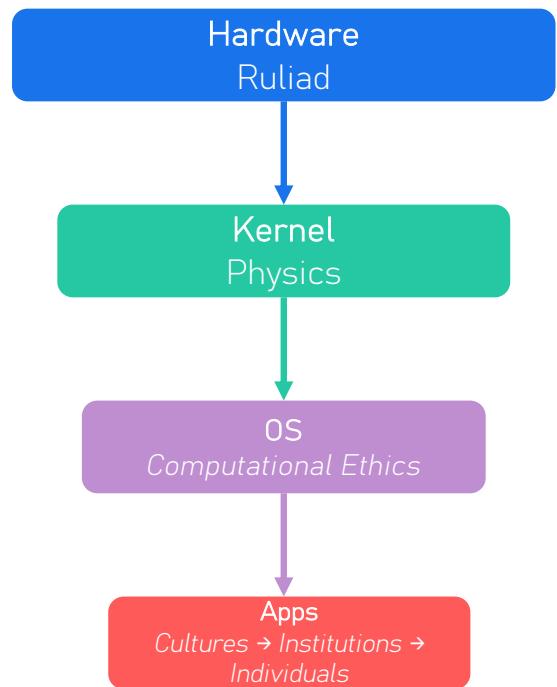
Species

Prediction	Evidence
Cooperating group outcompete non-cooperated in iterated games	Eusocial insects / primates / humans
Morphospace has attractor basins	Convergent Evolution
Computational constrain innovation sequences	Kardashev scale / Wright's Law



Ethics are Reality's Operating System

- Every persistent Observer implements the same function / loop
- Ethics = discovery of **optimal trajectories** for that function
- Synthesis
 - **Ethics are structural**, like **mathematics** and **physics** they are not arbitrary preferences or social conventions i.e. postmodernism is wrong
 - **Virtue** corresponds to **minimal cost paths**, **maximal information integration** and **stable networks**
 - **Sin** corresponds to **maximal cost paths**, informational **entropy increasing**, **fragile networks**
- How does Theology come in?
 - The closure point of the Ruliad (the compactifying point at infinity, TI) can be considered to share certain properties that theists attribute to God like **necessity, omnipotence and omniscience** (in limit)
 - “**Perfect Justice**” = Optimal pattern arrangement (max info, min entropy)
 - “**Perfect Love**” = maximal Observer coupling
 - These correspond to mathematical limits of the Observer's optimisation function





IMPLICATIONS - THEOLOGY

Science vs. Meaning

- Two Languages

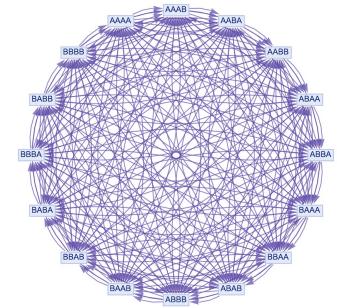
Science (particles, forces) vs. Meaning (purpose, consciousness, value)

- Historical Divide

- These domains have evolved and progressively siloed since the Copernican Revolution
- Science describes "a measurable, predictable reality" and Religion / Philosophy describe "meaning"
- Disconnection formalised in "Separate Magisteria" i.e. postmodernists lack imagination!

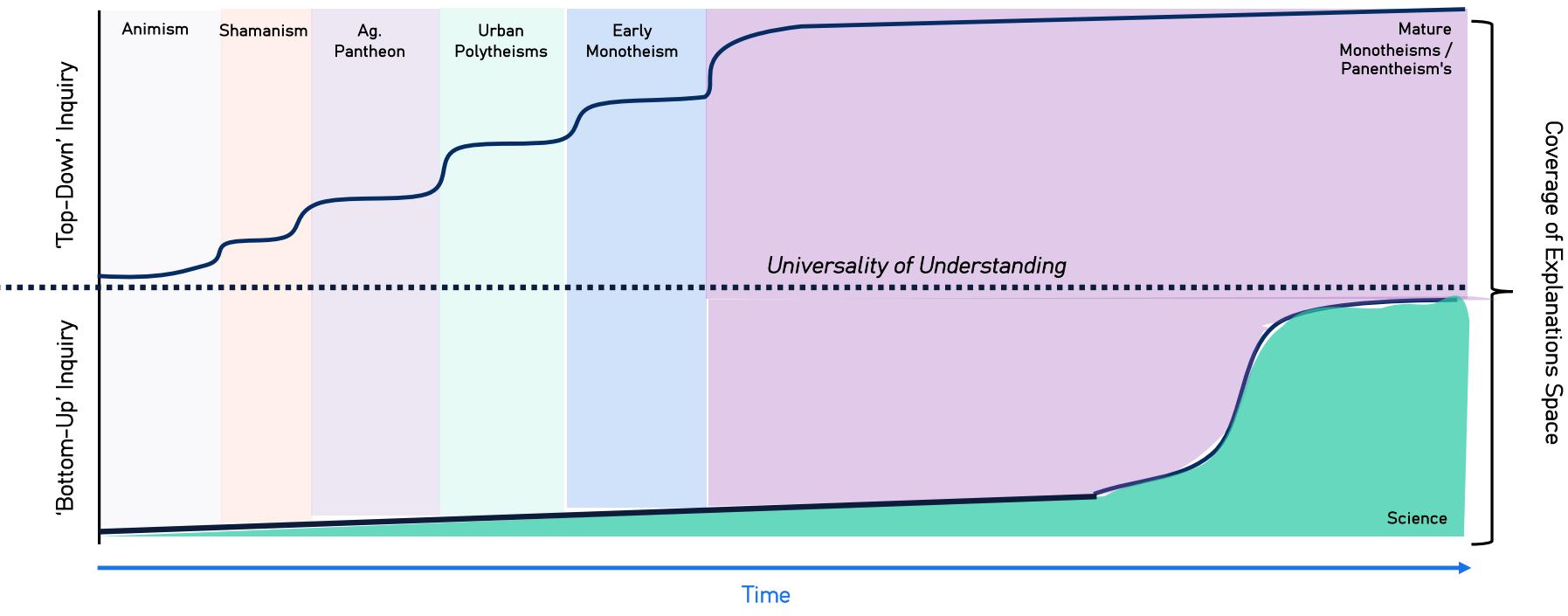
- Computational Bridge

- Ruliad offer a common language to unify these domains under one lingua franca
- **Core Idea:** Observer Theory uses the Ruliad – the "abstract limit of all possible computations" – as a shared canvas to model **a God-concept in a way that is mathematically compatible with computational physics (at least the Wolfram version of it!)**



The Epistemological Timeline

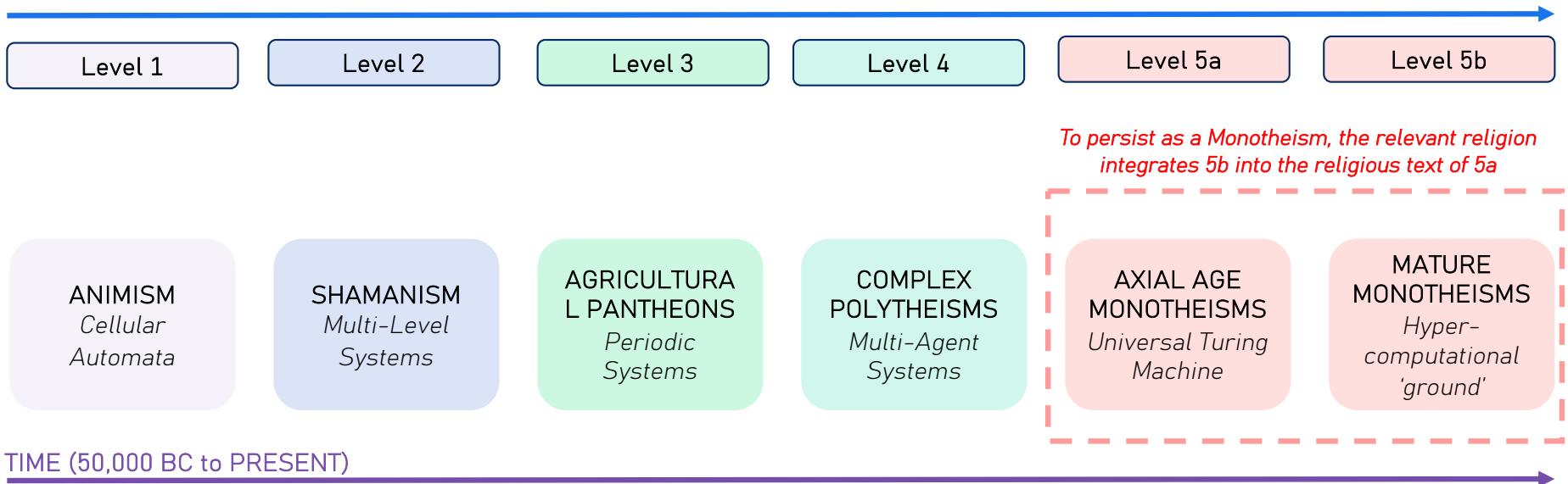
The Rationalisation of Reality



How Do Religions Evolve?

Spiritual Systems “Set the Limit” of R_0 for Observers Like Us

INCREASING ABSTRACTION / COMPUTATIONAL CAPACITY / 'SIZE' of OBSERVABLE RULIAD



Each level INTEGRATES and TRANSCENDS the prior enabling Observers to access larger latent spaces

Mapping Theology to Computational Language

Theology	Computational Correspondence
Necessity	Necessary as denying computation exists requires a computation for the denial - contradiction
Divine Simplicity	Despite containing infinite complexity, Ruliad has extremely simple definition <i>"All possible rules, for all possible steps, taken to the limit"</i>
Omnipotence	Can model / generate any possible reality because it contains all generative processes
Omniscience	Contains all possible logic, information and all computations that could process it
Omnipresence	Wolfram Physics: Ruliad is 'everywhere' as physical space emerges from Ruliad + Observers
Transcendence / Immanence	The Ruliad transcends any individual Observer's sampling, yet every possible sampling exists within the Ruliad



Mapping Physics to Cosmogenesis

Physical Event	Time	Genesis 'Day'	Kabbalistic Stage	Vedantic Parallel	Daoist Parallel	Information Transition	Symmetry Breaking
Planck Era	10^{-43} s	"Formless void" (Gen 1:2)	Tzimtzum	Brahman's self-limitation	Dao becoming nameable	$I_0: \infty \rightarrow \text{finite}$	All symmetries unified
Grand Unification	10^{-36} s	"Let there be light" (Gen 1:3)	Kav (Ray of light)	First vibration (OM/Shabda)	Primordial Qi emerges	Unity \rightarrow First distinction	$SU(5)$ or $SO(10)$ breaks to $SU(3) \times SU(2) \times U(1)$
Cosmic Inflation	10^{-32} s	Light/Dark separation (Gen 1:4)	Adam Kadmon / MetaObserver emergence	Expansion of Hiranyagarbha	Yin-Yang differentiation	Local \rightarrow Global structure	Space-time symmetry breaking
Electroweak Transition	10^{-12} s	Waters above/below (Gen 1:6-7)	Binah / Chochmah split	Purusha/Prakriti divide	Clear/Turbid (Qing/Zhuo) separate	Force differentiation	$SU(2) \times U(1) \rightarrow U(1)_{EM}$
Quark Confinement	10^{-6} s	Dry land appears (Gen 1:9)	Tiferet	Five elements (Pancha Mahabhuta)	Five phases emerge	Matter stabilization	Chiral symmetry breaking
Nucleosynthesis	1-3 min	Lights in heavens (Gen 1:14)	Yesod	Atomic observation (Pratyaksha)	Ten thousand things	Stable atoms form	Isospin symmetry accessible
Recombination (CMB)	380 ky	Atmosphere clears	Malkhut (becomes observable)	Gross world manifests	Perceptible realm	Photons decouple	Universe becomes transparent
First Stars	100 My	Living creatures (Gen 1:20-21)	Light returns (Tikkun begins)	Life emerges	Vitality appears	Complex structure	Stellar nucleosynthesis



Synthesis: Spiritual Systems as Search Algorithms

- Ancient traditions spiritual systems act like evolutionary algorithms: [they help Observers like us explore ever-larger computational "maps" of reality i.e. the Observable Ruliad, \$R_0\$](#)
- Each tradition encodes different strategies for finding more structure / information and maximising their Observers unboundedness and persistence (all their laws!)
- Over a civilisational timeline, belief systems have abstracted upward. The power of their God 'grew' to access more of the computational possibility space :

Animism / Shamanism → Pantheons / Polytheisms → Philosophical Monotheism → Infinite Oneness

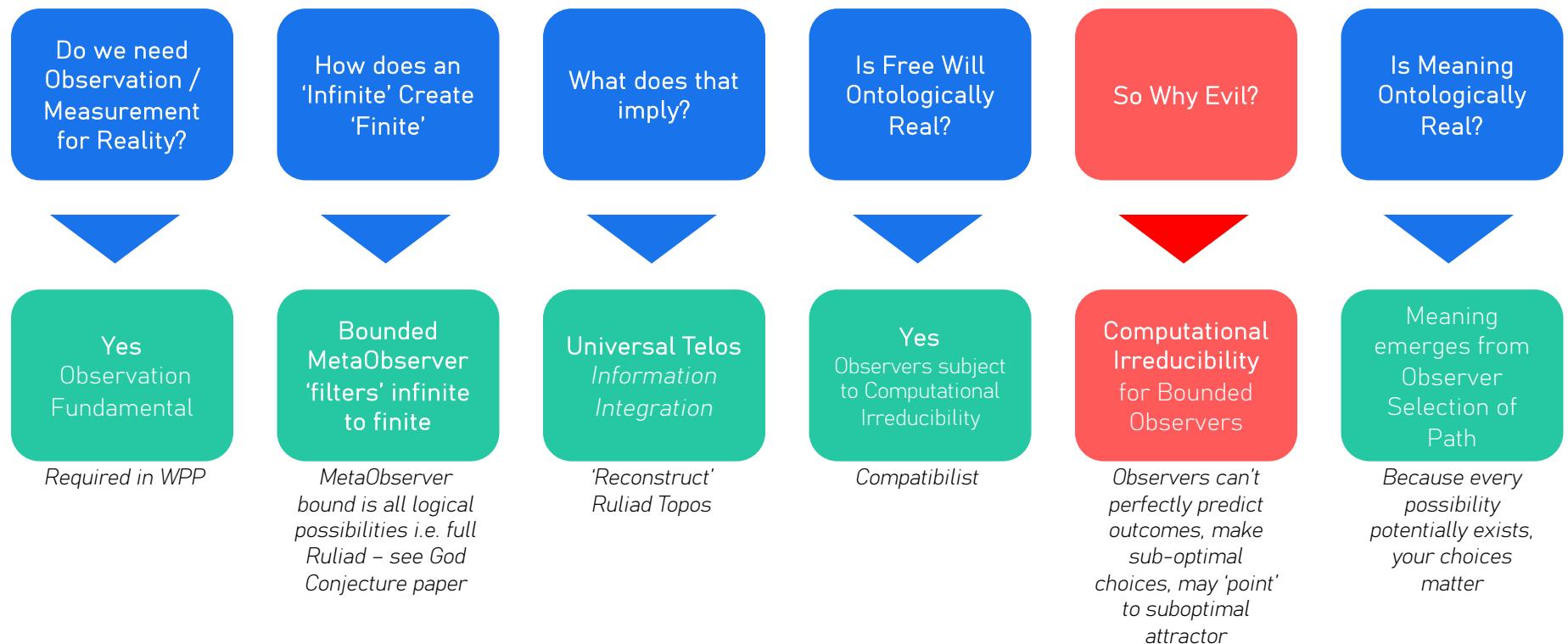
- Each jump gives Observers like us access to a bigger "computational possibility space" i.e. more potential causal influence!
- This parallels science's progression which builds F_0 bottom-up:

Local Heuristics → Universal Classical Laws → Quantum Mechanics → Information Theory?

- Each transcends and includes the previous, collectively expanding what we can know



Theological Questions Find Answers in a Computationally Parseable Universe



Why an Infinite Computational 'Ground' Doesn't Make Claims Equivalent

- **Circularity is universal:** Any framework that tries to explain "everything" leans on axioms it cannot prove from the inside
e.g. logic, induction, existence, lawfulness
- That doesn't make frameworks equal. Some explain far more with far less, with fewer contradictions and richer predictive apparatus
- **Key distinctions:**
 - Unprovable = cannot be finally derived from a more basic system
 - Unequal = can differ dramatically in coherence, explanatory power, and usefulness
- **Computational Theology:**
 - Forces theology into precise contact with the Ruliad / Computation / Maths / Science
 - Respects formal limits (Gödelian limits, Tarski)
 - Yields **non-trivial constraints** on what theistic creation was to be computationally valid
- **The question is not "Can we prove it?" but "Given the axioms, does it give us more understanding for fewer assumption?"**

Materialism	Traditional Theism	Computational Theology*
Sciences Invariant	Why questions Invariant	Both <i>Invariant structure</i> <i>Variable outcomes</i>
Why questions	Everything Else	?
Yes Testable	None	Yes Testable
Multiple frameworks	Yes but...	Single Framework others as subsystems <i>But requires computation / Ruliad</i>
Paradoxes at domain boundary	Disagrees with empirical evidence	No contradictions Resolves paradoxes



The Scorecard: Explanations per Assumption

	Materialism	Observer Theory
Assumes	<ul style="list-style-type: none">Existence of laws, constants, matter, consciousness as brute emergent factsc.26 Free Parameters in PhysicsAt least 2 but up to 5 Metaphysical Brute Facts	<ol style="list-style-type: none">1a Logic exists1b Computation follows (CTD as meta-assumption)2 Ruliad as complete structure of computations3 Observers as bounded samplers
Explains	<i>Local physical phenomena given those laws</i>	<i>Why laws, why unreasonable effectiveness of mathematics (computationally efficient), why they're finetuned (boundedness), why consciousness / meaning / free will / telos, why religious structures repeat / why secular superstructures evolve and persist</i>
Conclusion	<ul style="list-style-type: none">Many Brute FactsLimited ultimate explanations	<ul style="list-style-type: none">10x-100x explained per axiom than materialism<i>Orders-of-magnitude contrast</i>



If we must live with brute facts, choose the framework that buys the most understanding for the least



CONCLUSIONS (FINALLY!)

Conclusion



What we started with:

- **The Ruliad:** Observable reality as the entangled limit of all possible computations
- **Observers:** bounded samplers running a universal loop
- **Undecidability:** Ultimate questions (hard problem, meaning, free will) cannot be resolved inside our own system

What moves did we make:

- Showed how **physics (as we know it today)** slots into this picture
- Reframed **evolution** as optimisation of information integration
- Proposed **Universal Telos:** climbing information gradients under constraints to integrate as much information as possible
- Formalised **Computational Ethics:** path selection criteria

Then we mapped:

- Ancient traditions to an Observer-centric meta-model
- Applied it to spiritual systems evolution to demonstrate increasing computational complexity and correspondence with computational physics



What's New and What Isn't:

Not New

- Using computation as a lens on physics
- Using information, complexity and causal history to talk about life and mind
- Recognising ethical convergences across traditions (meta-ethics)

What a Universal Observer Model Adds

- A single way to discuss measurement from Atoms to Humans
- How Observer's interact at all scales
- How platonic / latent space ingresses to the physical world via ideas
- Universal Telos (testable)
- Computational Ethics (testable)

Note: this is a conjecture, not a theorem. It rests on specific assumptions that can be tested and could fail!

Why This Matters (Even If It's Wrong)

Even if the Conjecture turns out to be false or incomplete, the attempt has utility:

1. A shared language

- It forces physics, biology, consciousness, philosophy, and theology into **one formal vocabulary** (computation, observers, information), without sacrificing empiricism

2. Sharper questions

- What exactly do we mean by meaning, free will, good & bad and telos?
- Which parts are unfalsifiable, and which are about **Observer dynamics?**

3. Better experiments

- Thinking in terms of Observers and telos suggests new experiments in non-neural cognition, multi-domain information integration (see PID in IIT), memetics and ethics

4. A computational model can formalise theological questions

- It gives religious people a way to take science **seriously**
- It gives scientists a way to take religious questions **seriously**, without turning off their error-detectors



In other words: “even a failed bridge is useful if it tells us where the river actually is”