

Semantic Remainder

The Language Uncertainty Principle as a Closure Theorem

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Abstract

The Language Uncertainty Principle holds that no linguistic expression can simultaneously maximize definitional precision and contextual fidelity. This claim has been received primarily as a structural analogy to Heisenberg's uncertainty principle in quantum mechanics. That reception, while capturing something of the intuition, has prevented the LUP from being taken seriously as a philosophical argument in its own right. This paper derives the LUP as a theorem within the closure framework developed in *Consciousness, Closure, and the Cosmos*, without appeal to physics or analogy. The derivation proceeds as follows. Every linguistic expression is a closure operation over semantic degrees of freedom: it stabilizes some semantic content, fixes some distinctions, and generates remainder at its boundary. Linguistic closure has two irreducible dimensions, definitional content and contextual force, that make competing demands on the same finite operation. Minimizing remainder in the definitional dimension requires stabilizing context-independent identity criteria, which generates remainder in the contextual dimension. Minimizing remainder in the contextual dimension requires attending to situational particularity, which resists the stable identity criteria that minimize definitional remainder. No finite linguistic closure can minimize both simultaneously. This is not a contingent feature of ambiguous language or imprecise speakers. It is a structural consequence of what any finite closure over semantic degrees of freedom can accomplish, derivable from remainder rather than from quantum mechanics. We distinguish the LUP from three concepts it is frequently confused with: Heisenberg's uncertainty principle, Quine's indeterminacy of translation, and ordinary semantic ambiguity. We demonstrate the theorem operating across four domains: scientific communication, legal language, clinical medicine, and ordinary conversation. In clinical medicine the theorem explains what a physician's guide to the neuroscience of healing observes independently: that the same truthful information, delivered with different framing, produces different biology. The LUP is the structural explanation of why that observation is not a contingent feature of good or bad bedside manner but a necessary consequence of finite linguistic closure. We position the theorem in relation to relevance theory, showing that the LUP explains why the definitional-contextual tradeoff is structurally necessary rather than merely observed. The implications for philosophy of language, epistemology, and the theory of communication are identified.

1. The Problem with the Analogy

The Language Uncertainty Principle has been in circulation for half a century, and in that time it has accumulated the reputation of a powerful intuition poorly grounded. The intuition is that there is something structurally similar between Heisenberg's uncertainty principle in quantum mechanics and the relationship between two dimensions of linguistic meaning: the more precisely

you pin down what an expression means in the abstract, the less accurately it captures what you mean in the particular, and vice versa. Speakers, writers, and anyone who has tried to write a contract or a scientific paper knows this tension immediately. The problem has been accounting for it philosophically without borrowing the authority of physics.

The standard objection is that the analogy to Heisenberg is loose to the point of being misleading. Heisenberg's principle is a mathematical theorem, derived from the commutation relations of position and momentum operators in quantum mechanics, with a precise lower bound on the product of position and momentum uncertainties. It is not a general claim about measurement or knowledge. Applying its name to a claim about language suggests either that language is quantum mechanical, which it is not, or that the analogy is doing more work than it can bear. Philosophers of language have generally let the LUP die quietly in consequence.

This paper argues that the quiet death was premature, and that the problem was never the substance of the claim but its framing. The LUP does not need Heisenberg. It does not need physics. It does not need analogy. It is a structural consequence of a property that all finite closure regimes share, derivable within the closure framework developed in *Consciousness, Closure, and the Cosmos* without appeal to quantum mechanics, measurement disturbance, or operator commutation. When properly derived, the LUP is not an analogy to a physical theorem. It is a theorem of its own, in the philosophy of language, about what any finite linguistic closure over semantic degrees of freedom can accomplish.

The derivation begins from the concept of remainder. Every finite closure generates remainder: the structural mismatch between what the closure can model and what the world contains. This is not a deficiency of particular closures but a structural property of all of them. A grammar that draws some distinctions leaves others undrawn. A system of identity criteria that makes some relationships legible leaves others invisible. Remainder is not noise. It is the proof that the grammar is finite. Linguistic closure is a species of closure in this sense, and semantic remainder is the remainder it generates. The LUP is the specific form that semantic remainder takes when a closure operates simultaneously across two dimensions that make competing demands on the same finite operation.

The paper proceeds as follows. Section 2 introduces linguistic closure precisely within the CC-C vocabulary. Section 3 derives the LUP as a theorem from remainder. Section 4 distinguishes the LUP from three concepts it is confused with. Section 5 demonstrates the theorem across four domains. Section 6 positions the LUP in relation to relevance theory. Section 7 draws the implications. The conclusion identifies what fifty years of the LUP as an analogy missed that the LUP as a theorem provides.

2. Linguistic Closure: The Semantic Grammar

Every linguistic expression is a closure operation. To see why, it is necessary to apply the CC-C definition of a grammar precisely to the semantic domain.

A grammar, in the CC-C framework, is a stabilized closure regime: a structured set of identity criteria, distinctions, and lawful relationships that constitute facts within its scope, generate remainder at its boundary, and are subject to supersession when remainder accumulates

sufficient force. Without a grammar there are no facts, only undifferentiated experience. Facts are constituted within grammars, not discovered independently of them.

A linguistic expression is a closure over semantic degrees of freedom in exactly this sense. When a speaker formulates an expression, they stabilize some semantic content: they fix the distinctions that the expression marks, establish the identity criteria that determine what counts as the same meaning across contexts of use, and activate the lawful relationships, inferential and associative, that the expression licenses. The expression constitutes a closure: it draws a boundary around what the speaker means to communicate and generates semantic remainder at that boundary.

A clarification about theoretical dependency is required here. The LUP derivation draws on the CC-C definition of grammar and closure, but the theorem does not require accepting the full CC-C cosmological framework. It requires only the minimal claim that any act of formulation stabilizes some semantic content and leaves other semantic content as remainder. That minimal claim is independently defensible on grounds that do not depend on the nested closure ladder, the C and c distinction, or the cosmological argument of CC-C. A linguist or philosopher of language who has never encountered the CC-C framework can accept the minimal claim on the basis of ordinary reflection on what formulation does, and the LUP follows from that minimal claim alone. The CC-C framework provides the richer theoretical home for the theorem and the vocabulary in which it is most precisely stated. It is not the only possible grounding for it.

Semantic remainder is the content the expression leaves open, underspecified, or actively suppressed. It is not the same as ambiguity, which is a property of particular words that can in principle be resolved by more precise formulation. Semantic remainder is structural: it is generated by the act of formulation itself, because any formulation that stabilizes some semantic content does so by leaving other semantic content as remainder. A more precise formulation generates different remainder, not less of it.

Linguistic closure has two constitutive dimensions that are irreducible to each other. The first is the definitional dimension: the abstract, context-independent content the expression carries, the component that allows a listener who does not share the speaker's situation to understand the expression across contexts. The second is the contextual dimension: the particular, situation-specific force the expression carries in this utterance, the component that gives the expression its precise import in the speaker's actual circumstances.

These two dimensions are not two aspects of the same thing. They make competing demands on the same closure operation. The definitional dimension requires stable, context-independent identity criteria: the expression must mean the same thing whether uttered here or there, by this speaker or that one, in this situation or another. The contextual dimension requires sensitivity to situational particularity: the expression must carry the specific force this context gives it, which may differ from the force it carries in other contexts. These demands pull in opposite directions. An expression that is stable across contexts is precisely one that has been stabilized against contextual variation. An expression that is sensitive to contextual particularity is precisely one that has not been fully stabilized against it.

This is the structural setup for the theorem. Two dimensions making competing demands on a single finite closure operation. The theorem establishes that no finite operation can satisfy both demands simultaneously, and that the attempt to satisfy one generates remainder in the other.

One clarification is required before proceeding. The claim that linguistic expressions are closure operations is not a claim that language is fundamentally fixed, bounded, or closed in any global sense. Wittgensteinian and post-structuralist traditions have correctly identified that language is dynamic, open-ended, and indefinitely extendable. The LUP is compatible with this view. The closure the theorem describes is local and provisional: it is the stabilization of semantic content that any individual communicative act necessarily performs in order to communicate anything at all. Even within a view of language as an open-ended play of signs, each sign at each moment of use stabilizes some semantic content, draws some distinctions, and activates some relationships. That local stabilization is what the theorem concerns. It is not a claim about the ultimate nature of language but about the structure of any individual act of linguistic formulation. Provisional closure generates genuine remainder. The remainder is real even if no boundary is permanent.

3. The Theorem: Semantic Remainder Is Irreducible

3.1 The Derivation

The Language Uncertainty Principle, formally stated as a logical theorem: for any finite linguistic closure K over semantic degrees of freedom, minimizing remainder in the definitional dimension requires stabilizing context-independent identity criteria, which generates remainder in the contextual dimension, and minimizing remainder in the contextual dimension requires attending to situational particularity, which generates remainder in the definitional dimension. There is no finite K that minimizes both simultaneously. This is a logical impossibility claim, not a mathematical inequality. It does not require that definitional remainder and contextual remainder be measurable in units, and it does not depend on specifying a numerical lower bound. What the theorem establishes is the structural impossibility of simultaneous minimization, which follows from what the competing demands require of the same finite operation, regardless of whether any particular formulation's remainder can be quantified.

The closest formal analogy is Shannon's channel capacity theorem, which establishes that every communication channel has a maximum rate of information transmission and that attempting to exceed it introduces error. The LUP is structurally similar: every linguistic closure has a maximum rate of simultaneous optimization across both dimensions, and the attempt to minimize both generates remainder in both. The analogy is instructive but the LUP is not an information-theoretic result. Shannon's theorem operates on measurable bit rates. The LUP operates on the logical structure of competing demands within a finite closure. The parallel licenses the formal intuition without requiring that semantic content be measured in bits.

The derivation has four steps.

Step one: definitional minimization generates contextual remainder. To minimize definitional remainder, a linguistic closure must stabilize its identity criteria to be context-independent: the expression must mean the same thing regardless of who uses it, when, where, and

in what situation. This stabilization is the constitutive act of definition: a definition is a formulation whose semantic content is specified independently of any particular context of use. But the very property that makes a definition context-independent, its abstraction from situational particularity, is what generates contextual remainder. The definitionally precise expression does not carry the particular force this context gives it, because that force depends on features of the situation that the definition has abstracted away. The contextual remainder is not incidental. It is the direct consequence of the stabilization that minimizes definitional remainder.

Step two: contextual minimization generates definitional remainder. To minimize contextual remainder, a linguistic closure must attend to the situational particularity of this utterance: the expression must carry exactly the force this context gives it, shaped by the speaker's specific circumstances, relationships, history, and purposes. But the very attention to situational particularity that minimizes contextual remainder resists the stable identity criteria that minimize definitional remainder. An expression that carries the force of this particular situation is one whose meaning varies with situational features. That variation is definitional remainder: the expression does not mean the same thing across contexts, which is precisely what a definition requires.

Step three: the trade-off is structural, not contingent. The competing demands of the definitional and contextual dimensions are not a consequence of imprecise speakers, ambiguous words, or remediable features of natural language. They are a consequence of what any finite closure operation can accomplish. A closure that fully stabilizes its identity criteria cannot simultaneously be sensitive to the variation in those criteria that situational particularity produces. A closure that is fully sensitive to situational particularity cannot simultaneously maintain the stable identity criteria that context-independence requires. This is not a limitation of any particular language or any particular speaker. It is what finitude means for a closure operating across two dimensions that pull in opposite directions.

Step four: more precise formulation generates different remainder, not less. The natural response to the definitional-contextual tension is to try to be more precise: to add qualifications, specify scope conditions, introduce technical vocabulary. This response addresses some semantic remainder by generating other semantic remainder. Every qualification added to increase definitional precision introduces new contextual ambiguity about when the qualification applies. Every technical term introduced to fix a definition introduces new contextual questions about its application to the specific situation at hand. The total semantic remainder does not decrease with increased precision. It is redistributed. The theorem holds at every level of precision.

3.2 The Lower Bound

The theorem claims that simultaneous minimization of definitional and contextual remainder is logically impossible for any finite linguistic closure. The argument does not require that remainder be measured in units. It requires only that the competing demands of the two dimensions be recognized as genuinely competing: that what satisfying one demand requires is precisely what frustrates satisfying the other. That recognition follows from what context-independence and situational sensitivity mean as properties of a closure operation, not from any measurement of the amounts involved.

The non-zero character of the impossibility can be stated without notation. If any finite linguistic closure could simultaneously achieve full context-independence and full situational

sensitivity, it would have to stabilize its identity criteria against contextual variation while remaining fully sensitive to that variation. That is not a difficult balance to strike. It is a logical contradiction. The theorem holds not because the bound happens to be non-zero but because the conditions for minimizing either dimension are structurally incompatible with the conditions for minimizing the other.

This is the sense in which the LUP is analogous in structure, though not in derivation or subject matter, to Heisenberg's uncertainty principle. Both identify an impossibility that follows from the competing demands two quantities place on the same finite operation. Heisenberg's impossibility has a numerical bound because position and momentum are measurable physical quantities derivable from quantum mechanical formalism. The LUP's impossibility is logical rather than numerical because its subject matter, the competing demands of definitional and contextual dimensions on a finite closure, does not admit of the same kind of measurement. The difference in the character of the impossibility reflects the difference in subject matter. It is not a weakness of the philosophical argument but a consequence of what the argument is about.

4. What the LUP Is Not

4.1 Not Heisenberg's Uncertainty Principle

The LUP is not a physical theorem. It does not claim that linguistic meaning is quantum mechanical, that observers disturb the meaning they measure, or that there is any physical process underlying the definitional-contextual tension. Heisenberg's principle concerns the behavior of physical particles under measurement at the quantum scale and has a precise mathematical derivation from the formalism of quantum mechanics. The LUP concerns the behavior of linguistic closures under formulation and has a derivation from the closure framework's concept of remainder. The two theorems share a structural form: both identify a lower bound on the product of two quantities that make competing demands on a finite operation. That structural similarity does not make the LUP a physical theorem or a borrowing from physics. Two independent derivations can arrive at structurally similar conclusions without one being derivative of the other.

The fifty-year habit of presenting the LUP as analogous to Heisenberg has caused more damage than it has helped. The analogy is vivid and communicates the intuition quickly. But it invites the dismissal that follows immediately: this is just a loose metaphor, language is not quantum mechanical, the analogy does not ground the claim. The present paper abandons the analogy entirely. The LUP is a theorem in the philosophy of language derived from the closure framework. It stands or falls on the quality of that derivation, not on its resemblance to a theorem in physics.

4.2 Not Quine's Indeterminacy of Translation

Quine's indeterminacy of translation holds that there is no fact of the matter about which of multiple incompatible translation manuals correctly captures the meaning of a foreign language speaker's utterances (Quine, 1960). The indeterminacy arises from the underdetermination of meaning by behavior: any pattern of linguistic behavior is compatible with multiple incompatible

hypotheses about what the speaker means. This is a claim about the relationship between meaning and evidence for meaning, specifically the behavioral evidence available to a radical translator.

The LUP is a different claim about a different phenomenon. It is not about the relationship between meaning and behavioral evidence. It is about the internal structure of any linguistic closure operation, specifically the competing demands of the definitional and contextual dimensions on the same finite closure. A speaker who faces no translation problem still faces the definitional-contextual tension, because that tension is a consequence of the closure structure of their own formulation, not of anyone else's interpretation of it. The LUP applies to the speaker's act of formulation. Quine's indeterminacy applies to the interpreter's act of translation. They are independent phenomena with independent analyses.

4.3 Not Ordinary Semantic Ambiguity

Semantic ambiguity is the property of particular expressions that can be interpreted in more than one way: bank can mean a financial institution or a river bank, light can mean not heavy or not dark. Ambiguity is a contingent feature of particular words in particular languages. It arises from accidents of lexical history and can in principle be resolved by disambiguation, either through context or through more precise reformulation.

Semantic remainder is structural rather than contingent. It is generated by the act of formulation itself, not by accidents of the lexicon. An expression that is unambiguous in the ordinary sense, one whose definitional content is fully determined, still generates contextual remainder, because the fully determined definition abstracts from situational particularity. An expression that is fully sensitive to situational particularity still generates definitional remainder, because contextual sensitivity requires variation that context-independent definition resists. The LUP holds for unambiguous expressions as well as ambiguous ones. It is not a claim about the accidents of natural language. It is a claim about the structural consequences of finite closure.

5. Four Demonstrations

5.1 Scientific Communication

Scientific communication provides the clearest demonstration of the definitional-contextual tension because the stakes of both dimensions are explicit and the failure modes are well documented.

The definitional dimension of scientific communication demands precision: terms must mean the same thing across research groups, institutions, and time. Statistically significant must have a fixed definition, operationalized by a threshold p-value, that allows results to be compared across studies. Associated with must be distinguished from causes in a way that is stable across different causal frameworks. Effect size must be specified in a way that is transportable from one study population to another. This is the definitional demand: context-independent identity criteria that allow findings to cumulate.

The contextual dimension demands fidelity to the specific finding: the result of this study, conducted with this population, under these conditions, using this operationalization, means this

in this context. The p-value threshold that makes a result significant in a large population study does not carry the same force in a small clinical trial. The effect size that is clinically meaningful in an elderly population may not be clinically meaningful in a younger one. The causal interpretation that is warranted by a randomized controlled trial is not warranted by an observational study. The contextual dimension demands that the finding be understood in terms of its specific circumstances.

Woloshin and Schwartz's systematic documentation of how medical findings travel from trials through press releases to news coverage shows the LUP operating in practice (Woloshin and Schwartz, 2006). At each stage of transmission, expressions move toward greater definitional stability and away from contextual fidelity. Associated with becomes causes. May reduce becomes reduces. Statistically significant becomes important. The movement is not random. It is directional, toward stronger, more context-independent readings, because the communicative pressure of each stage pushes toward the definitional dimension at the cost of contextual remainder. The definitional gains are real: the expressions become easier to understand across contexts. The contextual losses are also real: the specific circumstances of the finding, its population, its conditions, its operationalization, become semantic remainder.

This is not a failure of the scientists or the journalists. It is the LUP operating under communicative pressure. The definitional-contextual tension cannot be eliminated by better training or more careful writing. It can be managed, with appropriate hedges and scope conditions, but every hedge added to recover contextual fidelity generates new definitional uncertainty about when the hedge applies. The total semantic remainder is redistributed, not reduced.

5.2 Legal Language

Legal language is the domain where the definitional-contextual tension has been most explicitly theorized, under the name of the interpretation problem, without being named as a structural consequence of finite closure.

Statutory language aims at the definitional pole: laws must mean the same thing for all citizens, in all circumstances, across all future cases that the legislature could not have specifically anticipated. The identity criteria of legal language must be stable enough to provide predictability and equal treatment. This is the definitional demand of legal closure.

The application of law to specific cases is the contextual demand: this statute, applied to this situation, with these facts, in this jurisdiction, at this moment, means this. The specific circumstances of the case generate contextual force that may not have been anticipated by the statutory formulation. The word vehicle in a statute prohibiting vehicles from public parks has clear definitional content. Its application to a war memorial in the park, a baby carriage, an electric scooter, or an ambulance entering to assist an injured person generates contextual remainder that the definitional formulation leaves open (Hart, 1958).

The entire discipline of legal interpretation is the management of this semantic remainder. Originalism attempts to recover the definitional meaning of the text as it was understood at the time of enactment, reducing contextual remainder by anchoring interpretation to historical definitional content. Living constitutionalism attempts to recover contextual fidelity by allowing the meaning of constitutional provisions to evolve with changing circumstances, reducing

contextual remainder at the cost of definitional stability. The debate between these interpretive approaches is the LUP instantiated at the level of constitutional theory: two positions, each managing the definitional-contextual tension differently, each generating remainder in the dimension the other optimizes.

No interpretive approach eliminates the tension. Every statutory formulation that achieves definitional precision leaves contextual remainder that courts must manage. Every contextual interpretation that achieves fidelity to the specific case generates definitional remainder about what the statute means in other cases. The theorem holds throughout.

5.3 Clinical Communication

Clinical medicine is the domain where the definitional-contextual tension carries the most direct biological consequences, and where the failure to recognize it as structural rather than remediable has caused measurable harm. *The Invisible Prescription: A Physician's Guide to the Neuroscience of Healing* documents three independent observations of the LUP operating in the physician-patient encounter, each arriving at the same conclusion from a different angle: the same propositional content, formulated differently, produces different biology (Dietz, 2025). Chapter 9 of that book is titled *The Same Words, Different Worlds*, which is, without the theoretical framework, the LUP stated as a clinical observation. The three demonstrations that follow are drawn from that work.

The first observation concerns the consent paradox. When a physician delivers informed consent about potential side effects, they face a choice of formulation. The standard formulation attends to the definitional dimension: this might cause some nausea, maybe headache, possibly dizziness, let me know if you experience any of these. The propositional content is complete and accurate. The side effects are named as stable, context-independent facts about the drug. But the contextual remainder of this formulation is substantial: the patient cannot locate themselves in relation to the information. They cannot determine their own probability of experiencing the effect, the likely severity if they do, or what the experience will mean for their treatment. That contextual remainder is filled by the patient from their own position on the definitional-contextual spectrum, typically toward the more threatening reading, because the definitionally stable formulation provides no contextual anchor that would constrain interpretation toward the benign end.

The alternative formulation, what the book calls contextualized disclosure, minimizes contextual remainder at the cost of definitional stability: some patients report nausea, but most do not; in the studies it was usually mild and went away within a few days; most patients tolerate this well. The propositional content is the same. The contextual force is different: the patient is located within a distribution, the severity is specified, the trajectory is indicated. The definitional remainder of this formulation is higher: the precise probability is expressed as a range rather than a fixed fact, and the applicability to this specific patient is acknowledged as uncertain. But the contextual remainder is lower, and the biological consequence of lower contextual remainder is reduced nocebo activation.

The book names this the consent paradox: patients have a right to information, and communicating information can itself cause harm. The LUP explains why the paradox is structural rather than resolvable by finding better words. Any formulation that reduces contextual remainder generates definitional remainder. Any formulation that achieves definitional precision generates

contextual remainder. The harm is not in the information. It is in the semantic remainder that any formulation of the information necessarily produces, remainder that the patient fills from their own interpretive position with consequences that are neurobiologically real.

The second observation concerns diagnostic framing. The book contrasts two formulations of the same clinical finding in a cognitive screening encounter. One formulation: your cognitive screening shows some changes we want to look into, and the most important step is figuring out what is driving them, because many of the common causes are very treatable. The other is a direct announcement of cognitive decline or diagnostic label without contextual anchoring. The propositional content of both is accurate. The contextual force is different. The first formulation constitutes agency, approach, and the possibility of reversal as cognitive facts within the healing grammar. The second constitutes helplessness, avoidance, and the certainty of decline. The book observes: she has prescribed a different biological trajectory using the same clinical data by choosing different words. The LUP is the structural explanation of what that sentence means. The words did not change the facts. They changed which cognitive facts were constituted by the formulation, and different cognitive facts initiate different biological cascades through the same prefrontal cortical machinery described in the Grammar of Healing (Dietz, 2026c).

The third observation the book makes three times independently in different contexts is the most direct statement of the LUP in clinical terms: the same words delivered with confidence and reassurance land differently than the same words delivered with hesitation and concern; the same honest information, delivered with confidence versus delivered with anxiety, produces different outcomes; the same truthful information, delivered with different framing, produces different biology. This is not a claim about deception or the power of positive thinking. It is a claim about the contextual dimension of linguistic closure. Delivery, tone, and framing are not cosmetic additions to propositional content. They are the contextual dimension of the formulation, and the contextual dimension has independent biological consequences because it constitutes different cognitive facts within the healing grammar. The definitional content, the information conveyed, is identical. The contextual force, the situational meaning constituted by the formulation in this encounter, differs. And that difference produces different neurobiology.

None of these clinical examples were framed in the source as demonstrations of a structural property of linguistic closure. They were framed as clinical observations about communication that physicians should attend to. The LUP provides the structural account of why they are not contingent features of good or bad bedside manner but necessary consequences of what any finite linguistic closure over semantic degrees of freedom can accomplish. To be precise about the causal claim: the LUP does not produce biological effects directly. Language does not reach into neurons as a physical force. The causal chain has three levels. The LUP explains the structure of the linguistic input: two formulations with identical propositional content differ in the contextual remainder they generate. That contextual remainder is filled by the listener from their own interpretive position, producing a different affective state, fear or anxiety in one case, agency and manageability in the other. The affective state is then processed by the prefrontal cortex and initiates different biological cascades through the mechanisms the Grammar of Healing describes. A skeptic who says the biology changes because of fear, not semantic remainder, is correct at one level of the chain and incomplete at another. The fear is produced by the patient filling contextual remainder from an anxious interpretive position. The LUP explains the linguistic structure that generates the remainder. The affective account and the LUP account are not competing

explanations at the same level. They are adjacent levels of the same causal chain, each explaining what the other presupposes. To be explicit about Occam's Razor: the LUP does not add an entity to explain what simple psychology already explains. Simple psychology asks what psychological state causes the biological change. The LUP asks what linguistic structure produces that psychological state. Answering the second question extends the causal chain one level upstream. It does not multiply entities over the first answer. It completes the account the first answer begins.

5.4 Ordinary Conversation

In ordinary conversation the definitional-contextual tension is managed continuously and largely automatically, through the mechanisms Grice's cooperative principle describes.

Grice's four maxims of conversation, quantity, quality, relation, and manner, are normative expressions of communicative pressure on the definitional-contextual balance (Grice, 1975; 1989). The maxim of quantity, make your contribution as informative as required, pushes toward the definitional dimension: a more informative contribution is one whose content is more fully specified, more context-independent, more transportable to other conversations. The maxim of manner, be clear and avoid obscurity, pushes in the same direction: clarity favors expressions that are stable in meaning across contexts.

But conversational implicature, the mechanism by which speakers communicate more than they literally say, operates in the opposite direction: it uses contextual particularity to convey content that no definitional formulation would carry. When a speaker says it is getting late in response to a guest who shows no sign of leaving, the contextual force of the expression, please leave now, is carried entirely by the situational particularity of the moment. The definitional content of the expression, a factual report on the time of day, is not what is communicated. The contextual remainder of the definitionally precise expression is where the communicative content lives.

This is the LUP in its most ordinary form. Speakers constantly move between the definitional and contextual poles of linguistic closure, and the movement is not random. It is governed by the communicative purposes of the moment, which pull toward contextual fidelity when the purpose is to convey something specific to this situation, and toward definitional stability when the purpose is to convey something transportable across situations. The tension between these purposes is the definitional-contextual tension. It cannot be resolved by speaking more carefully. It can only be managed by choosing which dimension of remainder to accept in any given communicative act.

6. The LUP and Relevance Theory

Relevance theory, developed by Sperber and Wilson, holds that communication is governed by a single principle: every communicative act creates a presumption of its own optimal relevance, meaning that it is worth the audience's attention because the cognitive effects it produces justify the processing effort it requires (Sperber and Wilson, 1986). The theory explains how listeners infer what speakers mean beyond what they literally say, by constructing the interpretation that achieves optimal relevance at the least processing cost.

The LUP and relevance theory are in the same territory but making different claims. Relevance theory observes that communication involves a tradeoff between cognitive effects and processing effort, and accounts for how listeners manage that tradeoff through inference. The LUP claims that the definitional-contextual tension is structurally necessary, derivable from remainder, and holds regardless of cognitive effort or processing cost. The two accounts are compatible but the LUP provides something relevance theory does not: an explanation of why the tradeoff is necessary rather than merely observed.

Relevance theory treats the tension between informativeness and processing cost as a given feature of communication that the relevance principle governs. It does not explain why there should be a tension at all between what an expression says and what it communicates, or why that tension should be systematic and irreducible. The LUP provides that explanation: the tension is a structural consequence of the competing demands of the definitional and contextual dimensions on any finite closure operation. Speakers must manage the tension not because of cognitive limitations but because no finite formulation can simultaneously satisfy both demands.

The relationship between the LUP and relevance theory is therefore the same as the relationship between the LUP and Grice's cooperative principle: the LUP explains why the phenomena these frameworks describe are structurally necessary rather than contingent. Grice describes the normative pressure of the cooperative principle without explaining why the tension between informativeness and contextual fidelity should exist. Sperber and Wilson describe the cognitive economics of relevance without explaining why communication should systematically produce a gap between what is said and what is meant. The LUP, derived from remainder, explains both: the gap is semantic remainder, the structural consequence of finite linguistic closure operating across two dimensions that make competing demands on the same finite operation.

A methodological clarification closes the Occam's Razor objection that semantic remainder is an unnecessary entity if processing effort already explains the gap. The objection assumes the LUP and relevance theory are competing explanations at the same level. They are not. Relevance theory operates at the level of cognitive management: it explains how listeners infer what speakers mean by minimizing processing effort while maximizing cognitive effects. The LUP operates at the level of structural necessity: it explains why a gap between what is said and what is meant must exist in any finite linguistic closure, prior to any cognitive processing of that gap. Processing effort explains how the gap is navigated. The LUP explains why the gap cannot be eliminated. These are different questions at different levels of analysis. Adding the LUP to the theoretical landscape does not multiply entities beyond necessity. It provides the structural grounding that relevance theory presupposes but does not supply.

One reframing is important here. Semantic remainder is not a deficit. It is not a failure of communication, a loss, or a limitation to be overcome. Remainder is what makes language generative: the contextual remainder of a definitionally stable expression is precisely what allows implicature, metaphor, irony, and poetic resonance. The physician's contextually rich disclosure generates definitional remainder that makes the expression richer and more attuned to the patient's situation than any fully specified formulation could be. The LUP does not say that language falls short of a communicative ideal. It says that language operates structurally across two dimensions simultaneously, generating remainder in both, and that this two-dimensional structure is the source of both language's limits and its expressive power. What Grice and Sperber and Wilson identify as the richness of communication, the capacity to mean more than is said, is the contextual

dimension of linguistic closure at work. The LUP names the structure that makes that richness possible and necessary.

7. Implications

7.1 For Philosophy of Language

The LUP as a closure theorem establishes that semantic remainder is not a deficiency of natural language that formal languages or more precise formulations can eliminate. Formal languages achieve greater definitional stability at the cost of greater contextual remainder: they are highly transportable across contexts precisely because they have abstracted away from contextual particularity. Mathematical notation means the same thing for a physicist in Beijing and a mathematician in Buenos Aires, and it carries essentially no contextual force beyond its definitional content. The contextual remainder of formal language is maximal. The definitional remainder of natural language, with its contextual sensitivity, is also maximal in the other direction. No language, formal or natural, escapes the lower bound.

This has consequences for debates about the relationship between natural language and formal languages in philosophy. The aspiration to replace the contextual ambiguities of natural language with the definitional precision of formal language is not achievable in principle, not because formal languages are imperfect but because the definitional gain is purchased with contextual remainder. The formal language that eliminates one kind of semantic remainder generates another.

7.2 For Epistemology

The LUP connects directly to the Grammar of Knowing's account of the directional drift of transmitted belief. The Grammar of Knowing argues that every knowledge claim transmitted through language undergoes systematic transformation in the direction of stronger, less hedged readings, because communicative pressure consistently pushes expressions toward the definitional pole at the cost of contextual fidelity (Dietz, 2026b). The LUP provides the structural grounding for that argument: the directional drift is not a contingent feature of careless communication. It is the consequence of the LUP operating under the communicative pressure of action-oriented contexts, which consistently reward the definitional dimension at the cost of contextual remainder.

The LUP also bears on the testimony literature in epistemology, which asks whether and how knowledge is transmitted through testimony. The standard assumption of the testimony literature is that the content of a belief can be transmitted from speaker to listener through language. The LUP establishes that this transmission is always lossy in a specific direction: the listener receives a formulation that has been shifted toward the definitional pole relative to the speaker's contextually specific belief. The listener does not receive the speaker's belief. They receive a transformation of it, with contextual remainder, and they interpret that transformation from their own position on the definitional-contextual spectrum, generating additional semantic remainder. Transmission through language is structurally lossy in a direction that the testimony literature has not fully accounted for.

7.3 For the Theory of Communication

The LUP establishes a structural limit on what communication can achieve. Every communicative act leaves semantic remainder. The remainder is not a failure of the communication. It is the structural consequence of what any finite closure over semantic degrees of freedom can accomplish. This limit is not remediable by more careful communication, more precise formulation, or better shared context. The semantic remainder can be managed and redistributed. It cannot be eliminated.

The practical implication is that every communication creates interpretive obligation on the receiving end: the listener must supply contextual content that the formulation has left as remainder, using their own position on the definitional-contextual spectrum to do so. That position may differ from the speaker's, generating interpretive divergence that is not a failure of either party but a structural consequence of the LUP. This does not reduce speaker responsibility. It transforms and increases it. A speaker who understands the LUP can no longer claim ignorance of the structural consequence of their formulation choices. The physician who delivers a definitionally stable side-effect disclosure and produces patient anxiety has not failed accidentally. They have generated contextual remainder that the patient filled predictably from their own anxious interpretive position. Understanding the LUP makes that consequence visible and therefore makes it a choice. The speaker who manages remainder deliberately, choosing which dimension to optimize and designing formulations that constrain the listener's interpretive position toward the contextually useful reading, bears more responsibility than the speaker who generates remainder without awareness. The LUP does not shift the burden of clarity from expert to layperson. It makes the expert's structural power over the communicative act visible, and with visibility comes accountability.

One further clarification is essential for legal and clinical contexts. The inevitability of semantic remainder does not flatten all formulations into equivalence. Some closures are better than others, not in the sense of eliminating remainder but in the sense of generating remainder that is more manageable, less harmful, and more likely to be filled by the listener in ways that serve the communicative purpose. The physician who offers contextualized disclosure generates definitional remainder but manages contextual remainder toward agency and hope. The physician who delivers a catalogue of potential harms generates contextual remainder that the patient fills with fear. Both have generated remainder. One has done so deliberately and skillfully. The ethical obligation is not to eliminate remainder, which is impossible, but to manage it with awareness of what the listener's interpretive position is likely to produce. Structural inevitability does not excuse structural carelessness. To state this with the directness that legal and clinical contexts require: the LUP is not available as a defense for poor communication. The theorem increases the speaker's epistemic access to the structural consequences of their formulation choices. Increased epistemic access increases professional obligation, not decreases it. A physician or lawyer who understands the LUP and still generates contextual remainder they could foresee would be filled harmfully has made an informed choice with foreseeable consequences. The structural limit on communication is not a limit on accountability. It is the reason accountability extends to the management of remainder itself.

In clinical medicine this implication is not abstract. The patient who fills the contextual remainder of a definitionally stable side-effect disclosure with their own anxiety is not failing to understand the communication. They are doing exactly what any listener does: supplying the

contextual content the formulation leaves open from their own interpretive position. The physician who understands the LUP does not conclude that the patient is therefore responsible for their own anxiety. They conclude that the formulation generated predictable contextual remainder and that a different formulation would have generated different remainder with different consequences. Understanding the LUP makes the physician more responsible for their word choices, not less, because it removes the excuse of ignorance. The structural consequence of any formulation is now visible. Choosing to deliver a definitionally stable disclosure that generates contextual remainder the patient will fill with fear is a structural choice, not an innocent one.

8. Conclusion

The Language Uncertainty Principle has spent fifty years being received as an analogy and dismissed as a loose metaphor. The dismissal was premature. The LUP is not an analogy to Heisenberg's uncertainty principle. It is an independent theorem about a structural property of all finite linguistic closure operations, derivable from the concept of remainder within the closure framework developed in *Consciousness, Closure, and the Cosmos*.

Every linguistic expression is a closure over semantic degrees of freedom. Linguistic closure has two irreducible dimensions, definitional content and contextual force, that make competing demands on the same finite operation. Minimizing remainder in either dimension generates remainder in the other. No finite linguistic closure can simultaneously minimize both. This is not a deficiency of natural language, an accident of the lexicon, or a failure of speakers. It is what finitude means for a closure operating across two dimensions that pull in opposite directions. Semantic remainder is irreducible.

The theorem holds across scientific communication, legal language, clinical medicine, and ordinary conversation. In clinical medicine it explains what a physician's guide to the neuroscience of healing observes three times independently: the same truthful information, delivered with different framing, produces different biology. That observation has been treated as a clinical puzzle about bedside manner. The LUP establishes it as a structural consequence of what any finite linguistic closure over semantic degrees of freedom can accomplish. The physician's formulation generates semantic remainder. The patient fills that remainder from their own interpretive position. The remainder has biological consequences. This is not a contingent feature of particular physicians or particular patients. It is what the LUP predicts wherever linguistic closure operates in a healing context.

The theorem explains why the phenomena that Grice's cooperative principle and Sperber and Wilson's relevance theory describe are structurally necessary rather than contingent. It grounds the directional drift of transmitted belief that the Grammar of Knowing identifies as a structural feature of epistemic transmission. It establishes a genuine limit on what any act of communication can achieve: not a limit imposed from outside by the imperfections of language, but a limit generated from inside by the structure of what finite closure can do.

The LUP shares a structural form with Heisenberg's uncertainty principle: both identify a lower bound on the product of two quantities that make competing demands on a finite operation. That structural similarity is real and worth acknowledging. But the LUP's derivation is

independent, its subject matter is different, and its standing as a philosophical theorem does not depend on its resemblance to a physical one. It stands on its own ground, as it always should have.

Fifty years is long enough to carry an idea as an analogy. It is time to carry it as a theorem.

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Author's Note

The Language Uncertainty Principle was first developed by the author in 1975 and has been refined across subsequent decades. The present paper is its first formal derivation within a philosophical framework, replacing the Heisenberg analogy that has accompanied the concept since its inception with a derivation from remainder within the closure framework of Consciousness, Closure, and the Cosmos. The structural similarity to Heisenberg's uncertainty principle, which the analogy always pointed at, is acknowledged in section 3.2 as a genuine formal resemblance with an independent grounding. This paper is the fourth in a suite that includes Consciousness, Closure, and the Cosmos, The Grammar of Knowing, and The Grammar of Healing. Each paper demonstrates the closure framework operating in a different domain: cosmology, epistemology, medicine, and language. The clinical demonstration in section 5.3 draws on The Invisible Prescription: A Physician's Guide to the Neuroscience of Healing, which documented the LUP's operation in the physician-patient encounter without the theoretical framework to name it.