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Case Report

Soliton Pacemaker

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Abstract

A human is not only a purely biological construct but also contains a substrate of biochemical, bioelectronic, computer and cybernetic processes, which are responsible for shaping the psychobiological processes of a human.

Keywords: anatomic heart; biochemical; bioelectronic

Abbreviations Used:

A human is not only a purely biological construct but also contains a substrate of biochemical, bioelectronic, computer and cybernetic processes, which are responsible for shaping the psychobiological processes of a human. The human biological system, apart from the biochemical path, also uses the transfer of information using quantum processes - electromagnetic, acoustic, soliton waves, spin fields and bio-plasma. Human life is not only a matter of biology and biochemistry, it is also a bioelectronic-cybernetic-informational construction, which influences the health, illness and behaviour of a human. This bioelectronic construction creates Homo Electronicus with its electronic personality. The electronic model of life was created based on data from the field of research on the electronic properties of some biological structures (proteins, DNA, RNA, bones, etc.). [Sedlak 1979, p. 169].

Research on electronic properties of biological structures has shown:

- piezoelectricity and pyroelectricity for proteins, collagen, keratin, elastin, and myosin. [Fukada 1974], DNA, [Fukada, Ueda 1971, Fukada Ando 1972. Fukada Hara 1968], [Athenstaedt 1970,1974, 1987].

- phonon emission in organic piezoelectric during electrostriction; [Sedlak1994],According to the concept of Fritz-Albert Popp, the function of DNA is based on a "laser system", which means that DNA generates coherent light. Laser action in DNA is used to create a Bose-Einstein condensate and generate solitons.

The loss of functionality of bioplasma and Bose-Einstein condensate is associated with the loss of continuity of self-awareness, along with the death of the organism. After the death of the body, the information recorded in solitons about perceptual and mental impressions passes to the Galactic Quantum Information located in the Cosmos. In Janusz Sławiński's approach, along with the death of the organism, there is a necrotic emission of light to the Cosmos, which carries with it the entire history of human life from its ontogeny (Sławiński 1990, p. 22).

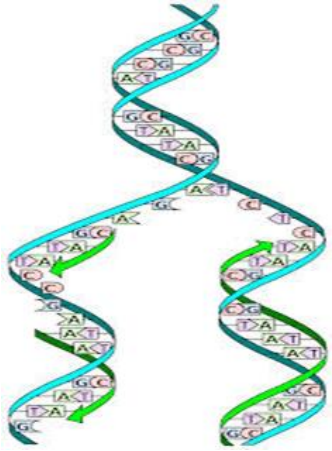


Figure. 1. Anatomical structure of DNA

Figure. 2. Coherent light emission from DNA

The formation of the B-E condensate requires quite special conditions, there must besuperconductivity, a very low temperature, or laser interaction, etc. The condensate integrates the atoms around it into one whole, these atoms move at the same speed and exhibit vibrations of the same frequency. They become one whole and are indistinguishable. Laser waves and a large concentration of atoms in the Bose-Einstein condensate have an impact on the formation of multidimensional solitons. The variety of soliton densities in the Universe is infinite (Lomdahl 1984; Trippenbach, Infeld 2007).

1. Bose-Einstein condensate and soliton generation

It is currently assumed that the basic parameter of nature is phase changes. A phase change is the transition of one phase of a system in thermodynamic equilibrium to another phase. During the phase transition, the substance adopts a new type of structure or acquires new features specific to the new phase, which did not occur before the occurrence of the new phase. The phase transition is associated with a jump change in one or several physical quantities, and often even with a significant change in the physical properties of the system, such as a change in the state of matter, the disappearance of electrical resistance, the appearance of spontaneous magnetization and many other phenomena. (Gonczarek 2004).

Using the example of photons and solitons, we see that the phase, as a specific time-space relationship, determines the degree of coherence and dispersion. When the phase relations disappear to zero, then the relationship and kinship disappear and we say that the phase relations have disappeared and decoherence, diffusion, dispersion, or dephasing have begun. For example, daytime coheres objects in the external environment, which are connected by light from different sources. The lack of light, mainly sunlight, causes the disintegration of the relationship occurring between objects, e.g. at night. In the darkness, the relationship falls apart, the coherence that holds the fragments of reality together into a holistic, meaningful picture is lost (Trąbka 2003, p. 21).

Bioplasma and Bose-Einstein condensate have a significant influence on phase transitions. In Bose-Einstein condensate, quantum processes exhibit great order and a high degree of unity. Particles do not lose their individuality in their entirety. The condensate is described by a single wave function. This means that the entire object has one constant phase. The disappearance of the condensate causes the dephasing of a specific phase structure (Salasnich 204).

Bose-Einstein condensate (BE) also determines the time-space change between the elements of the micro and macro cosmos. The product of BE condensation are solitons and excitons (Trąbka 2003,) (Adamski 2016).

According to Jibu and Yasue, condensates inside and outside the neuronal membrane can weakly connect, forming the so-called Josephson connection. Bias potentials of the biological cell membrane cause self-excited oscillations that excite the Josephson junction to produce solitons along the biological membrane. Soliton waves retain their form over long distances and can propagate to macroscopic dimensions, which may indicate that cellular conduction transmits information via ionic and soliton pathways (Jibu, Yasue 2000). In physics and mathematics, a soliton is understood as a solitary single wave moving alone, and it is assumed that solitons:

- represent a wave with an unchanged shape,

- are localized, i.e. at infinity they tend to zero or a certain constant;

- can strongly interact with other solitons, but after collision, they return to their original shape;

(Matuszewski 2007, p. 6) (Matuszewski et al. 2006).

- shape and velocity do not change with distance travelled and after collisions with other solitons,

only a phase shift occurs (Light Bullet Home Page [online], www.sfu.ca [accessed 2017-11-26).

Solitons are formed in nonlinear optical centres and in Bose-Einstein condensates. Strong laser waves, degree of nonlinearity and high concentration of atoms in the Bose-Einstein condensate influence the formation of multidimensional solitons. Currently, the greatest degree of nonlinearity is achieved by organic substances, in which electrons seem to travel large distances (Brizik 2015).Solitons appear in various physical systems - in light, low-energy plasmas and chemical compounds such as water and protein, and liquid crystals, where their nature is strongly dependent on piezoelectricity and ferroelectricity (Brizik 2002, 1993).

In pyroelectrics, spontaneous polarization occurs in the entire temperature range, up to the melting point. Ferroelectrics are a special case of pyroelectrics, in which spontaneous polarization occurs, in a certain temperature range. All ferroelectrics are characterized by a certain temperature at which the ferroelectric state completely disappears -this is called the phase transition temperature called the Curie temperature (TC), each material has its own transition temperature. Materials exhibit ferroelectricity only below a certain phase transition temperature, and above this temperature they are paraelectric: spontaneous polarization disappears, and the ferroelectric crystal changes to the paraelectric state. Many ferroelectrics completely lose their pyroelectric properties above TC because their paraelectric phase has a centrosymmetric crystal structure. When ferroelectric properties disappear, piezoelectric properties also disappear (Scott, 2013).

Ferroelectrics can be both pyroelectric and piezoelectric, meaning that they can generate electric charges on their surfaces when exposed to temperature changes or mechanical stress. In other words, if a ferroelectric is heated or cooled, or compressed or stretched, an electric charge (voltage) will appear on its surfaces (Tan and Li 2015).

Ferroelectrics can be both pyroelectrics and piezoelectrics, which means that they can generate electric charges on their surfaces under the

influence of temperature changes or mechanical pressure. In other words, if a ferroelectric is heated or cooled, or compressed or stretched, an electric charge (electric voltage) will appear on its surfaces (Tan and Li 2015).

In ferroelectrics, there is a phase transition from an ordered, i.e. polar, to a disordered, i.e. non-polar, also called dielectric. In ferroelectrics, there is a phenomenon of hysteresis, i.e. polarization P of the sample caused by the applied electric field E and depends on the value of polarization that preceded a given state (Krajewski 1970, p. 178).

Ferroelectrics, under the influence of an external electric field, undergo deformation, which is proportional to the square of the field intensity. This phenomenon is called electrostriction, which generates an acoustic wave. All ferroelectrics, except electrostriction, exhibit the piezoelectric effect (Lemanov 2012).

One of the nucleic bases - thymine, is ferroelectric, and therefore piezoelectric and pyroelectric (Bdikin, et al. 2015).

The authors of these studies present the thesis that thymine ferroelectricity can find wide possibilities in creating new bases that are currently unknown and at the same time reconstructing bases occurring in the DNA of the genetic chain. This opens a new path for the use of thymine in the treatment of infectious diseases. All this will be done on a piezoelectric and ferroelectric basis, in which the electric field will play an important role (Guerin et al. 2019).

In the DNA molecule, thymine combines with adenine via two hydrogen bonds, thus stabilizing the composition of the nucleic acid and taking part in pairing and replication. The most important feature of ferroelectrics is polarization, i.e. the binding of Thymine to Adenine by a direct current electric field and the work of solitons (Liu et al. 2013).

Scientists from the University of Washington have studied the ferroelectric properties of the tropoelastin protein (Wise, et al. 2014).

Elastin, as a key protein found in connective tissues, is an important structural component of the lungs, heart and arteries, is ferroelectric (Liu et al. 2012), (Liu et al. 2013), and fulfills important physiological functions in vascular morphogenesis (Brooke 2003), homeostasis and in the regulation of cell functions (Debelle 1999).

It provides the necessary elasticity and resilience to the aorta, lungs, ligaments and skin subjected to repeated mechanical and physiological loads (Mithieux et al. 2013).

Ferroelectric polarization of elastin affects the proliferation and organization of smooth muscle, vessels and contributes to the morphogenesis of arteries (Li, Dy, et al. 1998. (Baldock, et al. 2011).

Li 2002 and Liu 2012 believe that the ferroelectricity of elastin affects the phase switching process and helps elastin maintain its elasticity and functionality in the body. Disruption of this process is expected to have a direct impact on the process of atherosclerosis, hardening of arteries, etc. Ultimately, it would be possible to use ferroelectricity to study the artery wall using a novel imaging technique to detect the earliest stages of the disease. Similarly, heart and lung diseases can be imaged in a way that is currently not possible. Therefore, ferroelectricity is an important biophysical property of proteins, this is the first key step towards establishing its physiological significance and pathological implications. Elastin is an ECM protein present in all connective tissues of vertebrates, providing the necessary elasticity and resilience of the aorta, lungs, ligaments and skin subjected to repeated physiological loads (Bailey 2018). There are solitons of light, water and sound that can strongly interact with other solitons, but after this interaction the form and structure remain unchanged. This means that they penetrate each other without losing their identity (Brizk 2014).

Light, water and sound solitons retain their temporal and spatial features, i.e. geometric and dynamic, and fall within the scope of local processes, while spin solitons fall within the scope of quantum nonlinear processes and are carriers of information fields that affect human psychobiological states (Adamski 2006).

Soliton stimulation requires a sudden change in any variable that can shift the phase transition. These may be voltage pulses (commonly used in electrophysiology), mechanical stimulation, pH drops, temperature decreases or increases, and other sudden stimuli that increase the phase transition temperature (Adamski 2020).

Solitons emit their own electromagnetic field with a characteristic frequency determined by their average velocity. Exposure of the system to an oscillating electromagnetic field with a frequency that coincides with the solitons' own frequency can increase the solitons' own radiation and thus enhance charge transport synchronization, stimulate redox processes and increase coherence in the system. The oscillating electromagnetic field also causes the soliton ratchet phenomenon, i.e. soliton drift in macromolecules in the presence of an unpolarized periodic field. Such additional drift enhances the charge transport processes. It has been shown that temperature facilitates the ratchet drift. In particular, temperature fluctuations lead to a decrease in the critical value of the field intensity and period above which soliton drift occurs. Furthermore, there is a stochastic resonance in the soliton dynamics in external electromagnetic fields. This means that there is a certain optimum temperature at which the soliton drift is maximum (Denschlag et al. 2000), (Bongs, et al. 1999).

Generating an electromagnetic wave or absorbing it by a soliton results in the creation of a continuous medium for conducting and transferring information over a distance (Salasnich , al. 2002), (Salasnich 2004), (Muryshev, et, al. 2002).

The Josephson effect has been observed (Cataliotti et al. 2001), in which interference of condensates can occur, perhaps it is responsible for the coherence of consciousness (Eilenberger 1981), (Poguet, Maugin 1984), (Poguet, Maugin 1985), Denschlag et al. 2000), (Salasnich et al. 2002).

The movement of solitons is influenced by the density and thickness of the biological membrane in the cell, because it determines the size of the piezoelectric effect, from which the electric field flows, which is in interaction with solitons. (Pouget and Maugin 1984).

Solitons densely fill the space of the Universe and bring signals, meanings, conceptual content from space to the human psychosphere. This happens in such a way that in the DNA molecules of the genetic material there is an emission of laser light, which activates helical bioplasmic antennas that pull solitons from space into the interior of the cell, simultaneously into the bioplasm of the biological system. (Lomdahl 1984, p. 134) (Munteanu, Donescu 2004).

The action of solitons in a biological system is presented by many scientific works (Sinkala 2006), (Davydov, 1991), (Brizhik 2002, 2003), which show the functioning of solitons in protein structures and in DNA (Salasnich 2004), (Adamski 2016 a).

Pouget and Maugin showed the action of solitons in ferroelectrics, with electroacoustic interaction, which is conditioned by the piezoelectric phenomenon and electrostriction. They point to the domain structure of the medium, which determines the size and intensity of the soliton wave (Pouget and Maugin 1984). The soliton phenomenon is similar to waves caused by a gust of wind in a grain field, where we see waves running along the field, while the grain itself remains at rest " Solitons are associated with phenomena such as tornadoes, cyclones, tsunamis, water whirlpools, etc. (Petviashvili,, Pokhotelov1992), (Roger, Rottman 2002).

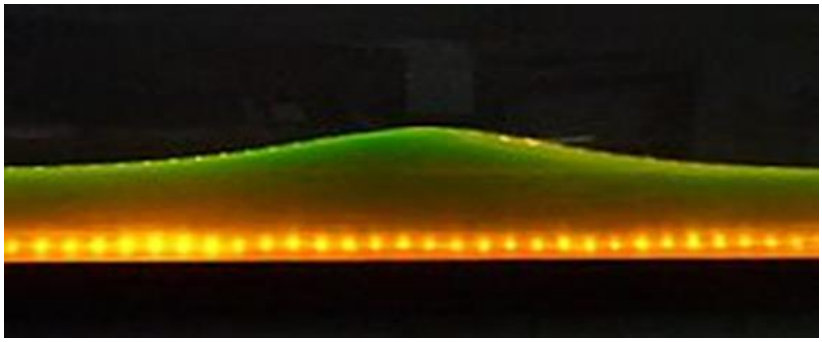


Figure 3: Soliton image for an acoustic wave

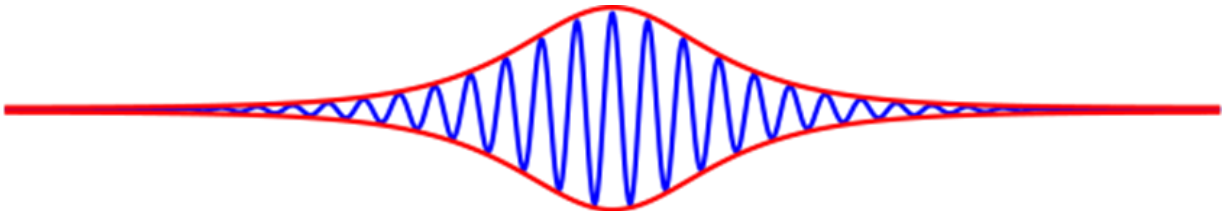


Figure 4: Image of a soliton for a water wave

Photo 4: Formation of solitons during Tornadoes

Photo 5: Huragan Katrina / Fot. NASA

the temperature difference of which is large. The action of solitons is associated with the whirlwind. Similar

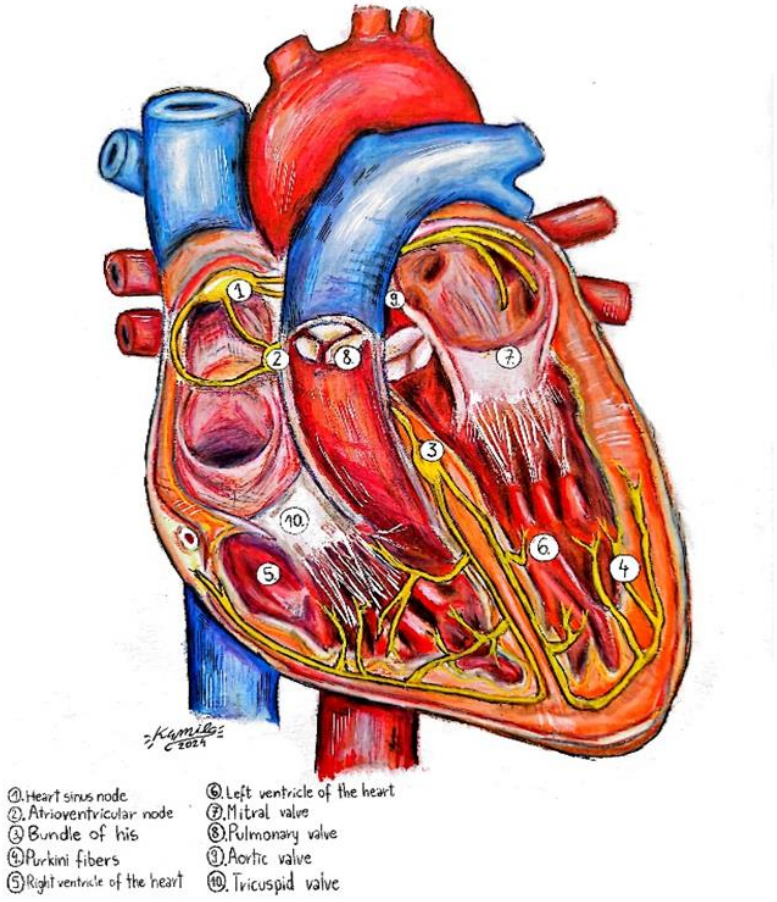
The phenomenon of Solitons occurs at water whirlpools.

With the help of a soliton wave, we can correct the information state of a biological cell. Solitons are a barrier that limits the intensity of the spin wave (Adamski 2020 b).

In living organisms, the spin wave closely cooperates with the soliton wave, which has encoded programs about the proper functioning of the cell and maintaining homeostasis, etc. Solitons can spread without

distortion over very large distances and are the wisdom of the laws of the development of the Universe (Brizik 2015), (Brizik 2017)

1. Conduction system of the heart



Anatomic Heart:

Scientific Artist Kamila Góra

One of the functions of the heart is to pump blood. This is achieved through the process of rhythmic contractions and relaxations of the atria first, and then the heart. All thanks to electrical impulses that stimulate the heart muscle cells to contract. The human heart consists of four parts called chambers, these are:

- the right atrium (which collects blood from the entire body except the lungs),

- the left atrium (4 veins enter it, which collect blood from the lungs),

- the right ventricle,

- the left ventricle;

2. Valves, which do not allow the pumped blood to flow backwards (a heart that works properly pumps blood in one direction);

3. The pericardium (pericardial sac) protects the heart: it secures it in the mediastinum and limits the friction of the moving heart muscle on the neighboring organs (Sawicki 2012).The heart's electrical signal is generated by a tiny structure called the sinus node, which is located in the upper part of the right atrium. It consists of 4 elements:- the sinoatrial node - (SA) (also called the pacemaker): is responsible for the heart rate - it spontaneously generates electrical impulses that cause both atria to contract and then reach the atrioventricular node. The sinoatrial node gives a healthy heart a rhythm of 60 to 100 contractions per minute.

- the atrioventricular node (it makes sure that the atria and ventricles do not contract at the same time, so its task is to slow down the conduction of the electrical impulse).

- the bundle of His and the Purkinje fibers (Longstaff 2012).

From the sinus node, the electrical signal spreads through the right atrium and left atrium, causing both atria to contract and pushing blood into the right and left ventricles. The electrical signal then passes through the AV node to the ventricles, where it causes them to contract in turn. The heart's electrical signal controls the heartbeat in two ways. First, each electrical impulse generates one heartbeat, the number of electrical impulses determining the heart rate. Second, as the electrical signal "spreads" through the heart, it causes the heart muscle to contract in the correct order, coordinating each heartbeat and ensuring that the heart works as efficiently as possible. The heart also has valves in its structure that prevent the pumped blood from flowing backward. A properly working heart pumps blood in one direction. The speed of impulse conduction changes in subsequent sections of the impulse-conduction system. In the sinoatrial node, it is about 1 m/s, and at the ends of the Purkinje fibers it reaches 2 m/s. The impulse propagates the slowest in **the atrioventricular** node - about 0.05 m/s. This slowdown in the impulse speed causes the ventricles to contract later than the atria (Deresiewicz, Mączewski 2010).

Damage to the sinoatrial node causes the activation of secondary stimulation centres. First, the atrioventricular node takes over its role. The

frequency of impulse generation is lower here than in the case of the sinoatrial node (approximately 50 contractions per minute). Next, the structures that stimulate the heart to contract are the Purkinje fibers, and the last center capable of generating an impulse are cardiomyocytes. The frequency of impulse generation by these cells is approximately 30 contractions per minute. The heart rhythm may then deviate from the normal one - then the rhythm may be faster, slower, or irregular (irregular). Such conditions are referred to as cardiac arrhythmias. An important factor is the origin of the rhythm, whether it has the characteristics of a sinus rhythm, or extra sinus rhythm, (atrial or nodal). Abnormalities related to the generation of an inappropriate impulse or disturbances in its transmission lead to arrhythmia (disorders of heart rhythm) or slow heart rate Beręsewicz A, Mączewski M. 2010)

The heart muscle consists of several types of cardiomyocytes

1. The working cardiomyocytes of the heart muscle are composed of two cell nuclei, which gives them the basis for generating light solitons through the Bose-Einstein condensate located in the DNA of these cells. They have ordered myofibrils, the Golgi apparatus reticulum, the endoplasmic and sarcoplasmic reticulum, mitochondria, a cell membrane, and a system of T-tubules.

The working cardiomyocytes constitute about 99% of the heart muscle.

The working cardiomyocytes are ~50% filled with muscle fibers (myofibrils) arranged along the cell. Each fiber consists of serially arranged sarcomeres, which constitute the functional unit of the contractile apparatus**. The main components of the sarcomere are:**

1) thin filaments made of actin protein;

2) thick filaments made of myosin protein, which is also an enzyme that breaks down ATP.

3) Z disks – multi-protein structures in which thin filaments are anchored;

4) sarcomere support proteins, including titin protein.

Titin performs several functions:

The process of binding myosin to elastin takes place, which is influenced by the electric field resulting from the piezoelectricity and ferroelectricity of these proteins.

1) Stabilizes their position in the sarcomere; This happens thanks to solitons,

2) It is partly responsible for the increase in contraction force, ensures optimal positioning of actin and myosin filaments, and at the same time stretches the elastin segment. The tension created in it, which dynamizes cell contraction. The joint action of the electric field and solitons.

3) Takes part in the so-called passive phase of relaxation (active relaxation is associated with energy-consuming elimination of Ca2+ from the cytoplasm. After contraction, when as a result of a decrease in Ca2+ concentration, the myosin heads detach from the actin filament, the sarcomere returns to its pre-contraction length thanks to the energy stored in the elastic domain of the titin molecule; Dephasing feroelectric, it loss of the electric field, which leads to the loss of electrostriction and relaxation of the heart. During contraction, the task of the electric field is to generate electrostriction in protein structures that affect the dynamic contraction of the heart chamber. The task of solitons is to control the heart rhythm and in such a healthy heart it gives a rhythm of 60 to 100 contractions per minute. The heart contracts on average about 72 times per minute.

2. P cells - round cells, practically devoid of contractile elements, with the ability to spontaneously generate an action potential and ensure the automatism of the heart muscle.

3. Purkinje cells – elongated cells of relatively large diameter, ensuring rapid, non-extinguishing and synchronous conduction of excitation to working cardiomyocytes. Purkinje cells are characterized by automaticity, but it is less pronounced in comparison to P cells.

4. Transitional cardiomyocytes, T cells (transitional) are located between the cells of the conduction system and working cardiomyocytes. 5. Secretory cardiomyocytes are located mainly in the atria of the heart. These cells secrete a hormone–atrial natriuretic peptide (ANP), which takes part in regulating the volume of circulating blood and, consequently, blood pressure. All types of cardiomyocytes are highly differentiated. Cardiomyocytes proliferate in the fetal period, after birth (around day 3). (Mackiewicz 2010).

The phenomena occurring in the heart from the beginning of one contraction to the beginning of the next are called the hemodynamic cycle of the heart, or the cardiac cycle, in which the following are distinguished:

1) the diastolic phase – the aortic and pulmonary valves are closed, and the atrioventricular valves are open. Blood flows out according to the pressure gradient from the veins through the atria to the ventricles, initially quickly (the period of rapid ventricular filling), then more slowly (the period of slow ventricular filling), and finally the atrial contraction. The increase in blood volume in the ventricles is accompanied by a small increase in ventricular pressure and stretching of the ventricular walls, which activates the Frank-Starling mechanism. During the stretching of the ventricular walls, piezoelectric polarization of the protein structures occurs, and with it the generation of an electric field becomes a carrier for solitons.

2) contraction phase – electrical stimulation of heart cells triggers ventricular contraction (QRS complex in ECG). The pressure in the ventricles increases and the atrioventricular valves close, this is the first heart pulse. The pressure in the ventricles continues to increase rapidly with unchanged ventricular volume (isovolumetric contraction phase) and becomes equal to the pressure in the aorta and pulmonary artery, respectively. After the aortic and pulmonary artery valves open, blood is ejected into the aorta and pulmonary artery (ejection phase). Then the heart cells repolarize (T wave in ECG), the ventricular muscle relaxes and the pressure in the ventricles drops to a value below the pressure in the large arteries. After the aortic and pulmonary artery valves close (second heart sound), the isovolumetric relaxation phase occurs. When the pressure in the ventricles drops below the pressure in the atria, the atrioventricular valves open and another cardiac cycle begins. When listening to the heart, these phenomena are heard as heart murmurs, which we call heart sounds. The first sound, the systolic sound, comes mainly from the contracting ventricles, the second sound is caused by the backflow of blood hitting the closed valves: the aortic valve and the pulmonary trunk. This entire process is driven by water and acoustic solitons. Solitons are generated in the human biological system in various ways. Soliton stimulation requires a sudden change in any variable that can shift the temperature transition through the phase transition. The stimulation threshold is proportional to the distance between the physiological temperature and the membrane temperature and corresponds to the critical free energy of stimulation (Adamski 2020 a).

These may be voltage pulses (commonly used in electrophysiology), mechanical stimulation, pH drops, temperature drops and other sudden stimuli that increase the phase transition temperature. None of these changes are taken into account in the voltage pulses of the heart (Adamski 2020 b).

The conduction velocity of the impulse changes in subsequent sections of the stimulus-conduction system. In the sinoatrial node, it is about 1 m/s, and at the ends of the Purkinje fibers it reaches 2 m/s. The impulse propagates the slowest in the atrioventricular node - about 0.05 m/s. This slowdown in the impulse velocity causes the ventricles to contract later than the atria. In the human biological system, the ejection of blood from the heart into the main artery causes an increase in pressure and

constitutes a shock wave. This wave becomes a generator of solitons, which propagate throughout the body and are a measure of health and disease in humans. The heart rate allows us to assess the state of the circulatory system, it shows us how fast the heart pumps blood to all the organs of the body. It depends mainly on two factors - the heartbeat, which pumps blood into the arteries and the condition of the blood vessels. The correct heart rate should be consistent with the heartbeat, symmetrical and regular (Kołodzińska et al. 2022)

It should be assumed that during the ejection fraction of blood in the heart, water and acoustic solitons are generated.

The working heart, through the regular ejection of blood from the ventricles, forces the creation of a pulsating movement of the walls of the arteries, which become a generator of water solitons. Blood pressure is generated by the work of the heart muscle and the expansion and contraction of blood vessels. Its height depends on the force with which the blood presses on the walls of the vessels. Blood pressure is the force of pressure that the flowing blood exerts on the walls of the blood vessels. This process affects the generation of the size of the soliton and determines its speed, which depends on the amplitude.

Alternating contractions and relaxations of the atria and ventricles cause changes in blood pressure in them, and this is the cause of blood flow through the heart. Changes in blood pressure are also the cause of the opening and closing of valves. The sound generated during this is heard as a heartbeat - heart tones. **Closing and opening of valves is the main source of acoustic soliton generation.**

Damage to the sinoatrial node causes the activation of secondary stimulation centers. First, the atrioventricular node takes over its role. The frequency of impulse generation is lower than in the case of the sinoatrial node (about 50 contractions per minute). Next, the structures that stimulate the heart to contract are the Purkinje fibers, and the last center capable of generating an impulse are cardiomyocytes. The frequency of impulse generation by these cells is about 30 contractions per minute. The heart rhythm may then deviate from the normal one - then the rhythm may be faster, slower, or irregular (irregular). Such conditions are called cardiac arrhythmias. An important factor is the origin of the rhythm, whether it has features of sinus rhythm, extra-sinus rhythm, (atrial or nodal) (Jaunszewska, Pawłowska 2014.)

Abnormalities related to the creation of an inappropriate impulse or to disorders of its transmission lead to arrhythmia (heart rhythm disturbance) or slow heart rate(Beręsewicz, Mączewski 2010). Tendon cords, especially in children, can cause turbulent blood flow generating an innocent systolic murmur. Turbulent blood flow generates a systolic murmur, a typical soliton phenomenon based on water eddies, often found in rivers.

The first and at the same time the highest level of the stimulus-generating system is the sinoatrial node, here the atria are stimulated first. The stimulus continues down into the ventricle, reaching the atrioventricular node and bundle (the so-called AV junction) first, and only then the working muscle of the ventricles. Therefore, the ventricles contract last of all the structures of the heart. This gives the correct sequence of atrial and ventricular contractions. To sum up, the depolarization path in the heart looks like this:

1 sinoatrial node,

2 working muscle of the atria,

3 atrioventricular node,

4 atrioventricular bundle,

5 atrioventricular bundle branches,

6 Purkinje fibers,

7 working muscle of the ventricles (Gołąb 2014).

He authors of the paper believe that this entire process is driven by soliton phenomena.

Ferroelectric switching may help to suppress increased pulsatile flow and blood pressure in arteries to reduce distal pulse stress. Elastin polarization may also help regulate vascular smooth muscle proliferation and organization and contribute to arterial morphogenesis (Li et al. 1998).

Aberrant impulse generation or conduction abnormalities lead to arrhythmia (heart rhythm disturbance) or slow heart rate

• **Atrial fibrillation (AF)** – caused by a disruption of the electrical messages that normally cause the heart muscle to contract. In AF, the atria beat very rapidly and are uncoordinated. This can cause blood flow around the atrium to become "turbulent" and the heart to become less efficient at pumping blood. AF can cause palpitations and increase the risk of blood clots forming, which can increase the risk of stroke.

• **Ventricular premature beats (VPB)** – this is an extra heart beat that occurs when electrical impulses start in one of the ventricles and contract before they receive the normal signal from the atria.

• **Ventricular tachycardia (VT) – VT** starts because of abnormal electrical activity in the ventricles, where the heart contracts abnormally quickly (over 100 beats per minute). This can lead to loss of consciousness.

• **Ventricular fibrillation (VF)** – the ventricles contract uncoordinated and instead of contracting normally, they "quiver", blood is not pumped out of the heart effectively. This is a life-threatening condition and requires urgent treatment with a defibrillator (Demczyszak 2006).

• Heart block – when the normal electrical activity that controls the heartbeat slows or stops and the heart cannot communicate normally. Heart block may require a pacemaker if the heart is unable to maintain a normal rhythm.

• Sudden cardiac death (SCD) – can happen due to dangerous arrhythmias such as ventricular fibrillation (VF), where the contraction of the ventricles is uncoordinated and instead of contracting normally, the ventricle "quivers" so blood is not pumped out of the heart effectively. If VF is not controlled (using a defibrillator to restore a normal heart rhythm), it can cause the heart to stop beating (Świątecka, Kornacewicz-Jach 2007).

Conclusion

One of the essential components of the cytoskeleton are microtubules, the existence of which has been found in all living cells. Hameroff and Watt (1982) believe that microtubules, together with other bio-structural components, form a bioelectronic junction system, the main task of which is to process energy (e.g. piezoelectric, pyroelectric transduction) and transmit intracellular and intercellular signals (electron and proton streams, agitation and polarization waves, visible and infrared radiation), and at the same time to store information. The fact that microtubules store information is evidenced by the fact that they exhibit the ability to remember. Microtubules are considered by some authors to be biomolecular automata and nano - computers (Hameroff, Rasmussen 1989 p. 253).

Biological systems have a network of molecular pyroelectrics, piezoelectrics and semiconductors, which functions as a medium for the conversion of mechanical, thermal, electromagnetic and chemical energy into electrical energy. Every living organism has acquired piezoelectric, pyroelectric and semiconductor properties, which are necessary for the generation of bioelectronic processes necessary for the functioning of the organism. These processes occur throughout the organism but are particularly visible in the cardiovascular and musculoskeletal systems.

Solitons are associated with phenomena such as tornadoes, cyclones, tsunamis, whirlpools, etc. (Petviashvili,, Pokhotelov1992), (Roger, Rottman 2002).

Similarly, it can be assumed that a similar mechanism for generating water and acoustic solitons occurs in the work of the heart. The situation is no different with light solitons, which require a Bose-Einstein condensate to exist. The cell nucleus is prepared for this, and in it DNA, which generates laser light necessary for the creation of the Bose-Einstein Condensate.

Science shows that the human biological system creates the structure of the image of the world not only based on the electromagnetic and acoustic waves received by the senses but also based on the soliton, spin wave and bio-plasma. This is a new face of knowledge for psychology, medicine and philosophy, which can be directed to new, previously unknown research.

It can be concluded that we are dealing with a second centre that creates the structure of the image of the world and is responsible for the development of personality health and disease in humans. This provides a basis for accepting the conclusion that the existence of solitons is necessary to maintain the coherence of the system and create the structural and dynamic stability of the biological system.

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