Glossary of some terms used in the biological sciences

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Action Potential

In 1868, Julius Bernstein demonstrated that an “action potential” spike of the cell membrane travels along a nerve fiber, or axon, based on the concentration of sodium and potassium ions inside and outside the neuron. From a slightly negative resting potential, a neuron cell absorbs varying numbers of positive sodium and potassium ions through its semi-permeable external membrane. When the balance of charge between outside and inside the membrane reaches a threshold value, the neuron will fire an action potential (i.e., send a signal) of a specific voltage depending on the type of neuron. The neuron will either fire or it will not fire

Amino Acid

The fundamental organic molecule that serves as the building block for proteins. There are 20 different amino acids, each of which includes a basic amino group ($-NH_2$), an acidic carboxyl group (−COOH), and an organic group designated as “R”.

Amplicon

DNA in diluted solutions is typically difficult to identify and work with. This is addressed by a process called “PCR amplification”, or polymerase chain reaction amplification, which amplifies (increases) the amount of DNA. Such “amplified” diluted solutions are called amplicons.

Aquaphotomics

A new scientific field; the study of the interaction of light and water. The discipline held its third international symposium in 2018.

Bénard Rayleigh convection

The coordinated movement of a fluid which is confined between two thermally conducting plates, and is heated from below to produce a temperature difference. An uncoordinated movement of fluid particles which allows energy transfer between lower and upper plates is replaced by a coordinated movement above a certain temperature difference. Rayleigh Bénard convection forms convection rolls, resulting in hexagonally shaped convection cells at the bottom plate, which allows a much more efficient energy transport between the plates. The phenomena was first observed by Henri Bénard around 1900, and first explained theoretically in 1916 by Lord Rayleigh. This was an early example of a self-organizing coherent system or dissipative structure which is dynamically maintained. In technical language, an equilibrium phase transition to macroscopic order has taken place, under conditions far from equilibrium.

Biological Coherence

Stimulated biophoton emission that decays not according to an exponential function characteristic of a noncoherent Boltzman distribution light but rather as a hyperbolic function. Molecular organization is of Liquid crystalline structure. In Superfluidity and superconductivity, photon or electron elements move as a coherent whole.

Cavity Quantum Electrodynamics

The control of spontaneous radiation from excited atoms in resonant cavities.

Cellular Pattern Determination

At the start of development, the embryo is multi-potent; that is, all parts of it have the potential to become many structures or any structure of the adult organism. In the course of early development, a hierarchy of determination events occur, so that the different parts of the embryo become more restricted in their development potential. A piece removed from an embryo before determination and transplanted into a different location will develop in harmony with its surroundings. If the same experiment is carried out after determination, the graft will develop into the structure it was determined to be the irrespective of its surroundings. The process of cellular determination was discovered a century ago but its basis remains largely unknown.

Centrosome

(cytology): an organelle, near the nucleus in the cytoplasm of most cells, and contains a pair of centrioles.

Centriole

These are a pair of small cylinders (0.5 µm x 0.2 µm) oriented perpendicular to each other. They are able to map the direction of light sources. Centrioles only develop when cell motion is required. Each centriole is formed from 9 main protein filaments called microtubules. Another way of looking at it is that each centriole "controls" the organization of its microtubules.

Centrosphere is (biology) the cytoplasm surrounding the centriole of a centrosome.

Chemical Signatures

Chemotaxis

The movement of an organism or entity in response to a chemical stimulus, including chemical gradients.

Chromatography

Chromatography is an important biophysical technique that enables the separation, identification, and purification of the components of a mixture for qualitative and quantitative analysis. Chromatography is based on the principle that molecules in mixture applied onto the surface or into the solid, and fluid stationary phase (stable phase) is separating from each other while moving with the aid of a mobile phase.

Collagen

A special protein which makes up 70% of all proteins of the connective tissues. There are many kinds of collagen. They share a molecular structure in which three polypeptide chains are wound around one another in a triple helix. The triple helical molecules aggregate head to tail and side-by-side into long fibrils and bundles of fibrils. The clue to the intercommunication function of connective tissues lies in the properties of collagen, according to May Wan Ho, Rainbow and the Worm p. 186.

Connective Tissue

Includes the extracellular matrix (ECM) surrounding all cells, the skin, bones, cartilage, tendons, ligaments, the wall of arteries, veins, alimentary Canal, air passages. Connective tissues contain collagen, and are most likely liquid crystalline.

Consensus Spectrum

Based on spectrum similarity, a large number of near-identical spectra are grouped in clusters, after which each cluster can be represented by its so-called consensus spectrum. The presence of a peak frequency in a consensus spectrum implies that all of the analyzed sequences within the group have one frequency component in common. The consensus spectrum is used in the Molecular Resonance Recognition (MRR) Model.

Cellular Cortex

A dense layer of contractile proteins (actin, myosin, etc.) right underneath the plasma membrane. It executes changes of cell shape and generates the major types of motile surface projections (pseudopodia) such as filopodia, lamellipoia, and blebs.

Cyclotron Resonance

describes the interaction of external forces with charged particles experiencing a magnetic field, thus already moving on a circular path. In **Geomagnetic cyclotron resonance,** the earth's geomagnetic field provides the magnetic field. **Electron cyclotron resonance**, can be observed in plasma physics, condensed matter physics, and accelerator physics. It happens when the frequency of incident AC radiation coincides with the natural frequency of rotation of electrons in magnetic fields. A free electron in a static and uniform magnetic field will move in a circle due to the Lorentz force. The circular motion may be superimposed with a uniform axial motion, resulting in a helix, or with a uniform motion perpendicular to the field (e.g., in the presence of an electrical or gravitational field) resulting in a cycloid. **Ion cyclotron resonance** is a related to the movement of ions in a magnetic field. Although often used in inorganic physics, it has been shown to occur in biological tissue, especially for the ions of calcium, potassium, magnesium, and lithium.

Cytoskeleton

A network of 3 types of protein polymers: microtubules, intermediate filaments, and microfilaments. It also contains numerous proteins that are associated with the fibrous polymers. They nucleate, bundle, cap and link the fibers with each other, with cell organelles and the plasma membrane. It is the mechanical and functional framework for every known cellular function.

Dielectrophoresis

The migration of uncharged particles toward the position of maximum field strength in a nonuniform electric field.

Dimensional Rigidity.

Liquid crystals go through successive stages of dimensional rigidity, from completely liquid to relatively solid. It is possible that in the course of development, liquid crystalline mesophases transition from mostly liquid to increasingly solid patterns which then may become mineralized in the formation of Bones and vertebrates.

Dissipative Structures

In the formation of such steady-state cyclic structures as Bénard Rayleigh convection cells**,** despite large fluxes of materials and chemical transformations in the systems, the net change is entropy is zero because entropy is a state function, and a return to that same state will always result in no entropy change. Ilya Prigogine et al have shown that such dissipative structures can arise in systems far from thermodynamic equilibrium.

Electromagnetic Therapy

Use of electromagnetic energy in the treatment of biological disorders. Includes: PEMF: pulsed electro-magnetic field; ICRMF: ion cyclotron resonance magnetic field combinations, and rTMS: rapid transcranial magnetic stimulation.

Electro-mechanical Model of Physiology

A broad category which can include simplistic electro-mechanical machines, as well as sophisticated very high-fidelity descriptions of actual physiological processes. An example would be Fröhlich's model of collective modes of electromechanical oscillations (phonons) that extend over macroscopic distances within and possibly outside the organism.

EMITTAS :

Acronym for Electromagnetic Information Transfer Through Aqueous Systems

Exciton

An excited electron-hole pair which can propagate over long biological distances before emitting a photon.

Exciplex Popp and Rattemeyer suggest that the DNA molecule is an excited duplex, or exciplex, in which photons are effectively stored between two DNA strands. These can be a source for emitted biophotons. Exciplex formation in DNA has been shown to predominate even at room temperatures.

Extracellular Matrix

complex meshwork of proteins and carbohydrates called the extracellular matrix (ECM). A major component of the extracellular matrix is the protein collagen.

Fourier transform

Changes a space-time coordinate system into a space frequency coordinate system.

Fourier Transform Infrared Spectroscopy (ftir).

Measures how the absorption peaks of different chemical groups in the proteins change by interaction with water.

Fluorescence

Part of absorbed ultraviolet light is emitted at a lower frequency, as visible light.

Hall effect:

When a magnetic field vector intersects a current vector at right angles, a voltage is generated perpendicular to both. This is called the Hall voltage, discovered in 1879 by the U.S. physicist Edwin Herbert Hall. The Hall effect is often used to determine semiconductor properties of materials, and was confirmed in biological systems by Robert O. Becker.

Holonomic brain process

Describes a type of process that occurs in fine fibered neural webs. The process is composed of patches of local field potentials described mathematically as windowed Fourier transforms or wavelets. Holonomic processes have more recently been called "Quantum Holography" by Walter Schempp (1993) in their application to image processing in tomography as in PET scans and functional Magnetic Resonance (fMRI) -- and even more recently for processing images in digital cameras.

Imprint

Interfacial Water

Water at a solid-liquid interface. This would also include Gerald Pollack's exclusion zone, as well as the water adjacent to cell surfaces in biological tissue, sometimes called biological water. Most, if not all, water in living organisms is interfacial water, as it is almost never more than a small fraction of a micron away from surfaces, such as membranes or macromolecules. Mae Wan Ho *Entropy* 2014, *16*, 4874-4891

Interference Colors

The colors generated in organisms, which can be produced in birefringent materials viewed in transmitted white light between two crossed polarizers.

Laplace Pressure

The pressure difference between the inside and the outside of a curved surface that forms the boundary between two fluid regions. The pressure difference is caused by the surface tension of the interface between liquid and gas, or between two immiscible liquids.

Liquid Crystals From those that most resemble solid crystals to those that are more like liquids. Although the molecules of more liquidy liquid crystals tend to be aligned in One Direction individual molecules can move quite freely and change places with one another while maintaining their common orientation. Those that resemble solid crystals will have order in all three dimensions, so the movement of individual molecules is restrained, yet they remain flexible and responsive. Liquid crystals typically undergo rapid changes in orientation or phase transitions when exposed to electric or magnetic fields, which is why they are useful in electronic display screens as well as in biocommunication.

Liquid Crystalline Mesophases

The biologist W.B. Hardy wrote on the special physical properties of protoplasm, recognizing it as a colloid which is neither a liquid nor solid, but has properties of both. Therefor protoplasm of a living cell may develop significant internal strain energy. in 1927 Hardy suggested that molecular orientation may be important for living protoplasm. Biochemist R.A. Peters made explicit the link between molecular orientation and liquid crystals. Joseph Needham in 1936 proposed that all properties of protoplasm can be accounted for in terms of

liquid crystals, and later proposed that living systems actually are liquid crystals. Mae Wan Ho refers to these biological liquid crystals as liquid crystalline mesophases.

Metabolism

In the **ecological cycle**, photons absorbed by green plants split water molecules and process carbon dioxide, resulting in the formation of carbohydrates and oxygen. in **respiration** the converse takes place; carbohydrates combine with oxygen (oxidation) to restore carbon dioxide and water. Many cycles and epicycles are coupled to this primary cycle which results in **metabolism** in living systems. In metabolism, energy yielding reactions are always coupled to energy-requiring reactions by the cyclic inter-conversion of ATP and ADP. Worm p. 53.

Microplasts

Fragments of cells that remain alive for many hours. They come in various sizes. The smallest contain about 2% of a cell volume and consist mostly of cortex surrounded by a plasma membrane. Their movements are autonomous, but restricted to the universally observed shape changes such as spreading, attaching, ruffling, blebbing, waving of filopodia etc. Unlike whole cells they cannot move their entire body to another location after they were forced to round up and respread. This procedure destroys all directional properties that might have been left in their bodies from their parental cell. Microplasts cannot restore or create directionality of movement.

Microtubules

One of the 3 cytoskeletal fibers. They have a diameter of 24 nm and appear to be hollow tubes, although there are cases where they are filled with an “unknown” substance. They are composed of two proteins and appear prominently in mitotic spindles. Albrecht-Buehler’s research suggests that they are the 'nerves' of the cells.

Mitochondria

The 'power supplies' of cells. In phase contrast microscopy they appear as squiggly lines. They 'swim' in a snake-like fashion autonomously through the cytoplasm. They divide autonomously because they are the only cellular compartment with its own DNA that, however, that DNA is not a complete genome. Another part of their genome is contained in the cell's nucleus requiring a remarkable level of co-operation between the two.

Molecular Resonance Recognition (MRR) Model

A complex process developed by Veljko Veljkovic and Irena Cosic to demonstrate that specific molecules recognize their particular targets, and vice versa, by electromagnetic resonance. The entire process can be thought of as the interaction between transmitting and receiving antennae of an EM system.

Nuclear Magnetic Resonance NMR

A process that measures the relaxation times of magnetically sensitive atomic nuclei subjected to magnetic fields.

Nucleus

From the point of view of the 'intelligent cell' the nucleus is the main library. It contains the blueprints and instructions that have evolved over one billion years of evolution, which tell the cell how to operate, how to rebuild itself (including its 'nerves' and 'brain') after every cell division, and how to act and interact with other cells as they build and maintain an organism. Topologically speaking, the nucleus is located outside the cell because there is a closed surface between it and the cytoplasm. This surface is not entirely closed, though, because it is pierced by so-called nuclear pore complexes.

Organelle:

A subcellular structure that has one or more specific jobs to perform in the cell.

PCR amplification

Also called Polymerase Chain Reaction amplification. A process by which the test liquid is treated with a thermostable DNA polymerase such as TAQ, then heated to different temperatures for set amounts of time. Each time this heating cycle is repeated, the amount of initial DNA is doubled.

Phonons

Are of two types: low frequency acoustic mode vibrations, which correspond to sound waves in the lattice, and optical Mode Phonons. Optical mode phonons always have some minimum frequency of vibration, even when their wavelength is long. They are called *optical* because in ionic crystals (like sodium chloride) they are excited very easily by infrared radiation.

Photonic crystals

Periodic optical nanostructures that are designed to affect the motion of photons in a similar way that periodicity of a semiconductor crystal affects the motion of electrons/protons). Various forms of photonic crystals have been studied scientifically for the last 100 years. http://en.wikipedia.org/wiki/Photonic_crystal Similar structures have been found in biological tissue whose optical properties are due to second-harmonic generation (SHG) interactions.

http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2818.2002.01081.x/full:

Piezoelectricity

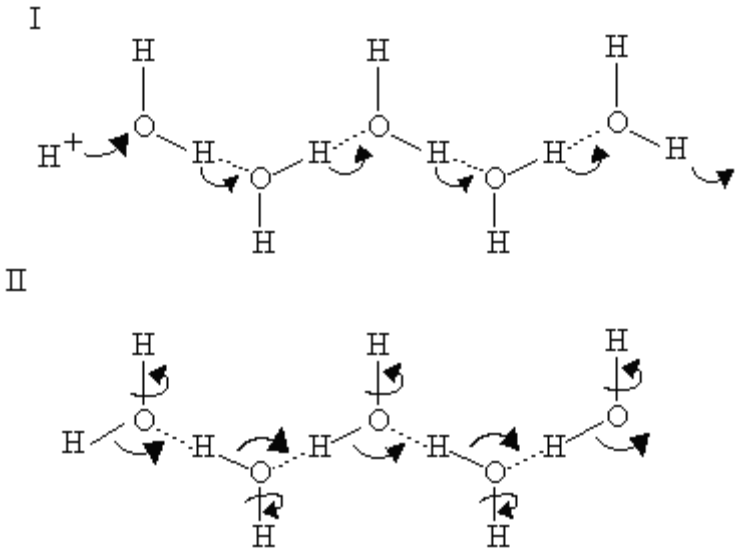
PN junction diodes.

Protein

A molecule composed of a number of amino acids

Proton conduction:

Also called proton jumping, hopping, or H^+ conduction. Water is a good conductor of protons, because of the H-bonded networks between water molecules that give water its liquid properties. Conduction occurs through a "hop-turn" mechanism, first suggested by Grotthuss, and often referred to as the Grotthuss mechanism:



In the "hop" part of the mechanism, a proton first hops from the end of the H-bonded chain to an adjacent group (I, right); transfer of H-bond strength then allows it to be replaced by a H^+ binding at the other end, to give the structure in II. In the "turn" phase, rotation of the waters as shown in II then restores the starting structure (I). In this H-bonded chain, the waters can in principle be replaced by suitable protein side chains with H-bonding potential.

The conduction pathway for protons into the protein is thought to involve channels formed by a chain of bound water molecules and protein side chains.

https://www.life.illinois.edu/crofts/bioph354/lect12.html

Quantum holographic model of brain consciousness

perception involves converting an interference pattern into an image of an object which is coincident with that object. This is accomplished by a process known as phase conjugation whereby the wave reflected from the object is returned by the receiver along its path before me an image for the object is situated. Worm p. 196.

Second Harmonic Generation (SHG)

A nonlinear optical process that occurs at the focal point of a laser beam (Shen, 1989). Second harmonic light emerging from an SHG material is exactly half the wavelength (frequency doubled) of the light entering the material. Second harmonic generation was confirmed in biological tissue in 1986.Since then, SHG has been confirmed in numerous biological structures.

Scientism:

A belief of almost religious fervor that a particular description of phenomena is the one and only truth.

Spectra: spectroscopy, spectrometry

spectrometer

A spectrometer is any instrument that's used to measure the variation of a physical characteristic over a given range, i.e. a spectrum. This could be a mass-to-charge ratio spectrum in a mass spectrometer, the variation of nuclear resonant frequencies in a nuclear magnetic resonance (NMR) spectrometer, or the change in the absorption and emission of light with wavelength in an optical spectrometer. The mass spectrometer, NMR spectrometer and the optical spectrometer are the three most common types of spectrometers found in research labs around the world.

Squeezed light

Squeezed light is an example of a nonclassical light field, i.e., it has no positive singular nonsingular Glauber-Sudarshan P function. The squeezed states exhibit less zero-point fluctuations in one quadrature than predicted by the Heisenberg uncertainty relation, while simultaneously experiencing increased fluctuations in the other quadrature.

Von Neumann Cut:

Point of separation between the observer and observed system: how are biofield interactions connected to brain structure and processes. Where is the observer situated?

Tomography PET/fMRI

Most clinical magnetic resonance imaging (MRI) applications detect their signal from protons, which compose over 90% of nuclei in the human body. The detected protons are either part of water, bound to molecules such as proteins or carbohydrates, or fat.

Wavelet

Fourier transforms provide only frequency information. Wavelets provide both frequency and time information.

Wolff's law

A law or principle that states that a bone responds to stress by growing into whatever shape best meets the demands its owner makes of it. When a bone is bent, one side is compressed and the other is stretched. When it's bent consistently in one direction, extra bone grows to shore up the compressed side, and some is absorbed from the stretched side.