

## The Quantum Theology of Matzah based on David Porush

I am a former professor of literature, electronic media, and AI (Rensselaer; William and Mary) and entrepreneur (Spongefish, MentorNet) writing about the [origin of the alphabet](#), Jewish history and mystery, what the past tells us about the future of culture, science, and the media, and other indulgences. Here are links to three of my books: [Rope Dances](#) (Fiction Collective, 1979) Short stories. [The Soft Machine: Cybernetic Fiction](#) (Methuen; Routledge, 1985) A literary look at the influence of cybernetics on culture, this book anticipated the cyberculture revolution. [A Short Guide to Writing About Science](#) (Pearson, 1993). Textbook connecting clarity of thought to clarity in writing.

Matzah is a sermon on Elohim's absence. By noting matzah is not bread, we open a door, inviting Him to enter the home during the seder. It's the secret twin of Elijah's Cup, asking the same question left by the untouched wine in Elijah's cup: Where is He?

We forego bread because the difference between bread and matzah is *inflation*, the chewy fullness that gives satisfaction, reminding us to beware our own puffed-up egos, and to liberate ourselves from enslavement to the things that make us too swollen with pride and arrogance. The difference between bread and matzah is our *taste* for sensuality. for the Hebrew word for "taste" – *tam* – also means "reason." Let's not let temptations of the body blind us to the truths that come from our spiritual intellect.

Another difference between bread and matzah is *time*: if you let flour and cold water sit for eighteen minutes, it will begin to ferment. Matzah was hurried because the Israelites had to stay small in the night. So they ate humble bread while the tenth plague, the slaying of the first born, passed over. Then the next morning they were rushing out of Egypt. They made and ate matzah a second time and rushed towards redemption and freedom. The difference between bread and matzah is we eat bread three times a day through the year, but "on this night, only matzah." Beware enslavement to routine habits or desires.

Matzah is spiritless bread, it's golem. Beware idolatries, worshiping things that are mere flat objects, empty of true dimension or inner meaning, else you will become like matzah, flat and de-spirited. Many hosts answer the invitation to interpret by writing fashionable *causes* into their matzah stories (hagaddahs). Sixty-five years ago, the Passover helped fuel the civil rights movement. Now, lots of home-made haggadim include passages about Martin Luther King, or genocide and slavery in other regions of the world, or calls for equality for transgender people, and an end to the oppression of animals by Pesach carnivores, or analogies between an unpopular president and pharaoh, or even misguided pleas for Israel to end its so-called apartheid. For that reason, on this holiday, we need to be reminded of the down-to-earth and practical.

Matzah reminds us that Elohim itself intervened in nature and time to free us. Because in Egypt we had only the flattened perception of slaves. We, and the world, needed to witness Elohim's miracles firsthand to be convinced. At other times, He works only through nature, quietly if universally.

### Metaphysics in the physics of matzah

It was one believer's idolatrous love of sushi that drove his inner circle to look at the physics of matzah. He thought he might fulfill the theme of liberation by "going Sephardi": that is, giving himself permission to eat rice on Passover. Those who follow strict practices have agreed to

avoid the five grains that expand when cooked – oats, barley, spelt, wheat, and rye. But a schism arose between the Ashkenazi and the Sephardi. Maybe because they lived where the weather made them grumpier, Ashkenazi Jews constructed the anti-inflation rule and also forbade lentils, beans, corn, and rice. The Sephardi continue to enjoy them.

This particular fellow voted for rice, largely because he had a fantasy about kosher for Passover sushi. (Are there others with that fantasy?) Well, he lost. But to defend his unpopular position, he was driven to science to try to find out what caused this dreaded “inflation.” What he discovered didn’t help to win his case, but it opened up an window to determine the difference between bread and matzah in the biophysics of yeast.

Matzah and bread both are essentially wheat flour and water. Outside the seder, on Passover, we can add eggs and salt for flavor, and some matzahs that are marked “kosher for Passover” even include oil, honey, juice, or wine, whatever doesn’t make the dough expand. But during the seder proper, we are supposed to eat only “poor matzah”: flour and water. To make bread, you need yeast.

Humans recognized and harnessed the magical properties of yeast even before they could write. Yeast makes flour and water into bread. It also makes grapes into wine. It seems to add life to inert foods, transforming them into something else alive. Grape juice is just a soft drink. But wine is literally a spirit. A *cracker* is a good delivery platform for dip, but *bread* is the staff of life itself. By ingesting wine and bread, we take some of that magic into us. Bread satisfies. Wine makes our hearts glad. It’s no wonder bread and wine were worshiped by the ancients and are central to many religious rituals, and especially Pesach and communion.

Though the technology of yeast has been perfected, the science of yeast still holds mysteries and surprises. To put it another way, we know the mechanics of how yeast work down to the molecular level, but we’re not completely sure how *it performs its magic*.

### **The quantum physics of yeast**

Yeast is a single-celled living creature. When we let these critters feed on their favorite food, sugar or anything that contains sugar or carbohydrates, they digest it into sugar’s components: energy, alcohol, carbon dioxide, and some residue molecules that add flavors. The process the ancients observed was bubbling, rising fermentation. When we bake bread, the heat evaporates alcohol produced by the yeast into gas bubbles that expand and burst, contained by the sticky dough. This gives bread its texture. In the cooler processing of wine (and beer), the alcohol is completely contained in the liquid for our pleasure.

All this you probably learned in high school chemistry as an example of enzymatic activity. But what they didn’t teach us, because chemistry isn’t etymology (word origins), is that “enzyme” is just the Greek for “in yeast” (en zumē). And what you didn’t learn, because chemistry didn’t know, is how yeast, or enzymes, are the gateways between the living and the inert - literally the bridge between life and death. The science of quantum biology has started to answer the question of how yeast performs its miracles.

Yeast is the ur-type of all enzymes. The source. Enzymes are present in all living things, in every living cell, and in every process that sustains life: digestion, neural action, making new cells, and repairing old ones (growth and healing), reproduction, and so on. There is an eternal philosophical battle between materialists and vitalists. Materialists believe the universe and everything in it, including humans and human consciousness, is a vast machine. It is made up only of physical things and the physical processes or forces between them. Vitalists argue that there is a meta-physical force in the universe that animates all life, a force that can't be reduced to mechanical explanations. Human consciousness particularly illustrates the problem and limitation of materialism. Materialists argue that everything can be explained by a self-consistent systems of reason, like logic or mathematics. Religious vitalists argue that the force behind such phenomena is divine.

Although yeast is a living thing, enzymes have until recently seemed to be purely chemical machines. In the debate between materialists and vitalists, enzymes have been the best proof for the materialist view of life. They seem to explain how life is introduced into inert matter without resort to non-mechanistic explanations. Until now. It turns out that enzymes require quantum effects to do their work, and quantum mechanics defies the materialist view of the cosmos. At its best, quantum mechanics defies logic, though we've learned to use it in MRIs and computer chips. At its worst, *every quantum process requires an aware-being to watch it work in order for it to be real.*

I know to most of you unfamiliar with it this claim for quantum mechanics seems just weird. There's no way to explain any quantum process without over-simplifying it or resorting to analogies that dangerously distort its actual, full-on weirdness. Many have tried and some have succeeded in illustrating its processes. Let's just say the quantum is profoundly counter-intuitive. But here are a few of the weird facts that you will need to know as we continue with our discussion of matzah. I leave it to you to discover whether you buy any of it yourself:

- Sub-atomic entities are both waves of energy and particles at the same time.
- A sub-atomic entity isn't in any one specific place until you observe it. Then it seems to settle on one. (Uncertainty principle.)
- A single sub-atomic particle can be in two places at once. But if you affect one, its other self will react, even if they are separated by millions of miles. (Superposition)
- They can pass through otherwise impassible barriers (quantum tunneling) and "travel" faster than the speed of light.
- When a subatomic particle is observed or measured, it "collapses" from its various possible quantum states into one state. ie, it stops behaving as quantum and starts behaving classically. (Measurement)

To understand the quantum *theology of matzah*, the last aspect is the most important. Again, 'When a subatomic particle is observed or measured, it "collapses" from its various possible quantum states into one state. ie, it stops behaving as quantum and starts behaving classically.' Until now, biologists have been fairly content to leave the weirdness of the quantum world among physicists. They assumed there was an barrier between the sub-atomic world of quantum weirdness and the macroscopic world of biology obedient to classical laws of physics. Thankfully (they believed) micro monkey business collapsed when it poked its head up into an

organism because the complexity of the organism automatically “measured” (observed) it (though no one specified how). They now seem to be really wrong. It’s uncomfortable.

Resurrected by water, living yeast seems to make the inert come alive. Yeast works enzymatically to ferment the sugars in flour. It explodes the flat mound of dough and makes it rise as little bubbles of alcohol explode inside. It adds tastes by creating new molecules. But what was once thought to be a classical, if incompletely understood, mechanical process we now know requires *quantum tunneling*.

### Quantum tunneling in yeast

Here’s the technical explanation: an enzyme in yeast takes a positively charged sub-atomic particle, the proton from the alcohol it has created, and transfers it to another molecule. This new molecule, with the addition of its extra proton, now has a positive charge. Like a magnet, it now attracts molecules carrying a negatively charged particle, the electron. So the new molecule the yeast created (called *nicotinamide alcohol dehydrogenase* or NADH) becomes a very effective carrier and releaser of electrons. With NADH, the ingredients can now perform their actions very quickly and efficiently. It’s like the brew now has an electric current running through it, with electrons able to hitch a ride and jump off when a chemical reaction needs an extra jolt of energy to make it happen. So far so good. This is all safe, mechanical chemistry.

As it turns out, though, the speed at which electrons get transferred from alcohol to NAD<sup>+</sup> to make NADH can’t be explained by classical chemistry. On the other hand, quantum tunneling, number three on our list of weird effects above, can. Again, at the risk of over-simplifying, a subatomic particle can help an electron travel across barriers *instantaneously* by using its superpower of quantum tunneling. As this effect occurs among millions of molecules in the dough, it speeds up the process enough for biologists to say it must be involved. [1]

This neat explanation of the quantum role in enzymatic action leaves one huge mystery, though: In order for the transport of the electron to occur, it can’t be just a probability, and in order for it to be more than a probability, it has to be observed or measured. The probabilistic quantum behavior – *the electron can be here or there and therefore nowhere at all, really* – has to become classical behavior.

*I see it now.* Until now, biologists, scientists and other materialists have maintained that the macroscopic bulk of the organism in which the quantum action occurs collapses any quantum craziness. I.e., the **fact** of the organism itself performs the “observing.” But that argument no longer holds water and even seems like a tautology, fabulous circular reasoning, because enzymes involve quantum action. Enzymes, and the quantum, is ubiquitous in every process of every cell in an organism. In fact, it seems to be the essence of life itself.

A quotation from Johnjoe McFadden, Jim Al-Khalili, **Life on the Edge: The Coming of Age of Quantum Biology** (Broadway Books, Jul 26, 2016) p. 97:

Enzymes have made and unmade every living cell that lives or has ever lived. Enzymes are as close as anything to the vital factors of life. .... [T]he discovery that enzymes work by promoting

the dematerialization of particles from one point in space and their instantaneous materialization in another provides us with a novel insight into the mystery of life.

There's simply too much quantum funny business going on everywhere in a living being to say one part of the organism is classical and collapses the other part that's quantum.

### **Materialists banish the quantum: the Many Worlds Hypothesis**

Scientists have resolved the measurement problem another way. They hypothesize that instead of collapsing the quantum into the classical through observation, every time a quantum event collapses into a classical one, other universes are spawned. All the other probabilities that didn't occur *here* does occur *there*, in these new universes.

This hypothesis is mathematically satisfying and sidesteps any suggestion of metaphysics. But there are a virtually infinite set of quantum events occurring everywhere at every instant everywhere in an organism, let alone the whole universe. Each of them would create an incalculable set of alternate universes. You do the dizzying math. Or alternatively, ask yourself: Which is the more ridiculous vision of the cosmos? This vision creates an even crazier and more incomprehensible cosmos than the one we have.

But who knows? That's what they said about quantum theory in the twentieth century. And that's what most well-educated, modern, rational sophisticated people say about Elohim.

### **Quantum theology of matzah**

*Quantum theology* is a term used by a few but growing number of theologians and mystics. Many of their essays and speculations are plagued by vagueness, weak understanding of science, and an over-heated, optimistic leap into the irrational analogies between quantum science and mysticism to prove Elohim's existence. Their "proofs" often require taking analogous-sounding mysteries as equivalents. Quantum theology is largely the provenance of well-educated fundamentalists.

The case of yeast is different. In this dance between the material and the vital, between science and faith, the science leads us to conclude something mystical is happening in bread that doesn't occur in matzah. That matzah has been promising something like this is lurking in its layers of meaning is a delightful coincidence. Even on its own terms, though, the new science of quantum biology shows quite specifically how the process of life itself depends on quantum action. In every possible process where life is created or sustained, enzymatic action is involved. And with quantum action comes the requirement that someone or something is observing the process. The nose of the quantum camel has entered the tent of biology, but it was summoned by the biology. In fact, the tent is the camel. Something or someone has to be observing omnipresent quantum events in enzymes to make them operative in life. Someone or something has to be operating life. Omnisciently.

Couple the biophysics with the metaphysics of the matzah and we get a powerful sermon. Matzah is bread without attention, perhaps without the attention of a Cosmic Consciousness. It

represents enslavement to inert material. It is both literally the bread of affliction, the food of slaves, and symbolically life without redemption from our inner Egypt, the body without a spirit. Matzah invokes an Elohim who redeemed the Children of Israel from slavery more than three thousand years ago and Who continues to operate the universe today by attending to its every quantum event. He is an incomprehensibly vast Elohim Who observes every infinitesimal event, all the infinite infinitesimal events that occur every instant to sustain each living cell of each living organism. This is a Elohim that watches everything actively. This Elohim expands and unfolds His Cognizance as much as the universe imagined by the Many Worlds Hypothesis multiplies infinitely bubbling alternatives, only this Elohim gives it life and an elegant unity.

I like this Elohim and this idea of Him.

On Matzah 1, I offered you a The Quantum of Matzah, what turned out for me to be a real eye-opener regarding Elohim's ability to observe. In order for yeast to ferment, there must be a work that breaks the conventional laws of the universe. The only way the quantum processes necessary, their transformative power must be observed. In our world, quantum processes outside natural physical laws. If these processes are to sustain life, they must be seen. Billions of quantum processes are running every second in the background to sustain life - turning sugar to alcohol is just one example. In our bodies, billions of these processes are happening to keep us alive. There is no life without quantum processes running constantly, and innumerable quantum processes are running in the background. Yet for these processes to complete themselves and sustain life, they must be observed by some entity or machine. Who is observing them constantly? There's only one answer to that - it's a WHO and it's Elohim. Imagine the mind of Elohim, Elohim's ability to observe all this quantum going on constantly. It's utterly profound.