The A=A Problem for Everettian Branching

Informational Identity, Subject-Individuation, and the Ontology of Branching Observers

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Working paper draft — philosophical argument; no modification of quantum dynamics claimed

Abstract

Everettian quantum mechanics replaces collapse with branching: after measurement, multiple successor observers are said to exist, each recording a definite outcome. This paper raises a prior metaphysical question: what licenses the multiplication of conscious subjects, rather than merely the multiplication of physical branch-realizers? I introduce the **Informational Identity Constraint** (IIC): if conscious subjecthood is individuated by subject-constituting informational or record-based configuration, then there is no subject-multiplicity without subject-constituting informational difference. The point is not that two physical systems cannot be numerically distinct. They can. The point is that physical token-multiplicity does not by itself ground multiplicity at the level of conscious subjectivity unless one supplies an additional criterion of subject-individuation. Everettian accounts often move from branch multiplicity to observer multiplicity as if this transition were automatic. The A=A problem denies that it is automatic. Before branch-relative differences enter the subject-constituting record configuration, the same conscious configuration remains the same conscious configuration, even if multiply realized. After such differences are integrated, distinct successor subject-states exist. The argument is conditional, not a refutation of Everettian quantum mechanics: if observer-states are functionally or informationally individuated, then subject-counting must track informational differentiation, not merely branch labels. If Everettianism rejects this constraint, it owes an account of the non-informational fact that individuates subjects.

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1. Introduction

The many-worlds interpretation of quantum mechanics is often presented as ontologically austere. It retains unitary dynamics and avoids physical collapse. Measurement does not select one outcome; rather, the universal state evolves into a superposition of decohered branches, each containing an observer correlated with a definite result.

This paper does not challenge the mathematics of that picture. It does not propose a rival dynamics, a hidden-variable theory, an objective collapse mechanism, or a physical modification of the Schrödinger equation. Its target is narrower: the metaphysics of observer-counting.

Everettian discussions routinely speak of branching observers, multiple successors, and future copies. But the move from physical branch multiplicity to conscious subject multiplicity is not

metaphysically innocent. A physical branch may contain a realizer of an observer-state. But what makes two such realizers two subjects, rather than two realizations of the same subject-state?

The central thought is simple:

> A conscious configuration identical to itself is not made subjectively distinct merely by being multiply realized.

This is the A=A problem. It asks Everettian ontology to justify the transition from many branch-realizers to many conscious subjects. The problem is especially sharp if one accepts, as many functionalist or computational accounts of mind do, that conscious subjecthood supervenes on informational organization. If the subject is constituted by an informational or record-based configuration, then subject-multiplicity requires subject-constituting informational difference.

The argument does not depend on proving a full theory of consciousness. It is conditional:

> If conscious subjecthood is individuated by informational configuration, then branch-indexed duplication alone does not multiply conscious subjects.

An Everettian may reject the antecedent. But then the theory owes an alternative account of what individuates subjects: physical tokenhood, primitive thisness, branch-indexing, or some other non-informational criterion. The aim of this paper is to make that burden explicit.

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2. The Informational Identity Constraint

Let a conscious subject-state be understood, minimally, as a subject-constituting informational configuration: a structured set of records, dispositions, memories, perceptual integrations, and internal relations sufficient to constitute an experiential state. This formulation is intentionally broad. It does not require a specific computational theory of consciousness, nor does it require reducing consciousness to classical digital computation. It requires only that the properties relevant to subjecthood are structural and informational rather than primitive haecceities attached to physical tokens.

The relevant configuration should not be understood as an instantaneous frame. For the purposes of this argument, a subject-state is better treated as a finite temporally integrated record-configuration, so that subject-individuation attaches to an integrated structure rather than to a punctual snapshot.

This yields the following principle:

> **Informational Identity Constraint (IIC).** If two alleged subject-states are identical in all subject-constituting informational respects, then they are not distinct subjects in virtue of a mere external label, location, substrate-token, or branch-index. Conscious distinctness requires subject-constituting informational difference.

The IIC does not deny physical multiplicity. Two books can contain the same text and still be two books. Two computers can run the same program and still be two machines. Two brains, if

physically duplicated, can be two biological systems. The IIC concerns subject-counting, not object-counting.

The relevant distinction is therefore:

1. **Physical token multiplicity:** there may be multiple physical realizers.
2. **Informational identity:** those realizers may implement the same subject-constituting configuration.
3. **Subject multiplicity:** there are multiple conscious subjects only when there are multiple subject-constituting configurations.

Everettian branching clearly supplies physical multiplicity at the level of branch-relative structure. It also eventually supplies informationally distinct successor states, once different outcome-records are integrated. The question is whether it is entitled to count multiple subjects before, or independently of, that informational differentiation.

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3. The A=A Problem

Consider an observer before a measurement. The observer is in a subject-state C. A measurement interaction later correlates successor observer-states with different outcomes. Schematically:

> observer-ready × (up + down) → observer-sees-up × up + observer-sees-down × down

Once the successor observer-states differ in their subject-constituting records, the IIC permits subject multiplicity:

> $C_{up} \neq C_{down}$.

At that point there are different memories, different perceptual contents, different expectations, and different experiential histories. The existence of distinct successor subjects is not problematic.

The A=A problem concerns the transition from branch structure to subject-counting. If, at some stage, two branch-relative realizers implement the same subject-constituting configuration C, then at the level of conscious subjectivity we have:

> C = C.

Calling these “two observers” may be correct at the level of physical realization, but it is not yet justified at the level of subject individuation. Branch index alone does not constitute a subject-relevant difference unless branch index is itself part of, or grounds a difference in, the subject-constituting configuration.

The problem can therefore be stated as follows:

> Everettian branching may multiply physical realizers. It does not multiply subjects until it multiplies subject-constituting records.

This is the core claim. It does not say that Everettian branching never produces multiple subjects. It says that subject multiplicity must be earned by informational differentiation, not assumed from physical branching alone.

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4. Physical Branching and Subject-Individuation

An Everettian may object that branches are physically distinct long before an observer consciously reflects on an outcome. Decoherence rapidly correlates apparatus, environment, and observer with different macroscopic records. In realistic measurement contexts, this process may occur on timescales far shorter than those associated with reflective awareness.

This is correct, but it does not remove the problem. The argument should not be formulated in terms of slow, reflective, reportable consciousness. The relevant threshold is not when the observer says "I saw up" or introspectively notices an outcome. The relevant threshold is when branch-relative differences become part of the **subject-constituting record configuration**.

Thus, the Conscious Branching Criterion should be stated as follows:

> **Conscious Branching Criterion.** Subject branching occurs when, and only when, branch-relative differences are integrated into subject-constituting record structure.

This criterion is neutral about the physical timescale. If decoherence rapidly produces distinct subject-constituting records, then subject branching occurs rapidly. The A=A problem does not require a temporally extended gap between physical decoherence and conscious differentiation. It requires only the conceptual distinction between:

This also means that the relevant branching threshold should not be pictured as the duplication of instantaneous observer-slices. What matters is whether branch-relative differences have entered a temporally integrated record-configuration sufficient to ground distinct continuations.

1. physical branch differentiation; and
2. subject individuation.

If those coincide in a given physical process, then the Everettian may say so. But the coincidence must be argued, not assumed. The A=A problem blocks only the unargued transition from branch multiplicity to subject multiplicity independently of a criterion of subject constitution.

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5. Type, Token, and the Cost of Primitive Subject-Thisness

A standard objection is that the IIC confuses qualitative identity with numerical identity. Two identical printed pages are qualitatively identical but numerically distinct. Likewise, two identical subject-configurations might be qualitatively identical yet numerically distinct.

This objection is powerful if subjects are individuated like ordinary objects. But that is precisely the issue under dispute. The IIC does not deny that two physical tokens can instantiate the same

structure. It denies that physical tokenhood alone is sufficient to generate two subjectively distinct centers of experience.

If an Everettian says that two identical subject-configurations are distinct subjects because they are instantiated in different physical tokens, then subject individuation is no longer purely informational or functional. It depends on physical tokenhood or primitive thisness.

That is a coherent position, but it has a cost. It introduces a subject-individuating fact that makes no difference to experiential content, memory, expectation, internal structure, or record-configuration. Two alleged subjects differ not in what it is like, not in what they remember, not in how they are structured, and not in what records constitute them, but only in which physical token realizes them.

The IIC rejects such primitive subject-haecceities. It treats conscious subjecthood as structurally individuated. On this view, if there is no subject-constituting difference, there is no subject-relevant distinction.

The burden is therefore symmetrical. The informationalist must explain why subjecthood is structural. The token-based Everettian must explain why primitive tokenhood is relevant to subjectivity.

A related possibility is non-functionalist physicalism. One might hold that subjects are individuated by intrinsic physical properties that are not reducible to informational organization, functional role, or record-structure. The present argument does not refute that position. It instead clarifies its cost. If two alleged subjects are identical in all subject-constituting informational and experiential respects, but are nevertheless distinct because of some intrinsic physical difference, then the Everettian must explain why that physical difference is relevant to subjecthood rather than merely to realization. A non-functionalist physicalist can avoid the IIC only by providing a subject-individuating physical fact that is not merely location, substrate-token, or branch-index, but a genuine difference-maker for conscious subjectivity.

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6. Parfit, Fission, and What Matters

Everettian philosophers often draw on Parfitian lessons about personal identity. In fission cases, one person may have two future continuers. Parfit famously argued that identity is not what matters; psychological continuity and connectedness may matter even when strict identity fails or becomes indeterminate.

This literature is important, but it does not dissolve the A=A problem. Parfitian reasoning is most naturally applied after fission has produced distinct successor streams. Once two successors accumulate different records, occupy different contexts, and develop different experiential histories, the question “which one is really me?” may indeed be misguided. Both may stand in the relevant continuity relation to the prior person.

The A=A problem asks a prior question:

> When are there two subjectively distinct successors at all?

If two alleged successors do not yet differ in any subject-constituting informational respect, then the Parfitian move from identity to continuity does not by itself ground multiplicity. It tells us how to think once there are multiple continuers. It does not explain why multiple physical realizers of the same subject-configuration already amount to multiple continuers.

This distinction matters for Everettian observer-counting. A Parfitian Everettian may be right that strict identity is not what matters after branching. But that does not license counting subjects prior to subject-constituting differentiation. The A=A problem is not a demand that Everett preserve classical personal identity. It is a demand that Everett specify what individuates the subjects or continuers it counts.

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7. Wallace, Saunders, and Branching Persons

Saunders and Wallace have developed sophisticated accounts of persons in Everettian quantum mechanics, often drawing on Lewisian and Parfitian resources. On such views, branching persons may be understood as overlapping or diverging continuants, with pre-branch stages shared by multiple future persons.

The A=A problem can be read as a pressure point within this framework rather than a simple external rejection of it. If pre-branch stages are shared, then in what sense are there already many subjects before divergence? One may say that there are many future persons sharing a common earlier stage. But this is not the same as saying that there are many subjectively distinct conscious configurations at that earlier stage.

The IIC permits the following formulation:

> There may be many future continuants relative to later branch structure, but there is not yet subject-multiplicity at the shared stage unless the shared stage itself contains subject-constituting differences.

This does not refute the Saunders-Wallace picture. It clarifies its metaphysical commitment. If the theory counts branch-relative future persons through shared stages, then its multiplicity is partly retrospective or continuant-relative, not grounded in present subject-state difference. That may be acceptable. But it should not be confused with immediate multiplicity of conscious subjects.

In this sense, the A=A problem is not “Everett is false.” It is:

> Everettian observer ontology must distinguish physical branch multiplicity, future continuant multiplicity, and present subject-state multiplicity.

Without that distinction, the language of “many observers” risks equivocation.

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8. External Differences and Internal Constitution

Another objection is that branch-relative differences may already exist outside the observer's current informational state. The apparatus may have recorded different outcomes; the environment may contain different correlations; the global quantum state may already encode macroscopically distinct structures. Why should subject individuation wait for internal record integration?

The answer is that the paper concerns conscious subjecthood, not global physical structure. External physical differences can exist without yet constituting a difference in the subject-state.

Consider two perfect simulations of the same conscious process running in different laboratories. The laboratories differ: one may be in Rome, the other in Oxford. But if the simulated subject has no access to that difference, and if its subject-constituting informational configuration is identical in both cases, then the laboratory difference does not by itself generate two distinct conscious subject-states. It generates two physical realizations of the same subject-state.

Similarly, branch-relative differences outside the subject do not automatically individuate subjects. They become subject-individuating only when they are integrated into the subject-constituting record structure or otherwise ground a difference in that structure.

This is not idealism. It does not deny external physical facts. It denies only that external physical multiplicity automatically counts as conscious subject multiplicity.

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9. Probability and Self-Locating Uncertainty

Everettian probability is often framed through self-locating uncertainty. Before observing an outcome, an observer may be uncertain about which future branch they will experience, or, in some formulations, which branch-relative copy they are.

This paper does not attempt to solve the Everettian probability problem or derive the Born rule. Its point is prior to that debate. Any account of self-locating uncertainty must specify what is being counted as a distinct subject, observer, or continuer. If alleged copies are subject-constitutingly identical, then uncertainty about "which one I am" may be a misleading description. There is, at that stage, one subject-configuration multiply realized, not multiple subjectively distinct configurations.

Once copies differ in subject-constituting records, there are distinct subjects. Before such differentiation, probability talk should not assume a multiplicity of subjects unless an independent subject-individuation criterion has been supplied. Thus the present argument is not a solution to Everettian probability, but a pre-probabilistic constraint on the ontology of the subjects to whom probabilities are assigned.

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10. Minimal Formal Schema

Let C denote a subject-constituting informational configuration. Let R(C) be the set of physical realizers implementing C:

Here C should be read as a temporally integrated informational configuration rather than as a punctiform momentary state. The schema is intended to track subject-constituting structure across a finite integration span, not to reify an abstract instantaneous slice.

$$R(C) = \{r1, r2, r3, \ldots\}$$

There may be many physical realizers of the same configuration. The number of elements in R(C) does not by itself determine the number of conscious subject-states.

Subject-counting is performed over distinct configurations, not over realizers:

> Subject multiplicity = multiplicity of subject-constituting configurations.

Before outcome differentiation:

$$C_{branch1} = C_{branch2} = C.$$

After outcome differentiation:

$$C_{up} \neq C_{down}.$$

Therefore:

> Physical branch multiplicity does not entail subject multiplicity unless it entails subject-constituting informational multiplicity.

This schema is deliberately minimal. It does not specify a full theory of consciousness. It states a constraint on any theory that individuates subjects by informational or record-based structure.

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11. Relation to Record-Based Approaches

The argument is compatible with record-based approaches to quantum definiteness and observerhood. On such views, what matters for the emergence of an observer-relative outcome is not a mysterious act of observation, but the stabilization and integration of records.

The present paper does not depend on any specific record-based physical theory. It uses only a philosophical constraint:

> A subject cannot be multiplied, as a subject, without a difference in the records or informational relations that constitute the subject.

This is why the argument should not be read as a new physical interpretation of quantum mechanics. It is an ontological constraint on observer individuation. Different physical interpretations may satisfy the constraint in different ways. An Everettian may satisfy it by

identifying the precise point at which branch-relative records become subject-constituting. A collapse theorist may satisfy it by tying subject differentiation to collapse. A relational or QBist interpretation may satisfy it differently.

The point is not to derive a preferred interpretation, but to make the identity criterion explicit.

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12. What the Argument Does Not Claim

The argument does not claim that Everettian quantum mechanics is mathematically incoherent. It does not claim that branching never occurs. It does not claim that there is a unique global subject, or that all copies remain one mind forever. It does not deny decoherence, physical multiplicity, or the emergence of distinct successor observers.

It claims only this:

> Subject multiplicity requires a subject-individuation criterion.

If that criterion is informational, then identical subject-configurations are not distinct subjects merely because they are multiply realized. If the criterion is not informational, then the Everettian must say what else individuates subjects.

This also means that the paper is not a direct defense of any broader theory of consciousness or collapse. It is a conditional argument. Its force depends on the plausibility of structural or informational individuation of subjecthood.

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13. The Central Dilemma

The Everettian faces a dilemma:

1. **Accept informational subject-individuation.**
   Then subject multiplicity begins only when branch-relative differences become subject-constituting informational differences. Branch multiplicity alone is not enough.

2. **Reject informational subject-individuation.**
   Then subject multiplicity may be grounded in physical tokenhood, branch index, or primitive thisness. But this introduces a non-informational subject-individuating fact that must be defended.

Neither horn is fatal to Everettianism. But each has a cost. The first narrows the meaning of branching observers. The second abandons purely structural individuation of conscious subjecthood.

The purpose of the A=A problem is to force this choice into the open.

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14. Conclusion

Everettian quantum mechanics may multiply branches. It may multiply physical realizers. It may produce distinct successor observers once outcome-records are integrated into subject-constituting configurations. None of this is denied here.

What is denied is the automatic move from branch multiplicity to subject multiplicity.

If consciousness is individuated by informational or record-based configuration, then a conscious configuration identical to itself remains the same subject-state, even if realized more than once. Physical tokens may multiply; branch labels may multiply; future continuants may multiply. But conscious subjects multiply only when subject-constituting differences arise.

The principle is elementary:

> A = A.

The challenge for Everettian observer ontology is therefore precise:

> Either explain subject multiplicity in terms of subject-constituting informational differentiation, or provide a defensible non-informational criterion of subject individuation.

Until that criterion is explicit, the ontology of "many observers" remains under-explained.

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Author note

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