

## QBist Style: Executive Summary

Thank you for downloading my paper. I'm happy to share with you an overview of my approach to life called, "QBist Style." This paper represents the underpinnings of my artistic vision and how it connects with my work.

### **Abstract: Imagination Sculpts Reality**

When faced with challenges, it is a natural instinct to employ our imagination in search of solutions. We mentally simulate various scenarios, considering their potential to unfold the desired outcome. Once a course of action crystallizes in our mind, fueled by motivation, we embark on an iterative journey towards that envisioned solution. This exploratory process—a blend of trial, error, and adaptation—often leads us to not just a resolution, but to a transformed state of being. This dynamic illustrates the fundamental role of imagination in molding the fabric of our lives, serving as a testament to its power in sculpting the reality that surrounds us.

In "QBist Style," I delve into the concept that our imagination actively sculpts reality. Drawing on the principles of QBism, a framework by Christopher Fuchs, I build a case that our subjective perceptions, beliefs, choices, and actions actively shape reality around us. Taking this lone step further, my vision represents a crossroads where traditional beliefs intersect with a universe that is much more malleable than we previously imagined.

While this may sound extraordinary, when QBist Style is applied, it strikes as a very practical way of thought to manage a rapidly changing world. Central to this exploration is my artistic process, aptly named "Stereo Layering," which serves as a tangible connection to this theory.

### **Part 1: The Quantum Perspective**

In this section, I guide you through the basics of Quantum Bayesianism. Using everyday metaphors, I illustrate how our observations are not just passive; they actively shape the reality we perceive. From discussing the historical context of Newtonian physics to the perplexing nature of the quantum realm, I aim to bridge the gap between scientific understanding and personal experience.

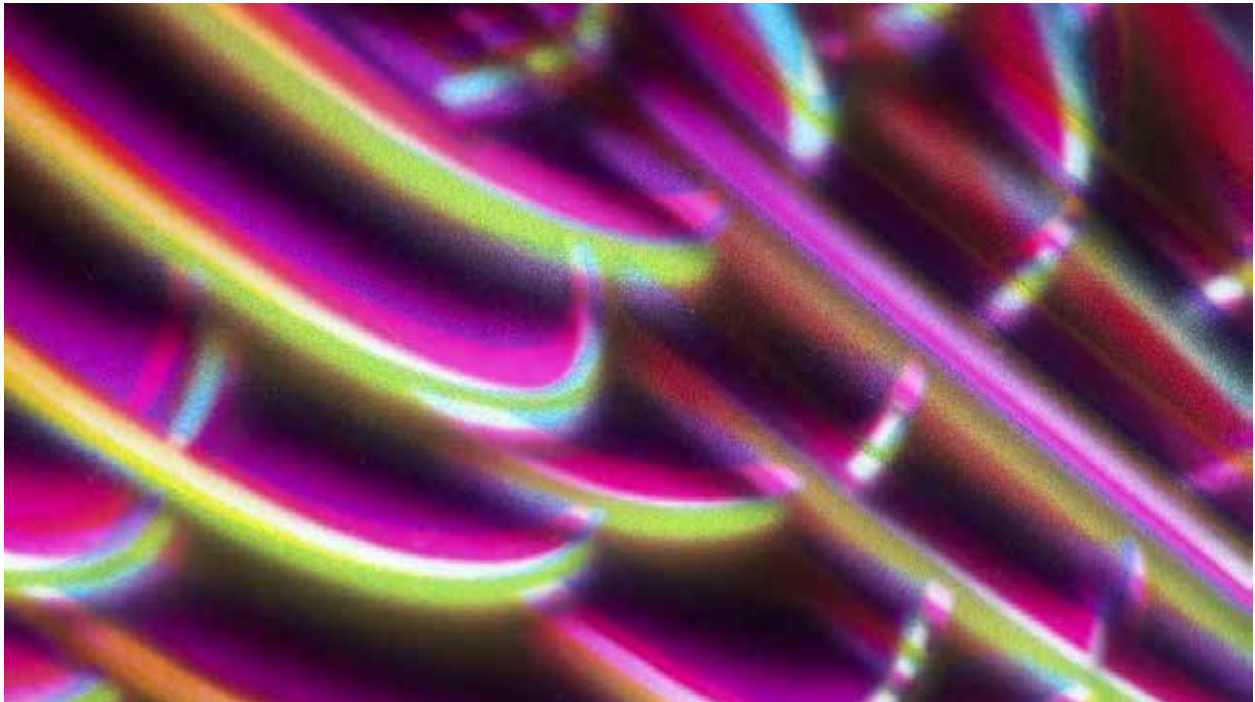
### **Part 2: Embracing a Quantum Life**

Here, I relay my principles of QBist Style as a way to observe everyday experiences, showing how quantum interactions are an integral part of our daily lives. It lays the groundwork for empowering anyone to use QBist Style to make changes around them. "Stereo Layering" is used as a metaphor for QBism, demonstrating the concept that conscious observation creates and completes the artwork. I also introduce the eight QBist Styles - practical principles for

incorporating QBism into daily life, complete with examples that range from artistic collaboration to imaginative future scenarios.

### **Conclusion: Shaping Our Reality**

The conclusion of this paper emphasizes the significant impact Quantum Bayesian principles have on our understanding of consciousness and reality. It's a call to action for each of us to actively participate in the observation, belief, interpretation, and questioning that shapes our world. We are not just passive observers but active participants in defining our reality.



## QBIST STYLE

12.05.23 | Steven Ochs | [stevenwochs@gmail.com](mailto:stevenwochs@gmail.com) | Stereo Layering

### Abstract

This document serves as the foundational underpinnings of my artistic vision: our imagination sculpts reality. To formalize this vision, I delve into the realm of Quantum Bayesianism (QBism), a radical perspective on quantum physics. QBism posits that we actively shape reality through our subjective perceptions, beliefs, choices, and actions. At the core of this exposition of ideas is my artistic process, Stereo Layering, a tangible manifestation of this central concept.

I offer a comprehensive overview of QBism's principles and its historical evolution, leading us to a pivotal moment of convergence between art and quantum philosophy. Taking a further step, I guide the reader to grasp the quantum experience they inhabit, bridging the scientific and imaginative realms while Stereo Layering serves as a my mental anchor in this worldview.

Beyond mere theory, this paper aspires to serve as a practical guide, illuminating the path toward integrating QBism into one's daily life, thereby unlocking the boundless potential of the human imagination.

## Part 1:

### The Reality of Your Choosing: An In-Depth Introduction to Quantum Bayesianism

Envision a moment of solitude in darkness where the unseen world awaits discovery. Holding a flashlight in your hand, you breach the shadows. An immediate halo is cast, revealing a red cup once hidden from view. It prompts us to wonder—was the cup itself dependent upon the light, or have we actively played a part in its emergence? While this question may appear deceptively simple, it's our civilization's historical knowledge, the framework of our perceived reality and our ingrained biases that actually obscure the answer. Yes, you played a part in its emergence. So let's understand how, why, and the implications associated with this statement.

#### A Newtonian Backdrop

To understand this view of reality, we must first dip into the historical context from which Quantum Bayesianism emerges as a radical alternative. The 17th century Isaac Newton developed classical "clockwork" physics models portraying reality as deterministic and measurable, operating by predefined laws irrespective of observers [1]. Its causal mechanisms implied the potential to predict future states if all contributing factors were accounted for. This matrix of interlocking physical forces represented an objective reality - what you see is what you get, independent of your perception, consciousness or imagination. We can refer to this doctrine as causality.

Scientific thinking was built upon the foundation of causality for centuries by testing hypotheses against data to reveal factual truths assumed to be constant across contexts [2]. And repeatability meant results would stay consistent regardless of who conducted experiments. However, the growing science of quantum mechanics began breaking down the assumptions of an objective world.

#### The Curious Quantum Realm

In the early 20th century, scientists delved into the microscopic world and stumbled upon a perplexing realm where particles behaved quite differently from everyday objects [3]. Rather than possessing well-defined characteristics, these particles existed as what we call "probability clouds." Think of them as spectral clouds representing a range of potential states [4].

Picture this quantum cloud as a haze of possibilities, much like a cloud of fog or smoke. Within this cloud, particles don't have specific properties; instead, they exist in a superposition of multiple coexisting possibilities [11]. It's as if they're ghosts, shape-shifting and elusive, rather than solid objects with fixed attributes.

Intriguingly, this cloud of probabilities only solidifies into a specific state when we introduce measurement or observation, much like shining a flashlight into the darkness [12]. Imagine attempting to focus your camera on a scene that's initially blurry – when you finally gain focus

on your chosen "subject," all other aspects of the scene disappear. Similarly, when we measure or observe a quantum particle, it collapses from its ambiguous, cloud-like state into a definite, observable parameter that matches the measurement equipment [12].

This concept of a quantum cloud, or what Erwin Schrödinger called the "wavefunction," serves as a fundamental representation of quantum states. These mathematical expressions are a dynamic, ever-changing cloud of possibilities that collapse by conscious inquiry.

This raised a key question - if the act of observation shapes the resultant states, do particles possess actual inherent properties before being observed? Or do they remain possibilities until interaction occurs?

The famous double-slit experiment conducted by Clinton Davisson and Lester Germer provided important clues into the nature of quantum particles, such as electrons. When quantum particles like electrons are fired toward two closely spaced slits, one would indeed expect to observe two straight beams, similar to what would happen with classical particles.

However, what makes the double-slit experiment so fascinating is that it doesn't follow classical expectations. Instead, when electrons are sent through the slits, they exhibit a phenomenon called interference, which results in an interference pattern on the target wall behind the slits. This interference pattern suggests that the electrons are behaving as waves, passing through both slits simultaneously and interfering with themselves, just like waves in water create interference patterns.

Remarkably, when scientists try to determine which slit an electron passes through (by introducing a measurement or observation), the interference pattern disappears. The act of gaining positional information about the electrons causes the wave-like behavior to collapse into two distinct columns, as if the electrons were behaving like classical particles.

This experiment played a crucial role in demonstrating the wave-particle duality of quantum particles, highlighting the inherent uncertainty and probabilistic nature of quantum mechanics. It is a fundamental experiment in quantum physics and has deep implications for our understanding of the quantum world.

Like the double-slit, many quantum experiments imply there is no definitive independent reality but one that we incrementally uncover. The ambiguities of the quantum realm start separating from our perceptual world only when we introduce observation. By focusing our consciousness on the event, we influence the answers that emerge.

To formalize this connectedness between observer and the observed, Werner Karl Heisenberg created his famous Uncertainty Principle [19]. It has serious implications for the behavior of quantum particles and introduced an element of fundamental uncertainty into the very nature of quantum systems.

## Entanglement, the Crack in the Foundation of Causality

Einstein famously rejected the unpredictability in quantum mechanics, believing there must be some hidden variables or deeper theory that would restore firm causality. To test this, he conceived a “thought experiment” with colleagues Podolsky and Rosen which became known as the EPR paradox.

They envisioned two particles linked together in a special “entangled” state, where actions upon one particle seem to instantly affect the other even when separated by large distances. Einstein argued that for the second particle to be definitively influenced, specific information must have been transmitted between them faster than light, which violated his theories.

Einstein's skepticism about the seemingly instantaneous influence of entanglement on distant particles stemmed from his desire to uphold the notion of a deterministic universe with well-defined states. He sought hidden variables or a deeper theory that would provide a more classical and predictable explanation for quantum phenomena. However, the EPR paradox and subsequent experiments demonstrated that entanglement was indeed a real and non-local phenomenon, challenging the classical framework of causality that Einstein had championed.

This realization further emphasized the role of observation and measurement in shaping quantum outcomes, as the entangled particles exhibited correlated effects even across vast distances, seemingly instantaneously. It underscored the idea that the quantum world operated by different rules than the classical world, where the act of measurement itself played a crucial role in determining outcomes.

John Von Neumann, a distinguished mathematician and physicist, made significant contributions to the field of quantum mechanics. His unique blend of mathematical prowess and physical insight positioned him as a key figure in the advancement of quantum theory. Von Neumann's central objective was to bridge the gap between the inherent unpredictability of quantum mechanics and the determinism of classical physics, recognizing the apparent incompatibility of these two realms [30].

To navigate this complex terrain, he harnessed the tools of intention and attention, using them as instruments to facilitate the transition between these seemingly irreconcilable domains [31]. However, as the exploration of quantum phenomena continued, it gave rise to a perplexing challenge: the observation of the observer itself, leading to an enigmatic conundrum about where to precisely delineate the boundary between the microscopic and macroscopic scales [32].

This enigma extended beyond the confines of theoretical considerations, encompassing practical elements such as measurement apparatus and even biological systems when examined through the quantum lens. It became increasingly evident that consciousness played an indispensable role, one that could not be circumvented or disregarded in the creation of tangible outcomes within the quantum realm [33].

In this intricate interplay between consciousness, measurement, and the fundamental fabric of reality, Von Neumann's work illuminated the profound connections that underlie the quantum world's strange nature.

### **The Bayesian Backbone**

While quantum mechanics unveiled a world governed by probabilities, where a definitive reality only seemed to emerge upon measurement, another field known as Bayesianism was also gaining prominence. Developed by Thomas Bayes, Bayesianism proposed that probabilities are most effectively used to represent an individual's degree of belief in a statement, rather than fixed attributes of objects.

To illustrate this concept, consider the example of predicting rain. Initially, you might assign a 60% probability to the belief that it will rain tomorrow. However, as you observe dark clouds gathering, your belief may increase to 80%. Bayes' Theorem provided the mathematical framework for adjusting these certainty ratings, or probabilities, based on new information, allowing for a dynamic representation of belief states rather than static characteristics of an external reality.

### **Quantum Bayesianism Takes Form**

Christopher Fuchs gave birth to Quantum Bayesianism, or QBism [45] by merging of Bayesian inference with quantum indeterminacy,. This framework extends interpretations of quantum mechanics, suggesting that conscious agents play a pivotal role in shaping reality from the vast realm of endless possibility waves [46]. Priors, in the context of QBism, are the initial assumptions that influence our subjective probabilities. The process of "collapse," where quantum states become definite, occurs not only internally but is also influenced by conscious actions that engage with the latent potential waiting to be activated [47].

In practice, Bayesianism begins with an initial hypothesis or "prior" and assigns it a certainty rating. As new data is encountered, these priors are adjusted accordingly. By comparing the results of measurements with the prior predictions, knowledge evolves contextually as measurement interactions unfold in unpredictable ways. QBism thus provided a structured framework that allowed storytelling and subjective beliefs to have a tangible impact on the quantum realm.

So let's illustrate this one more time. Imagine you're an archaeologist trying to determine whether a particular site contains hidden artifacts. You start with an initial hypothesis, your "prior belief," that there's a 30% chance of finding valuable artifacts at the site based on historical records and geological surveys.

As you begin your excavation, you unearth pottery shards, which serve as your first pieces of evidence. These findings update your prior belief, and you now increase your probability estimate to 40% because pottery shards are often associated with ancient civilizations.

As you dig deeper, you discover more significant artifacts, such as ancient coins and sculptures. Each new piece of evidence contributes to adjusting your beliefs. Your probability estimate steadily climbs to 60%, indicating a growing confidence that valuable artifacts are indeed present.

Now, imagine that during the excavation, you uncover a rare, intricately crafted artifact of immense historical significance. This remarkable find substantially alters your prior belief. Your probability estimate soars to 90%, reflecting your strong conviction that this site holds valuable treasures.

In this example, Bayesianism allows you to continuously update your beliefs as you gather more data. The initial hypothesis, or prior belief, evolves in response to the empirical evidence you collect. This dynamic process of adjusting your beliefs based on new information mirrors the core principles of Bayesianism.

In QBism, a similar process occurs on a quantum level, where observations and interactions with quantum systems lead to the revision of subjective probability estimates. This interaction between the observer's beliefs, measured as probabilities, and the quantum world demonstrates how QBism bridges the gap between subjective experience and quantum phenomena.

Let's imagine a quantum scenario where a hydrogen atom approaches another atom with the potential to bind together, forming a molecule—let's say, water. Quantum mechanics is the fundamental framework for understanding the behavior of particles and systems at the atomic and subatomic scale. It is a highly successful and precise theory that describes the behavior of matter and energy in this realm. In traditional quantum mechanics, one might assume that the binding of these atoms is a deterministic process, where the outcome is certain.

However, when we view this scenario through the lens of QBism, it takes on a different perspective. In the quantum world governed by QBism, the binding of these atoms isn't predetermined. Instead, it's influenced by the observer's beliefs and uncertainties.

Now, let's consider two different observers with distinct beliefs. Observer A approaches the situation with a strong belief that the hydrogen atom will bind with the other atom to form water, while Observer B is more skeptical and uncertain about the outcome.

As these observers interact with the quantum system, their subjective probability estimates come into play. For Observer A, their strong belief in binding may indeed lead to the formation of water molecules in their observation. However, for Observer B, the outcome may be



different. The uncertainty and skepticism may influence the quantum event, causing the hydrogen atom not to bind with the other atom in their observation.

In QBism, quantum happenings aren't solely dictated by an external, objective reality. Instead, they are intimately tied to the observer's beliefs and interactions. In a QBism-based world, the very act of observation can impact the outcome of quantum events, making it a great departure from classical physics and highlighting the central role of consciousness in the quantum realm.

### **QBism is a way of thought and approach to the world**

Measurement or observation, once seen as a passive act of revealing pre-existing states, is redefined in QBism as an interactive exchange. It involves the selection of certain possibilities over others from the seemingly infinite array of potential outcomes [48]. In this view, the world and the self are intertwined, and their interactions create a tapestry of tentative existence. We, as conscious observers, are not detached bystanders but active participants in the ongoing articulation of reality's future.

QBism also addresses and resolves quantum paradoxes by discarding the notion of a single causal reality that is gradually unveiled. Instead, it portrays shifts in a more contextually profound manner, synthesizing you, the observer and object in every act of exploration. In this perspective, matter emerges from the fabric of dreams through deliberate inquiry.

This expanded interdependence challenges outdated assumptions of the causality of reality that merely awaits our mapping. It suggests that, far from being constrained by inherited limitations, we continually co-create our personal reality in alignment with the focus of our imagination.

And so here lies at the centerpiece of this paper. When we consider that reality consists of all of what you experience. Qbism reflects back all of those aspects, seeing you as hairball of quantum probabilities ranging from atoms to information or imagination. For example, the information you are reading now is woven together with the world around you, into your world of probabilities. Located at the nexus of this knowledge, you are intermingling your probabilities. Most likely your priors have been playing out as though you are traveling in a straight line. However, with the new knowledge that you can change the reality around you, your priors are now changing, offering you a new way to impact your surroundings. At this moment you are not merely a reader. You are an active participant. This frame puts you as the center, the ultimate focal point. Your perception, just like the beam of light from the flashlight, possesses the strength to collapse quantum probabilities into real life experiences and shifts in the world around you. As one comes to understand this message a profound understanding occurs: There are no limits in the journey.

## Part 2. Qbist Style

Standing on the shoulders of giants we can paint an exciting picture. You are living in a soup of quantum like a fish in water. Since we focused on atoms at school, we tend to forget that quantum mechanics sets the rules that dictate the atomic world. Hence, all of this reality is made up of quantum waveforms of probabilities.

Think of it this way. You experience quantum interactions all day long when you look at the surrounding world. The colors you see are the interaction of quantum wavefunctions with your eyes. When light reflects off objects, it does so in a way that involves the probability of photons bouncing off at particular angles and wavelengths. These probabilities, described by quantum mechanics, determine the colors you perceive. The very act of seeing and perceiving the world is inherently quantum in nature.

In reflections, the play of light off surfaces is a quantum dance. When light strikes a mirror, for instance, photons behave both like particles, bouncing off the mirror's surface, and like waves, creating interference patterns that influence what you see. This dual behavior is a fundamental aspect of quantum mechanics, illustrating that even the way light interacts with matter is deeply rooted in the quantum world.

These are a few examples of what you experience, but even when you slam your fist onto the table, you are experiencing quantum interactions. At a microscopic level, the atoms in your hand and the table repel each other due to the Pauli exclusion principle, a quantum phenomenon that prevents two fermions (particles like electrons and protons) from occupying the same quantum state simultaneously. This repulsion, governed by quantum mechanics, is what gives you the sensation of resistance when you touch an object.

In essence, the quantum world is not something distant or reserved for scientists in labs; it's the very fabric of the reality you interact with every day. From the colors you see to the way objects reflect light and even the way you feel when touching something, quantum mechanics underlies these experiences, constantly shaping the world around you.

Qbist Style acknowledges our quantum state. Through this pursuit a Styling QBist can move toward the greatest dance with the universe. One in which practical approaches bring giant leaps in the world around us.

### Stereo Layering as a Metaphor for QBism

Throughout my life I have searched for an artistic process which could describe the nature of reality. Once I created the stereo layering process, I was able to present that. It embodies the principles of QBism at work. By converging photomontage, AI and layers, my work makes 3d images emerge from previously flat surfaces. The artwork expresses how observing it creates

dimensionality, which only occurs inside of your mind's eye. Just as Quantum Bayesianism requires the observer to collapse the waveform, so does my work need the observer to become complete.

And while the images I create are delightful 😊, they are not the central message. Actually, my process of Stereo Layering *is the message*: Imagination sculpts reality around you. With this central concept now formalized in this paper, we can move on to the practical aspects of Qbist Style.

8 QBist Styles:

1. The world is what you think it is.
2. There are no limits.
3. Energy goes where attention flows.
4. Now is the moment of power.
5. To love is to be happy with.
6. Power comes from within.
7. Effectiveness is the measure of truth.
8. Prior probabilities are updated physically, emotionally, consciously, imaginatively and/or spiritually

The QBist Style is both straightforward and pragmatic. It involves a holistic approach encompassing the physical, mental, emotional, and imaginative realms. It's not your traditional manifestation practice; instead, it's rooted in taking action while nurturing your imagination. Every step you take towards your desired outcome serves as an opportunity to refine and bring your beliefs (or priors) closer to the reality you aspire to achieve.

Embrace your boundless imagination, understanding that the greater the gap between your current reality and your desired destination, the more time it may require to adjust and realign your priors. However, by staying mindful and attentive throughout your journey, you'll witness something truly remarkable unfold before your eyes.

Some clear examples of QBism:

1. The Artist's Guild: Within a collective of artists, individual philosophies and creative priors intermingle, leading to an enrichment of perspective and evolution in artistic expression.
2. The Athlete's Journey: A novice runner's priors on physical and mental limits are recalibrated in the presence of a seasoned marathoner, opening new pathways of possibility.

More strange examples:

1. 500 years: A person believes they will live to be 500 years old and slowly society gathers technologies to offer extended life.

2. A Scifi writer : A scifi writer creates a story of a flat flip communicator and it becomes the cell phone.

Follow a path, it doesn't have to be straight. 😊

## Conclusion

Quantum Bayesian principles have a deep impact on how we understand our consciousness interactions with our reality. They suggest that our participation in observation, belief, interpretation, and questioning shapes reality. Our subjective presence is not separate from the universe but is entwined with revealing its mysteries. Reality waits for us to define it, much like how a pianist plays the notes.