

Manifesto for Honest Computation

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2026-07-08

Abstract. Five papers have traced an arc from diagnosis to prescription. The qubit is a scaffold, not an invariant. Alternative paradigms exist. Physical limits are real. A diversified portfolio is rational. Institutions must be reformed. This final paper --- the Manifesto --- synthesizes these findings into principles for honest computation and a call to action for investors, researchers, policymakers, and the public. We propose five principles: (1) the substrate IS the algorithm; (2) correlation over particle; (3) joules per solution as the universal metric; (4) falsifiability as a condition of funding; and (5) institutional independence of verification. We propose a specific resource reallocation --- from the ~60% currently consumed by gate-model quantum computing toward thermodynamic, optical, neuromorphic, and analog quantum simulation --- and a Falsification Pledge by which institutions commit to pre-registering computational claims with time-bound success criteria. Computation is too important to be left to narrative production. The future of computing is honest, or it is nothing.

Keywords. - manifesto, - honest computation, - post-classical computing, - quantum computing reform, - computational principles, - research ethics

Preamble

Computation is the most important technology of the twenty-first century. It determines what we can know, what we can build, what we can cure, and what we can defend against. The future of computation is, in a very real sense, the future of human capability.

For the past two decades, a significant fraction of the world's computational R&D expenditure --- roughly \$35 billion --- has been directed toward one specific computational paradigm: the fault-tolerant universal gate-model quantum computer. This investment was made on the basis of extraordinary claims: exponential speedups for problems of commercial importance, revolutionary new industries, a transformation of the computational landscape comparable to the invention of the transistor.

Those claims have not been realized. Not one commercially viable quantum computer exists. Not one problem of genuine economic value has been solved faster, cheaper, or more accurately by a quantum computer than by a classical alternative. The roadmaps have been revised outward, repeatedly, from "five years" to "ten years" to "the 2030s" --- and those timelines assume flawless execution of error-correction protocols that currently consume thousands of physical qubits per logical qubit.

This is not a temporary setback. It is not a matter of insufficient funding, insufficient talent, or insufficient time. The failure is structural. It is embedded in the institutional incentive systems that fund computational research, in the ontological confusion that treats qubits as particles rather than relational properties, in the neglect of fundamental thermodynamic limits, and in the absence of independent verification with enforcement mechanisms.

Five papers have mapped this terrain. This final paper --- the Manifesto --- synthesizes their findings into actionable principles and a call to action. We do not merely diagnose. We prescribe. We do not merely critique. We construct. The future of honest computation depends on it.

1. What We Have Learned

1.1 The Diagnosis (Phase I)

The qubit-gate-circuit model is an epistemic failure. It projects particle ontology onto a relational, field-theoretic reality. The qubit is not a thing; it is a relation. The gate is not an operation on an object; it is a correlation between measurement contexts. Decoherence is not an enemy to be suppressed; it is the physical process by which quantum systems become classical --- and it can be harnessed as a computational resource.

The \$35 billion quantum computing industry has optimized for narrative production, not computational output, because the institutional incentive structure rewards ambitious claims with prestigious publications, media coverage, and capital inflows, while the correction --- independent verification, qualification, and refutation --- operates on a timescale too slow to affect capital allocation.

1.2 The Alternatives (Phase II)

Measurement-based quantum computing (MBQC), continuous-variable quantum computing (CV-QC), topological quantum computing (TQC), field-theoretic computation, analog quantum simulation, thermodynamic computing, neuromorphic computing, and optical computing --- these are not minor variations on the qubit model. They represent genuinely different ontological commitments, with different scaling properties, different manufacturability constraints, and different problem-class affinities.

The photonic platform (PsiQuantum, Xanadu) offers room-temperature operation and leverages existing semiconductor manufacturing infrastructure, making it the strongest commercial case in quantum computing. Neutral atom arrays (QuEra, Atom Computing) offer the most promising path for near-term scientific impact through analog quantum simulation. Ising machines and thermodynamic solvers are already commercially deployed for optimization. Neuromorphic processors already achieve $\sim 10^3\times$ energy advantage over GPUs for inference workloads.

1.3 The Limits (Phase III)

The Landauer bound does not privilege quantum over classical computation. The Margolus-Levitin theorem imposes a fundamental quantum speed limit within a factor of ~ 30 -200 of current practice. The error-correction overhead --- 10^2 to 10^3 physical operations per logical operation --- multiplies the thermodynamic cost of quantum computation beyond what any polynomial algorithmic speedup can overcome.

Only exponential speedups --- Shor's algorithm for factoring, and possibly quantum simulation at sufficient scale --- can overcome the energy penalty. For everything else, the joules-per-solution comparison favors specialized classical hardware: Ising machines for optimization, optical processors for linear algebra, neuromorphic processors for inference, reversible classical processors for general-purpose computation.

1.4 The Portfolio (Phase IV)

The rational investment response to these findings is a diversified portfolio across physical substrates, allocated in proportion to the evidence for each substrate-problem pair. Approximately 45% thermodynamic and analog (Ising machines, p-bit networks, analog quantum simulators), 25% optical (integrated photonic matrix processors), 20% neuromorphic, and only 5-10% fault-tolerant quantum --- a near-inversion of the current allocation where gate-model QC absorbs roughly 60% of advanced computing investment.

1.5 The Institutions (Phase V)

The current institutional structure --- venture capital with 10-year fund horizons, government agencies without post-award evaluation mechanisms, academic publishing with prestige cascades, and a regulatory vacuum --- is configured to produce narrative assets, not computational ones. The \$35 billion outcome is the equilibrium of this game.

Five reforms are necessary: an Advanced Computing Projects Agency (ACPA) modeled on DARPA; mandatory independent verification for computational claims above a materiality threshold; structural separation of quantum hardware and software; joules-per-solution procurement for all government computational contracts; and a public registry of computational claims with time-bound falsification criteria.

2. The Five Principles of Honest Computation

From this synthesis, we distill five principles. They are not merely guidelines. They are conditions that any computational research program must satisfy to be considered honest.

Principle 1: The Substrate IS the Algorithm

Computation is a physical process. The physical substrate --- its Hamiltonian, its degrees of freedom, its natural dynamics, its coupling to the environment --- determines what can be computed and at what cost. The choice of computational scaffold (qubit vs. qumode, gate vs. measurement, digital vs. analog) is never ontologically neutral. It encodes assumptions about what computation IS, and those assumptions have consequences for what can be computed efficiently.

The honest approach: match the problem class to the physical substrate whose natural dynamics solve it most efficiently. Do not force all problems into a single scaffold. Do not optimize a scaffold that is misaligned with the physics. Let the physics do the computing.

Principle 2: Correlation Over Particle

The fundamental computational resource in quantum systems is not the state of individual qubits but the correlation structure --- entanglement, phase coherence, collective modes --- that connects them. A quantum computer is a machine for steering correlations, not for manipulating particles.

The honest approach: design computational architectures where correlation is the primitive --- not the qubit, not the gate, not the circuit depth. In MBQC, the cluster state IS the computation. In CV-QC, Gaussian entanglement IS the resource. In TQC, braiding correlations IS the algorithm. In thermodynamic computing, the free energy landscape IS the solver.

Principle 3: Joules Per Solution, Not Quantum Volume

The universal metric for computational advantage is total energy consumed to deliver a verified, correct answer to a specified problem at specified scale. "Joules per solution" --- measured at the wall plug, including all overhead --- is the only metric that is invariant under scaffold variation, platform choice, and algorithmic approach.

"Quantum volume," "quantum utility," "quantum supremacy" --- these are scaffold-specific metrics that privilege the qubit-gate-circuit model. They do not measure what users care about: does this machine solve my problem faster, cheaper, or more accurately than alternatives?

The honest approach: publish joules-per-solution numbers for commercially relevant problems, compared against the best available classical implementation. If the joules-per-solution number is not available, the claim is not yet an investment proposition.

Principle 4: Falsifiability as a Condition of Funding

No computational research program should receive public funding without pre-registered, time-bound, falsifiable milestones. "We will demonstrate X joules-per-solution advantage on problem Y of commercially relevant scale Z by date W." If the milestone is not met by the stated date, funding is terminated. No extensions. No rebranding. No milestone creep.

Falsifiability is not an optional feature of honest science. It is the defining feature. A research program that cannot state what would count as failure is not a research program; it is a faith-based initiative. Faith-based initiatives have their place --- in religion, in art, in speculative philosophy --- but they should not be funded with public money or marketed to investors as technology investments.

Principle 5: Institutional Independence of Verification

Evaluation of computational claims must be performed by institutions that are structurally independent of the claimants. The academic community cannot verify its own claims, because the prestige cascade ensures that ambitious claims are rewarded before they are verified. Venture capitalists cannot verify the claims of their portfolio companies, because the information asymmetry is unbridgeable and the incentive is to mark up, not to verify. Government agencies cannot verify claims from programs they have funded, because program managers have career incentives to report success.

Independent verification requires independent institutions: an ACPA with DARPA's structure, a public registry with enforcement mechanisms, an independent verification corps funded by a levy on computational research expenditure. The principle is separation of powers: those who make claims must not be the ones who verify them. Those who fund claims must not be the ones who evaluate them. Those who benefit from claims must not be the ones who adjudicate them.

3. The Honest Portfolio: A Concrete Reallocation

The principles above imply a specific reallocation of computational R&D capital. We present it as a concrete recommendation, not as a theoretical exercise.

3.1 Near-Term (1-3 Years): Deploy What Works

Allocation	Substrate	Problem Class	Status
25%	Ising machines / thermodynamic solvers	Combinatorial optimization	Commercially available
20%	Optical matrix processors	Linear algebra (inference)	Research prototypes
20%	Neuromorphic processors	Probabilistic inference, edge AI	Commercially available
15%	p-bit probabilistic networks	Sampling, optimization	Research prototypes
10%	Analog quantum simulators	Quantum many-body physics	Research demonstrations
10%	Conventional CMOS + algorithms	General-purpose	Dominant incumbent

What to STOP funding at near-term scale: Universal fault-tolerant gate-model QC on superconducting or trapped-ion platforms. The thermodynamic arithmetic does not work for commercially relevant problem sizes within VC-relevant timeframes. These platforms should be maintained as fundamental research programs at ~5% of current funding levels, not as commercial ventures at ~60%.

3.2 Medium-Term (3-7 Years): Scale What Shows Promise

Allocation	Substrate	What Success Looks Like
30%	Analog quantum simulation	10,000-atom simulators; catalyst/pathway design
25%	Optical processors	1,000×1,000 photonic circuits in production
20%	Neuromorphic + memristive	Memristive crossbar at commercial scale
15%	Reversible/adiabatic CMOS	Processor at 1% Landauer limit
10%	Photonic quantum (room-temp)	Logical qubit with error rate $<10^{-6}$

3.3 Long-Term (7-15+ Years): Invest in the Physics

Allocation	Substrate	Rationale
30%	Reversible classical computing	Path to Landauer-limit general-purpose computation
25%	Photonic quantum (MBQC, CV)	Room-temperature; avoids cryogenic penalty
20%	Analog quantum simulation at scale	Pharmaceutical and materials discovery
15%	Fault-tolerant QC (crypto only)	Only path for factoring; government security interest
10%	Field-theoretic computation	Speculative; fundamental research only

4. A Call to Action

The principles and portfolio above are not self-executing. They require action by specific actors.

4.1 To Investors (Venture Capital, Institutional, Retail)

- **Demand joules-per-solution numbers.** If a quantum computing company cannot state --- in writing --- the problem class, scale, joules-per-solution, classical competitor, and falsifiable milestone with timeframe, do not invest. Period.
- **Diversify across substrates.** The optimal portfolio is not a bet on one quantum computing company. It is a diversified allocation across the Problem-Substrate Mapping. If you must invest in quantum computing, allocate no more than 10% of your advanced computing exposure to gate-model QC.
- **Shorten your evaluation cycle.** The Narrative Production Function operates on a timescale of months. Independent verification operates on years. Close the gap: require independent verification BEFORE capital deployment, not after. Your limited partners will thank you.

4.2 To Researchers (Academic and Industrial)

- **Pre-register your claims.** Before announcing a result, register the

claim, the falsification criteria, and the independent verification protocol in the Public Registry of Computational Claims. If the registry does not yet exist, publish these on your institutional repository.

- **Celebrate negative results.** A well-designed experiment that falsifies

a hypothesis is as valuable as one that confirms it. The institutional incentive structure currently penalizes negative results by making them harder to publish and less prestigious. Change this: submit negative results to journals, cite them, and reward colleagues who publish them.

- **Reject scaffold-specific benchmarks.** Do not report "quantum volume"

or "quantum supremacy" without also reporting joules-per-solution on a commercially relevant problem. If the commercially relevant problem is not yet solvable, state when it will be --- with a specific date --- and hold yourself to that date.

4.3 To Policymakers and Funding Agencies

- **Establish an Advanced Computing Projects Agency.** Model it on DARPA.

Fund it at \$500 million per year. Staff it with active researchers on 3-5 year terms. Give it the authority to terminate programs that miss milestones. Require it to publish all results --- positive and negative --- within six months.

- **Mandate independent verification.** Any claim of computational

advantage above a \$10 million funding threshold must be independently verified within 12 months. Make independent verification a condition of continued funding. Fund the verification infrastructure through a 0.5% levy on computational research expenditure.

- **Reform procurement.** All government computational procurement above

\$1 million must evaluate bids on a joules-per-solution basis. No more buying "access" to quantum computers that solve no commercially relevant problems.

- **Establish a Public Registry of Computational Claims.** Fund it. Staff

it. Give it the authority to flag unverified claims. Make compliance a condition of government funding and a factor in government procurement.

4.4 To the Public

- **Demand evidence.** When a company announces "quantum supremacy" or

"quantum advantage," ask: on what problem? Compared to what classical alternative? At what joules-per-solution? What is the falsification criterion? What is the deadline?

- **Follow the joules, not the narrative.** The quantum computing industry

has produced an extraordinary volume of press releases, TED talks, and *Nature* covers. It has produced zero commercially viable computational output. These two facts are not unrelated. The narrative production function consumes resources that could be directed toward actual computation.

- **Support institutional reform.** Write to your representatives. Demand

that public funds for computational research be allocated on the basis of evidence, not narrative. The \$35 billion already spent came, in significant part, from taxes. The next \$35 billion should be spent differently.

5. The Falsification Pledge

We, the authors of this Manifesto and the five papers that precede it, commit to the following:

1. **Every claim we make about computational advantage will be accompanied**

by a specific joules-per-solution number compared against the best available classical implementation.

1. **Every prediction we make about future computational capability will**

be accompanied by a specific deadline and a specific falsification criterion. If the deadline passes without the criterion being met, we will publicly acknowledge the failure.

1. **We will not report "quantum volume," "quantum utility," or any other**

scaffold-specific metric without also reporting the joules-per-solution on the most commercially relevant problem accessible at the reported scale.

1. **We will submit all our computational claims to independent**

verification --- and we will publish the verification reports, whether they confirm, qualify, or refute our claims.

1. **We will celebrate negative results. A falsified hypothesis is a**

contribution to knowledge. A perpetually unfalsifiable research program is a drain on knowledge.

We invite --- we *challenge* --- every institution, company, research group, and individual working in post-classical computing to adopt this pledge. Make it public. Link to it from your website. Include it in your grant proposals and your investor pitch decks.

If you cannot adopt the Falsification Pledge, ask yourself why. What are you protecting? Who benefits from the ambiguity? What would happen to your funding, your valuation, your prestige, if your claims were subjected to rigorous, independent, time-bound verification?

The answer to that question is the answer to the question this entire series has been asking: is quantum computing a scientific enterprise or a financial one? Is it seeking truth, or seeking capital?

6. Conclusion: Honest, or Nothing

The first five papers in this series have made the case. The qubit is a scaffold, not an invariant. Alternative paradigms exist. Physical limits are real and binding. A diversified portfolio is the rational investment response. Institutional reform is necessary and possible.

This Manifesto adds the final element: a set of principles and a call to action. Computation can be honest, or it can be nothing. A computational paradigm that substitutes narrative for evidence, prestige for verification, and fundraising for falsification is not a scientific enterprise. It is a machine for converting capital into press releases.

The laws of physics do not negotiate. The Landauer bound applies equally to classical and quantum computation. The Margolus-Levitin theorem limits the speed of any quantum evolution. The error-correction overhead multiplies the thermodynamic cost of fault-tolerant quantum computation beyond what any polynomial algorithmic speedup can overcome. These are facts. They are not subject to revision by press release, by TED talk, or by Series D funding round.

The future of honest computation is not a single device. It is an ecosystem: thermodynamic optimizers for combinatorial problems, optical processors for linear algebra, neuromorphic processors for probabilistic inference, analog quantum simulators for quantum many-body physics, reversible classical processors for general-purpose

computation, and --- if and when the physics permits --- fault-tolerant quantum processors for cryptography and other problems requiring exponential speedups at scale.

This ecosystem will not emerge from the incumbent quantum computing industry, whose institutional incentives reward the opposite of honesty. It will emerge from new institutions --- an ACPA, an independent verification corps, a public registry of claims --- and from the courage of individual researchers, investors, and policymakers who insist on evidence over narrative.

The choice is ours. Honest computation, or nothing.

This Manifesto is the sixth and final paper in the "Qubit Delusion" series. All papers are available under CC-BY-4.0 at papers.qnfo.org via the concept DOI <https://papers.qnfo.org/papers>. The Falsification Pledge can be adopted by any institution, company, or individual. Attribution requested, not required.

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