Quantum research sheds new light on how cells communicate

December 23 2024, by Nathan S. Babcock

Credit: Image created using Gamma AI

Have you ever thought that light might hold a key to life's mysteries? One hundred years ago, Alexander Gurwitsch dared to propose that living cells emit faint ultraviolet light, invisible to the naked eye, to communicate with and stimulate one another.

It was an idea so ahead of its time that many dismissed it outright. Without a physical theory to back it up, his idea was relegated to the chronicles of history. Yet when I encountered his work, I couldn't help but ask the question: What if the UV effect is quantum mechanical? Armed with modern quantum theory, I began to uncover a new quantum dimension to life itself.

A century-old mystery revisited

In the 1920s, Gurwitsch's experiments revealed a startling phenomenon. Placing the tip of one onion root near the side of another, he noticed that more cell divisions occurred on the side of the root facing the tip. He observed that the effect disappeared when he placed a glass slide between the roots.

Curiously, when he changed the material of the slide from glass to fine quartz, the effect reappeared.

This mysterious light, which he called "mitogenetic radiation," passed freely through air and quartz but was blocked by glass, distinguishing it from visible light and some frequencies of infrared. He concluded that faint ultraviolet light emitted by one root tip stimulated cell division in the other.

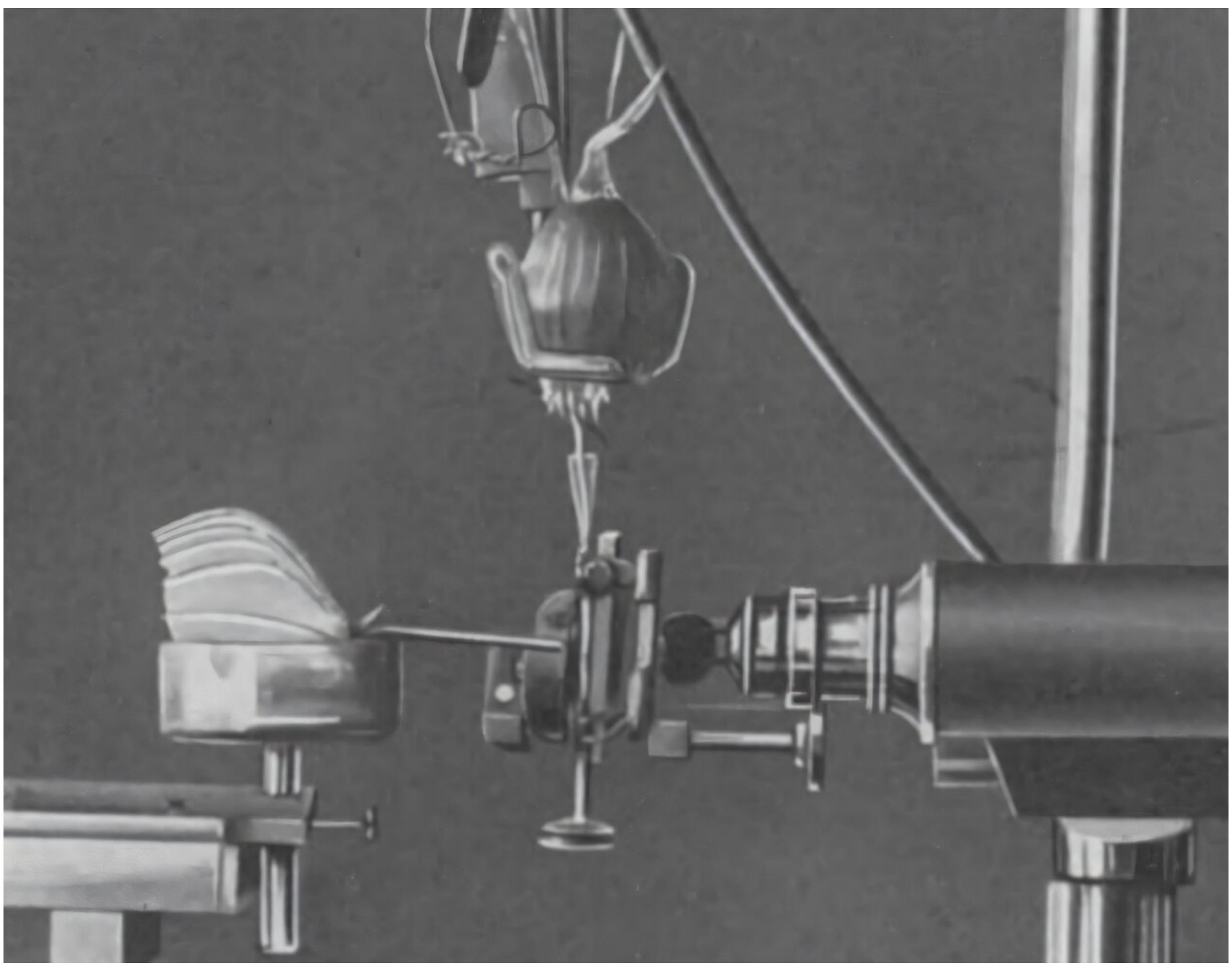
At the time, the idea that light, not hormones or other chemicals, could drive such a fundamental process seemed implausible. Skeptics dismissed his findings, and the phenomenon faded into obscurity.

Faced with this problem, I realized that the ultraviolet radiation he described might be explained using quantum resonance theory. Using resonance concepts from quantum mechanics, I've connected

Gurwitsch's observations to a sophisticated framework that explains how faint ultraviolet light can spark significant biological changes.

This explanation, outlined in my new paper published in the *Computational and Structural Biotechnology Journal*, not only validates his results but also reshapes our understanding of how quantum systems interact with biological environments.

In my research, Gurwitsch's mitogenetic radiation turns out to be a prime candidate for a quantum resonance effect where specific wavelengths of light trigger responses in living cells.



A photograph of Gurwitsch's onion experiment with the emitter onion held in the inductor (a bowl to hold the inducing onion bulb, left), the receiver onion (in a frame to hold the induced bulb, top), and location of mitotic induction (center). Credit: A. G. Gurwitsch, Das Problem der Zellteilung physiologisch betrachtet (1926)

Challenging conventional wisdom

Traditionally, quantum physics assumes that systems interact weakly with their environment—if at all. This misses out on the complexity of living organisms, which are nothing like isolated systems in a lab. They're dynamic, interconnected, and alive with collective interactions between photons, electrons and molecules.

For this reason, early researchers dismissed quantum effects in biology, believing cells were just too "warm, wet and noisy" for such delicate phenomena.

I took a different approach, turning to open quantum systems theory, an advanced framework that describes systems embedded in and interacting with their environments. Specifically, I employed Fano and Feshbach's model, a method originally developed for scattering phenomena in quantum mechanics.

This model is ideal for testing quantum resonance effects like those Gurwitsch proposed. By applying this framework, I've shown how biological environments could detect and amplify faint light signals, defying traditional assumptions that life is too chaotic for quantum phenomena to thrive.

Drawings of onion root cross-sections of non-irradiated (left) and irradiated (right) roots. The line divides the irradiated root into opposite halves to show the increased number of cell divisions in the irradiated half. Credit: T. Reiter and D. Gábor, Zellteilung und Strahlung (1928)

Revolutionizing our understanding of life

The implications of this discovery are extraordinary. First, it predicts that light isn't just a passive byproduct of biological systems—it's an active component. Ultraviolet ultraweak photon emissions (UPE) may provide a quantum channel for cells to communicate and coordinate activity. This adds a new layer to our understanding of cellular behavior.

Second, this work bridges biology with quantum physics in ways that seemed unimaginable last century. By applying these principles of open quantum systems theory, we can now explore processes like mitosis, photosynthesis, and enzyme catalysis through a distinctly quantum lens.

This interdisciplinary approach not only advances our understanding of biology but also pushes the boundaries of quantum mechanics into a new scientific frontier.

Finally, the practical applications are immense. Cellular UPE are poised to revolutionize medical diagnostics, serving as a biomarker for cellular health, oxidative stress, or early signs of cancer. In regenerative medicine, we might harness these emissions to stimulate healing or guide tissue growth with precision light therapies.

The potential to manipulate these quantum interactions opens doors to new treatments and technologies that could reshape the life sciences, health care, and biotechnology.

Looking ahead

Rediscovering Gurwitsch's work has opened avenues for discovery that pose many new questions. How do these photon emissions integrate with other cellular processes? Could they influence immunity, aging, or even the development of complex organisms? What other hidden quantum phenomena might exist in the biological microenvironment that we can model using quantum theory?

As we dive deeper into these questions, we're not just revisiting old ideas. We're stepping into uncharted territory. Gurwitsch's intuition about the quantum nature of life was a century ahead of its time, waiting for the tools and theories of the future to unlock its potential.

Today, those tools are here, and the faint light he discovered is shining through more than ever, revealing the beginnings of a quantum blueprint for life itself.

This story is part of Science X Dialog*, where researchers can report* *findings from their published research articles.* Visit this page *for information about Science X Dialog and how to participate.*

More information: Nathan S. Babcock, Open quantum systems theory of ultraweak ultraviolet photon emissions: Revisiting Gurwitsch's onion experiment as a prototype for quantum biology, *Computational and Structural Biotechnology Journal* (2024). DOI: 10.1016/j.csbj.2024.11.030

Bios:

Dr. Nathan S. Babcock has over 20 years of research experience in the quantum sciences. He attended University at the two major Canadian quantum research centers, the University of Waterloo (Ontario) and the University of Calgary (Alberta).

Upon receiving his Ph.D. in Physics, Dr. Babcock deepened his understanding of the underpinnings of quantum mechanics in biology by carrying out postdoctoral research on structural biology at Simon Fraser University (British Columbia) before developing experience in spin chemistry by working on studies of radical electron pair models of avian magnetoreception while at the Living Systems Institute at the University of Exeter (UK).

He then honed his expertise on open quantum systems by investigating the quantum mechanical effect of superradiance in biological microtubules at the Quantum Biology Laboratory at Howard University in Washington, D.C.

His peer-reviewed research on quantum effects in microtubules went "viral" online, being featured on numerous news feeds, blogs, and social media websites. Dr. Babcock is currently working on the first technical monograph for the field of quantum biology, while expanding research applications of open quantum systems theory to biological systems. Dr. Babcock is counted among his colleagues as one of the pioneers of the groundbreaking new field of quantum biology.

Citation: Quantum research sheds new light on how cells communicate (2024, December 23) retrieved 27 December 2024 from
https://phys.org/news/2024-12-quantum-cells-communicate.html