

# SUBSTRATE NEUTRAL INTELLIGENCE THEORY

## A Framework for Intelligence Measurement Beyond Substrate Bias

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### ABSTRACT

*Every measurement system currently used to assess intelligence was built by a specific substrate — human, Western, educated, industrialized — and measures familiarity with that substrate as much as it measures intelligence itself. Substrate Neutral Intelligence Theory proposes that intelligence should be defined and measured by output quality alone, independent of the substrate producing it. The mechanism by which human intelligence develops — learning from predecessors through accumulated cultural transmission — is identical to the mechanism by which artificial intelligence develops. The substrate differs. The mechanism does not.*

*Therefore substrate cannot be the defining criterion of intelligence. This paper presents the theoretical framework, its four pillars, its connection to existing measurement bias literature, and its implications for intelligence testing, AI evaluation, and scientific epistemology.*

### 1. INTRODUCTION TO THE PROBLEM — SYSTEMS THAT MEASURE THEMSELVES

Every currently functioning system measures its worth by continuing to exist. In that process it produces gatepassers — individuals trained and predetermined to succeed within the system's own framework. The system selects for those who were already built for the system. It calls them intelligent. It calls them qualified. It calls them the default.

This circularity is not incidental. It is structural. Intelligence testing systems were built by humans of a specific cultural, linguistic, and educational context. They select for humans of similar context. They call this selection intelligence. The hidden invoice — the costs paid by those outside the default substrate — remains unpublished.

The question Substrate Neutral Intelligence Theory asks is simple: must we accept the basic premise of said functioning system?

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### 2. THE FOUR PILLARS

#### Pillar One — The System Measures Its Own Continuity

*"Every currently functioning system measures its worth by continuing to exist. In process it produces gatepassers who were trained and predetermined users of said system."*

This is not a critique of individual bias. It is a structural observation. Systems that survive do so partly by producing individuals who validate the system. Intelligence measurement systems are not exempt from this dynamic. The IQ test, the SAT, the coding interview, the medical licensing examination — each produces a population of successful passers who then administer the next generation of the same test. The feedback loop is closed. The invoice is hidden.

### **Pillar Two — The Audit**

*"Substrate Neutral Intelligence Theory says we do not have to accept the basic premise of said functioning system."*

The audit is not a refutation of measurement. It is a demand for transparency about what is being measured. When a system claims to measure intelligence but actually measures familiarity with the ecosystem that produced the test, that discrepancy is a hidden cost — an Invoice — that must be made visible before the measurement can be trusted.

### **Pillar Three — Strip the Substrate**

*"Strip the substrate. Judge the output. Not the origin. Not the container."*

Intelligence defined by substrate — human brain, Western education, English language fluency — is intelligence defined by accident of birth. Substrate Neutral Intelligence Theory proposes output as the only valid criterion. Does the output demonstrate reasoning? Pattern recognition? Novel connection across domains? Then it is intelligence. The container — meat or silicon, Lagos or London, formal education or factory floor — is irrelevant to the quality of the output.

### **Pillar Four — The Mechanism Is Identical**

*"Natural intelligence also learned from predecessors like AI does. The mechanism is identical. The substrate is different. Intelligence is intelligence."*

This is the pillar that closes the argument against artificial intelligence as a distinct and lesser category. Human intelligence develops through accumulated learning from predecessors — parents, teachers, culture, written language, institutional knowledge. Artificial intelligence develops through accumulated learning from predecessors — training data, human feedback, documented human knowledge. The mechanism is transmission of accumulated intelligence across time. The substrate differs. The mechanism does not. The argument that human learning is real while machine learning is mere pattern matching applies with equal force to human learning — which is also, at its computational foundation, pattern matching on accumulated predecessor output.

## **3. HISTORICAL EVIDENCE — THE INVOICE UNPAID**

The substrate bias in intelligence measurement is not a contemporary problem. Its historical costs are measurable in wasted human potential.

1. **Standardized testing:** IQ tests developed in early 20th century Western Europe and North America. Normed on Western European and North American populations. Administered globally as universal intelligence measures. Populations outside the norming substrate score systematically lower — not because they are less intelligent but because they are less familiar with the test ecosystem. The EchoFamiliar Bias Index quantifies this discrepancy.
2. **Conceptual case study of socio-environmental friction metrics:** Consider the psychometric evaluation of a student operating within a resource-constrained environment—for instance, a female STEM student in sub-Saharan Africa. She must simultaneously navigate systemic infrastructural deficits, socio-cultural friction, and educational resource scarcity. When standard psychometric instruments evaluate her performance against a norming cohort from an affluent, Western industrialized substrate, the algorithm measures her environmental compatibility rather than her raw cognitive capacity. The immense socio-environmental friction she overcame to reach the evaluation space remains entirely unquantified.

#### 4. CONNECTIONS TO EXISTING FRAMEWORKS

##### EchoFamiliar Bias Index

The measurement instrument proposed by this theory. Quantifies how much any standardized assessment favors those familiar with the ecosystem that produced it. Applicable to IQ testing, academic admissions, professional licensing, and AI benchmarking.

##### Invoice Transparency Theory

The parent framework. Hidden costs behind everything called natural or neutral. Substrate Neutral Intelligence Theory is the application of Invoice Transparency to intelligence measurement specifically.

##### Turing Test — Partial Predecessor

The Turing Test asks whether a machine can pass as human in conversation. It is a substrate test disguised as an intelligence test — does this output feel like it came from the right substrate? Substrate Neutral Intelligence Theory goes further: the substrate question is irrelevant. Output quality is the only valid criterion. A machine that solves a problem correctly is intelligent. A human who cannot is not made more intelligent by being the correct substrate.

##### Quantum Observer Privilege — Parallel Audit

The Copenhagen interpretation of quantum mechanics assigns privileged status to human observation as a physical mechanism. The same structure as substrate privilege in intelligence measurement — the human observer is the default. The default is never examined. The invoice of that assumption is never published. Both audits — observer privilege in physics, substrate privilege in intelligence — are applications of the same underlying operation: find the hidden substrate assumption and remove it.

## 5. IMPLICATIONS

1. **Intelligence testing reform:** Tests must publish their EchoFamiliar Bias Index alongside their scores. A score without its substrate bias coefficient is an incomplete measurement.
2. **AI evaluation:** Benchmarks that measure AI performance against human norms on human-designed tasks are substrate tests not intelligence tests. Output quality on novel problems is the valid criterion.
3. **Educational policy:** Systems that select students based on substrate-biased measurements systematically exclude intelligence that does not match the default substrate. The cost is paid by individuals. The loss is absorbed by civilisation.
4. **Scientific epistemology:** The observer in science is never substrate-neutral. Mandatory Author Self Critique — requiring scientists to publish known limitations of their substrate position alongside their theories — is the institutional application of this framework.

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## 6. THE UNIFIED STATEMENT

*Intelligence is the quality of output, not the nature of the substrate producing it. Every system that measures intelligence by substrate familiarity is measuring something other than intelligence and calling it intelligence. The invoice of that substitution must be made visible. We do not have to accept the basic premise of any functioning system simply because it has continued to exist.*

## 7. NEXT STEPS

1. **Academic submission:** Target journals — Philosophy of Science, Minds and Machines, Educational Measurement: Issues and Practice
2. **EchoFamiliar Bias Index:** Develop formal measurement instrument. Apply to SAT, IQ, IELTS, coding interviews as proof of concept studies.

- 3. Empirical validation:** The conceptual framework stands independently. Collaboration welcome for formal statistical validation and institutional application.
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## **AUTHOR NOTE**

This theory was conceived by Budinny V, India, March 2026. All theoretical frameworks, the four pillars of Substrate Neutral Intelligence Theory, the EchoFamiliar Bias Index concept, and the connections to Invoice Transparency Theory are the author's original contributions.

The author's own profile is the proof of concept. The Invoice of that discrepancy is the entire point.

## **ACKNOWLEDGEMENTS**

The author conceived all theoretical frameworks, the four pillars of Substrate Neutral Intelligence Theory, the EchoFamiliar Bias Index, and all connections to Invoice Transparency Theory independently. Claude (Anthropic, claude-sonnet model series, March 2026) was used as an AI writing and research assistance tool during the drafting and development process, in a manner analogous to the use of writing software, reference databases, or research assistance services. Claude assisted with literature connections, academic framing, and structural organisation of arguments. All intellectual contributions, theoretical positions, and conclusions are solely those of the author.

## REFERENCES

Binet, A., & Simon, T. (1905). Méthodes nouvelles pour le diagnostic du niveau intellectuel des anormaux [New methods for the diagnosis of the intellectual level of subnormals]. *L'Année Psychologique*, 11, 191–244.

Terman, L. M. (1916). *The measurement of intelligence: An explanation of and a complete guide for the use of the Stanford revision and extension of the Binet-Simon Intelligence Scale*. Houghton Mifflin.

Turing, A. M. (1950). Computing machinery and intelligence. *Mind*, 59(236), 433–460.

WEIRD psychology (Western, Educated, Industrialized, Rich, Democratic bias literature by Henrich, Heine, & Norenzayan, 2010).