Randy Wayne

Self-evaluation

Research

As a researcher, I try to ask and answer the most fundamental scientific questions related to how plants transform light energy into food, how plants sense and respond to the physical environment, and how plants respond and develop in time. Specifically I work on the following fundamental scientific questions: what is light, what is gravity, and what is time? I do this by critically analyzing the foundations of relativity and quantum mechanics that have given us the scientific description of light, gravity, and time that is accepted by the consensus. My unique and original work is based on a deep understanding of the history and philosophy of science, a deep need to resolve inconsistencies between standard theories that have been swept under the rug, and on my computational and experimental skills. My work on the nature of light, gravity, and time is at odds with that of Einstein, and as reported in the Cornell Daily Sun (https://cornellsun.com/2010/11/30/plant-biologist-challenges-einsteins-theory-of-relativity/), "*Needless to say, such propositions on Einstein's seminal work, especially from a plant biologist, were not welcomed by the physics community. When Wayne first submitted a paper to Annalen der Physik, which published Einstein's paper on the theory of special relativity in 1905, 'an editor wrote back: we can find nothing wrong with your derivations, but we prefer not to publish*.'" Consequently, I have not been very successful in publishing in journals based in western countries. Indeed, after my first publication in a western journal, the journal, reviewers, Cornell University, and I were all attacked *ad hominem* online (https://www.physicsforums.com/threads/biologist-trying-to-do-physics-badly.449426/ provides an example).

According to the Report of the Committee on Freedom of Expression at Yale (https://yalecollege.yale.edu/deans-office/reports/report-committee-freedom-expression-yale), "*The primary function of a university is to discover and disseminate knowledge by means of research and teaching. To fulfill this function a free interchange of ideas is necessary not only within its walls but with the world beyond as well. It follows that the university must do everything possible to ensure within it the fullest degree of intellectual freedom. The history of intellectual growth and discovery clearly demonstrates the need for unfettered freedom, the right to think the unthinkable, discuss the unmentionable, and challenge the unchallengeable. To curtail free expression strikes twice at intellectual freedom, for whoever deprives another of the right to state unpopular views necessarily also deprives others of the right to listen to those views*."

To quote Pauli Murray (http://www.unz.com/print/CommonGround-1945q4-00022), "*When my brothers try to draw a circle to exclude me, I shall draw a larger circle to include them*." Consequently, I have published in journals, open to all to read, that are edited and published in the Islamic world where the publication of my research, which is at variance with current western knowledge, is still allowed and not attacked *ad hominem*. As over dramatic as this may

sound, this seems to me to be a repeat of the time when the western world but not the Islamic world condemned Greek knowledge.

Stanislaw Ulam said, "*Ask not what physics can do for biology, ask what biology can do for physics."* Biophysics is currently populated by people who have moved from physics into biology. However, historically, biologists and physicians, including Thomas Young, Hermann von Helmholtz, Robert Brown, Robert Meyer, and Adolf Fick have had a profound influence on physics and there is still room for a biophysical cell biologist to make an impact. This is because cells live in the world of neglected dimensions between the world of macroscopic physics and the world of microscopic physics. Studying physico-chemical processes in such a world has its advantages and its disadvantages. One disadvantage of working in this world of neglected dimensions is that it is not easy to assume that a given subset of physical laws can be neglected in order to model biological processes and solve the equations easily. On the other hand, one advantage of working in the world of neglected dimensions is that I have the opportunity to look for fundamental laws that are applicable to microscopic systems as well as macroscopic systems and thus help to unify macrophysics and microphysics. Such laws provide a parsimonious toolbox for modeling and solving a wide range of physico-chemico-biological problems.

As a result of my unusual background in biophysical plant cell biology, I have developed alternative interpretations for the fundamental observations that suggest that time is relative, reversible, and an illusion. My inferences are founded on the principle of causality, the principles of mechanics, and the laws of thermodynamics. This contrasts with mainstream science, which is founded on the theories of special and general relativity and the uncertainty principle. Based on causality, mechanics, electrodynamics, and thermodynamics, I have reinterpreted the oldest and the newest observations on why the speed of particles cannot exceed the speed of light, the relativity of simultaneity, the optics of moving bodies, the deflection of starlight, the gravitational redshift, the precession of the perihelion of mercury, stimulated emission, the global positioning system (GPS), and the observations of gravitational waves, in terms of absolute time.

I have also developed a model of the photon that is consistent with all the seemingly contradictory observations that led to the wave-particle duality. I consider the photon not to be an elementary particle but a composite particle that I call the binary photon. The binary photon is composed of matter and antimatter with conjugate properties of mass, charge, and sense of rotation. The binary photon is not a mathematical point but has extension in space. Giving the binary photon mechanical and electrodynamic properties consistent with classical physics, nullifies the need for relative spacetime. My model is consistent with Schrödinger's equation for a boson and shows how wave function solutions to the Schrödinger equation can be interpreted as paths of particles in absolute space and time. My model is also consistent with Kirchhoff's diffraction equation, the fundamental equation of image formation, that scientists, including Hans Bethe, were unable to make consistent with the standard electromagnetic theory of light.

In my opinion, one only has to look the laboriously built scaffolding of independent hypotheses that provide the standard description of the world in terms of dark matter, dark energy, and cats (and by extension cattails and pussy willows) that are dead and alive at the same time in order to

realize that there is a need for a new fundamental theory of nature that describes what we see in the living and nonliving world across multiple scales of space and time.

I have recently published more traditional work on the biomechanics, systematics, and cell biology of *Typha* (cattails) with Allan Witztum, on polarity with Karl Niklas, and will do a sabbatic with Peter Hepler and Larry Winship on the relationship between turgor pressure and wall extension in the oscillatory growth of pollen tubes.

Admittedly, my research goals are no longer perceived to be aligned with the goals of CALS, which is evidenced by my salary and title. I was hired at a time when one was expected to be the best scientist one could be *even* if the field had no money. There was room for this kind of diversity. Now one is expected to be more compliant and be the best scientist one can be *only* in the fields that provide the most money to the University. Above I presented the central themes and priorities of my research of which I am most pleased. A decent respect for the college administration requires that I attach a chapter from the second edition of my *Plant Cell Biology: From Astronomy to Zoology*, which explains why I am not interested in pursuing the -omic approach that is aligned with the goals of CALS.

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Cornell Faculty Page: https://plantbio.cals.cornell.edu/people/randy-wayne/

Wikipedia Page: https://en.wikipedia.org/wiki/Randy_Wayne_(biologist)

ResearchGate: https://www.researchgate.net/profile/Randy_Wayne

Google Scholar:
https://scholar.google.com/scholar?hl=en&as_sdt=0%2C33&q=randy+wayne&btnG=

Teaching and Outreach

In the last ten years I have written five books published by Elsevier: the first (2009) and second (2019) edition of *Plant Cell Biology: From Astronomy to Zoology* and the first (2009), second (2014), and third (2019) edition of *Light and Video Microscopy*. The two books provide outreach to the world for the fundamental knowledge and unique, critical, and creative way of thinking I present to the students in the Plant Cell Biology and Light and Video Microscopy classes described below. In both cases I present essential knowledge based on first principles and emphasize how we know what we know.

Plant Cell Biology (PBIO 4440). The cell is the basic unit of life because it is the lowest level of organization that is capable of taking up nutrients and synthesizing them into macromolecules at ambient temperatures and pressure, generating electricity, moving as a result of self-generated forces, transforming one form of energy into another, responding appropriately to the environment and reproducing with near-perfect fidelity. I teach my students how the various organelles in the cell make these processes, which are necessary for and operationally define life, possible. The students learn the purpose of each organelle, the processes in which they participate that make life possible and the particulars of that organelle that may illuminate other aspects of biology, physics, chemistry and/or the history and philosophy of science.

Light and Video Microscopy (PBIO 4500). When one looks at a specimen with a light microscope, how does one know what is real and what is an illusion created by the apparatus itself? My course takes the student step-by-step through philosophy, psychology, and particularly geometrical and physical optics so that the student can interpret images formed by light microscopes. The student can then use this knowledge to set up light microscopes that allow one to visualize transparent specimens and, in the process, quantitatively determine various physico-chemical properties of the specimen. One comes away from this course empowered to use past, present, and future microscopical techniques to visualize the microscopic world and find the real nature of life in the image.

Light and Life (PBIO 1130). By most accounts, whether theological or scientific, light is fundamental for the origin and continuation of life. The extraordinary relationship between "light and life" provides an important unifying framework to understand life in terms of physics, chemistry and biology. I hope to turn my lectures into a popular book on *Light and Life*.

Advising

As an advisor and the Agriculture & Life Sciences Advising Coordinator in Biology and Society, I make advising a priority and meet with students as soon as they ask for an appointment. I treat the students as if each and every one of them is a unique individual who has distinctive talents. I do not define them as either victims or privileged. I help them find meaningful, joyful, and thought-provoking classes that will help them to find, be, and become their best selves, develop their character, and be positioned to achieve their goals upon graduation, when they are at the top of their game, rather than after a gap year.

Conclusion

I will relate a story that Albert Frey-Wyssling, a plant cell biologist, told about Hermann Staudinger who proposed and developed the idea of macromolecules and polymers at a time when the gatekeepers of the day believed that macromolecules were artifacts. "*I remember Staudinger's lecture to the Zürich Chemical Society in 1925 on his high polymer thread molecules with a long series of Kekulé valence bonds. It was impossible to accommodate his view in the unit cell as established by X-ray analysis. All the great men present: the organic chemist, Karrer, the mineralogist, Niggli, the colloidal chemist, Wiegner, the physicist, Scherrer, and the X-ray crystallographer (subsequently cellulose chemist), Ott, tried in vain to convince Staudinger of the impossibility of his idea because it conflicted with exact scientific data. The stormy meeting ended with Staudinger shouting 'Hier stehe ich, ich kann nicht anders' [Here I stand, I cannot do otherwise] in defiance of his critics*." Staudinger held his ground and won the 1953 Nobel Prize in Chemistry. I too profess, "*Here I stand, I cannot do otherwise*."