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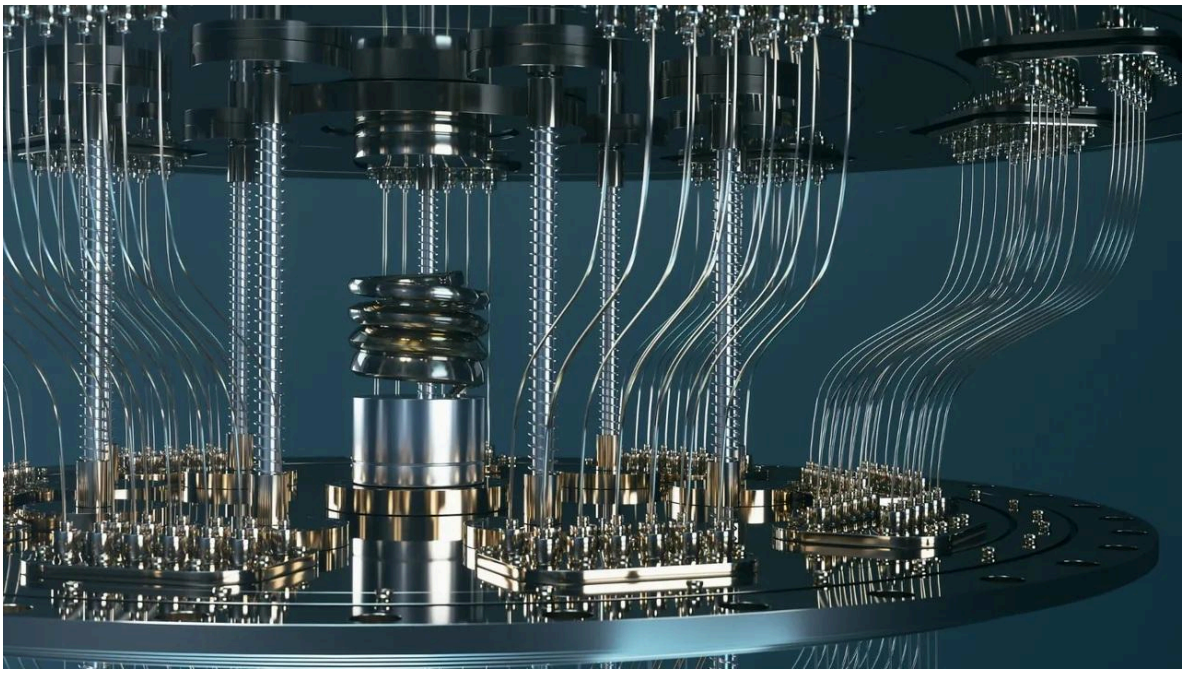

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The quantum advantage: IP considerations for the next generation of life sciences innovation

As quantum-enabled innovation accelerates, patentability will hinge on predictability, disclosure, and modality-specific claim drafting in an increasingly unforgiving enablement landscape, explain Ray Miller and Joseph Wolfe of DLA Piper.

Quantum computing is shifting from academic curiosity to practical experimentation, with potential breakthroughs in life sciences. This shift introduces novel IP challenges, making a clear IP strategy vital for capturing value.

From classical to quantum

In comparison to classical computers, quantum computers use qubits that can exist in a superposition of states, enabling parallel computation at a scale impossible for classical systems.

When combined with quantum entanglement (***ie***, the linkage of qubits such that the state of one instantaneously affects another), quantum systems can explore an enormous solution space simultaneously.
Practically, a quantum computer may enable the simulation of molecules, reaction pathways, and biological systems that are computationally intractable using classical methods, with significant implications for drug discovery, materials science, and genomic analysis.

Why modality matters: Hardware choices and life sciences applications

While quantum computers rely on qubits, not all qubits are built the same way. In this context, “modalities” refers to the different physical approaches or technologies used to create and manipulate qubits.

Competing modalities, such as trapped ions, superconducting circuits, and photonic qubits, each offer unique trade-offs in speed, fidelity, and scalability.

For instance, trapped-ion systems excel in precision and coherence time, making them well-suited to tasks like modelling small molecules or simulating quantum states of biological systems where accuracy outweighs speed.

Superconducting qubits offer faster gate operations, lending themselves to combinatorial optimisation problems such as virtual screening of potential drug compounds.

Meanwhile, photonic approaches show promise for quantum-secure data transmission, which is valuable in collaborative research environments that involve sensitive genomic or patient data.

The physical modality often dictates invention’s nature, influencing how patent law assesses predictability, disclosure, and reasonable expectation of success. Patent claims should be carefully tailored to the modality’s specific characteristics (eg, control techniques for trapped-ion systems, chip architecture for superconducting systems) to ensure success during examination.

Predictability as the unifying construct

In quantum-enabled and AI-informed life sciences inventions, enablement and obviousness increasingly turn on the same underlying inquiry: the predictability of success at the time of filing.

Although doctrinally distinct, these requirements rest on overlapping factual considerations, including the predictability of the art, the quantity of experimentation required, the availability of working examples, and the reliability of guidance tools.

Post-Amgen, broad genus claims grounded in functional outcomes or computational predictions must be supported by disclosure commensurate with their scope.
In unpredictable fields such as drug discovery, protein engineering, and molecular simulation, it is not enough to describe a desired result or a generalised computational workflow. The specification must teach how the approach works across the claimed scope and, critically, where it does not.

This distinction matters for both enablement and obviousness. Where claims rely on AI- or quantum-derived predictions, the specification should make clear whether those predictions were exploratory or whether they reliably translated into experimental outcomes within a defined domain.

Absent such disclosure, broad claims risk failing enablement for lack of commensurate teaching while simultaneously inviting hindsight-driven obviousness arguments that overstate the predictive power of computational tools available at the priority date.

Patentability challenges in Quantum innovation

While the transformative potential of quantum computing is clear, securing enforceable patents will be challenging. In life sciences, enablement and obviousness can become two sides of the same coin: enablement being directed to how to make and use the invention without undue experimentation, and obviousness testing whether a “person of ordinary skill in the art” (POSITA) would have arrived at the invention with a reasonable expectation of success.

Wands-type factors for undue experimentation (predictability of the art, quantity of experimentation, working examples) mirror the very considerations that inform “reasonable expectation of success”.

Three issues dominate the current landscape: novelty, written description and enablement, and subject-matter eligibility.

1. Novelty and non-obviousness

Quantum computing research remains heavily academic. The proliferation of non-patent literature in this space creates dense prior-art landscapes that can obscure what is truly novel. Examiners must navigate papers, theses, and preprints that describe foundational principles with enough specificity to threaten patentability.

For applicants, establishing novelty/non-obviousness often hinges not on the ***what*** of the solution, but on ***how*** it achieves its result. For example, the ***what*** might be the ability to model complex biochemical interactions using quantum computing.
The ***how*** could involve a unique qubit encoding method specifically tailored to represent molecular structures with greater accuracy.

2. Written description and enablement

The abstract and mathematical nature of quantum technology compounds the challenge of enablement. Claims that merely describe “performing a quantum computation” without disclosing specific qubit types, circuits, or encoding schemes risk rejection for lack of written description.

The most successful applications provide example detailed implementation pathways, such as circuit diagrams, gate sequences, or state-preparation steps, even if simplified. Applicants should avoid “black-box” functional claiming and instead connect the claimed functions to physical manifestations or operational processes.

3. Subject-matter eligibility

As with AI, quantum inventions can easily be characterised as abstract mathematical algorithms if they are not sufficiently tied to physical hardware or outcomes. To satisfy eligibility requirements, claims may be framed in terms of specific qubit operations, physical transformations, or improvements to quantum device performance.

Detailing how a quantum method improves error rates, coherence, or resource efficiency can help distinguish technological innovation from mere theoretical computation.

4. Does AI ‘raise’ the skill level of the POSITA?

The POSITA evolves with available tools. In calibrating the level of skill in the AI/quantum computing era, one should consider: (i) general availability of the tool at the priority date; (ii) professional adoption and accepted practices; (iii) transparency and explainability of the method; (iv) reproducibility of results across laboratories; and (v) regulatory and clinical credibility of the outputs.

Where AI and quantum computing systems function as opaque, non-reproducible predictors, their outputs should not inflate the level of ordinary skill or transform speculation into a reasonable expectation of success.

An AI-informed POSITA and quantum computing enabled claim is appropriate only where, at the priority date, (1) the AI / quantum computing methods were generally accessible to practitioners; (2) their predictions in the domain at issue were reproducibly accurate; and (3) reliance on those predictions to guide experiments was accepted as yielding a reasonable expectation of success.

5. Does quantum computing affect the reasonable expectation of success?

Quantum computing has the potential to shrink vast chemical search spaces by better approximating quantum interactions. Yet under today's NISQ-era constraints (eg, noise, limited qubit counts, and error-prone readouts), quantum simulations often function as hypothesis generators rather than definitive predictors.

As such, their presence, without corroborating experimental validation, do not establish a reasonable expectation of success in therapeutic applications.
When quantum models cross the threshold into validated, reproducible predictors for specific classes of problems (eg, consistently accurate binding-affinity rankings within defined chemical series), their outputs may support an inference of predictability relevant to both enablement and obvious analyses.

Drafting AI- and quantum-enabled life sciences applications

Where claims rely on AI- or quantum-derived predictions, the specification should make clear whether those predictions were exploratory or whether they reliably translated into experimental outcomes within a defined domain.

Absent such teaching, broad claims risk failing enablement for lack of commensurate disclosure while simultaneously inviting hindsight-driven obviousness arguments that overstate the predictive power of computational tools available at the priority date.

Accordingly, applicants leveraging AI- or quantum-derived insights should convert prediction into teaching. At a minimum, specifications should document the computational workflow, including relevant model or simulation parameters, data domains, and validation metrics. Working examples that trace computational outputs through empirical confirmation are particularly valuable in demonstrating that predictions were not merely aspirational, but reproducibly actionable.

Equally important, however, is disclosure of representative failures. In unpredictable arts, negative data is not a liability—it is probative. Contemporaneous evidence of failed experiments, misleading AI predictions, or abandoned quantum-derived hypotheses helps define the boundaries of enablement and rebuts assertions that routine experimentation would have yielded predictable success.
Comparative studies showing divergence among AI or quantum outputs may further underscore the absence of a reasonable expectation of success at the time of invention.
To align claims with what can be enabled and defended, applicants should anchor claim scope to the aspects of the workflow that demonstrably correlate with reproducible outcomes.

For quantum-enabled methods, this may include the selected modality (eg, trapped ions, superconducting circuits, photonic systems), circuit or algorithmic topology, data-encoding schemes, and error-mitigation conditions.

For AI-informed inventions, disclosures should specify model class, feature representations, training domain constraints, and validation protocols, with dependent claims capturing narrower parameter regimes where predictability has been established.

This approach preserves defensible claim scope even where broader claims face heightened scrutiny under Amgen-driven enablement standards.

Looking ahead: Building the quantum life sciences IP playbook

The convergence of quantum computing and life sciences is reshaping R&D and IP strategy. As hardware matures, the value of well-crafted patents will rise sharply. The key is precision: understand the physics, align claims with tangible implementations, and anticipate how modality influences protection. Early engagement with IP counsel is crucial to building an enduring advantage.

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