How the biofield is created by DNA resonance

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Abstract

Although there is plenty of evidence for the existence of the biofield, the evidence that DNA interacts with it is very limited. Therefore, the idea that the biofield is created by the mass of DNA in the organism remains a hypothesis. We will first briefly summarize the existing evidence and then briefly review our studies, in which we used computational genomics to reveal the traces of resonance signaling in the genome and provided statistical evidence for this resonance signaling.

The idea of the biofield is ancient. Indian yoga teaches about prana as life energy and chakras as centers of resonant vibration. Traditional Chinese medicine teaches about the meridians, which work as conduits of information, and herbal medicine for balancing the energies. Yoga and Chi-Gong teach the art of mastering the energies and redirecting them. Chi-Gong practitioners use body movements to send and direct the biofield energy through the air.

Brief history of biofield research

Scientific biological experimentation with biofields ran in parallel with the development of electromagnetic science. Franz Mesmer called it "animal magnetism". In his experiments, water and plants were charged by him with magnetism, and hypnotized (mesmerized) people were able to detect the presence of this energy [1,2]. The chemist Jöns Jakob Berzelius proposed in the early 19th century that a regulative force exists within and maintains the functions of living matter [3]. A widely used physiology textbook of the 19th century by Johannes Peter Müller [4] taught that the presence of a soul makes each organism an indivisible whole and that the behavior of light and sound waves showed that living organisms possessed a life-energy unexplainable by physical laws. The concept of biofield was introduced by the experimental biologist and metaphysicist Hans Driesch. In 1892, Driesch proposed the field properties of organisms as a conclusion of his experiments with fertilized sea urchin eggs [5]. In the early 1920s, Alexander Gurwitsch, Hans Spemann, and Paul Weiss independently postulated the idea of "morphogenetic fields" that guide the organism's development [5]. This was experimentally proven by Gurwitsch and others [6–8]. Modern experiments demonstrated biological information can travel through the air [9–12]. Burlakov demonstrated that biological systems can strongly affect embryo development and that by manipulating the biofield it is possible to produce developmental abnormalities in fish embryos, causing them to develop extra heads and tails [13,14]. The effects of the biofield on embryos on each other were reproduced technologically - and the fields were produced by a device that caused similar developmental abnormalities in fish embryos [13,14].

DNA as a source of the biofield

We (RAM) proposed the idea that the mass of the DNA of the organism is a source of the biofield 46 years ago (Miller et al., 1975; Miller and Webb, 1973). This idea makes a lot of sense. All of the genetic information about an organism is located in DNA. The genome is a complex instruction, 3.2 billion bases long, located in every cell of the body except red blood cells. DNA is one of the most harmoniously structured biomolecules; it comprises a substantial amount of the body. An average adult body contains about 300 grams of DNA or 0.3% of the body weight. Since we already know that the biofield exists, it makes much sense that it should be directly defined by the genome of each cell and for the genomes of all cells to communicate with each other

through it. This would also be in line with the hypothesis of Gurwitsch, suggesting that the genome creates the biofield and uses it to guide the development and homeostasis of the organism.

As we mentioned, the evidence for the involvement of DNA in the creation of the biofield is very limited. Although experiments that need to be done are quite feasible and inexpensive, they have been traditionally stigmatized by mainstream science in part because biofield therapy undermines the value of pharmaceuticals. Experiments that would prove the involvement of DNA and the biofield are pretty basic. They would involve manipulation of the DNA sequence, spectroscopic studies, and cell culture studies in model organisms. The experiments of Gurwitsch and Burlakov about the effects of the biofield on embryo development should be reproduced and the role of DNA in these effects should be tested. Specifically, we need to demonstrate that biofields affect the chromatin structure of DNA and, inversely, that modifications of DNA produce the changes in biofields. Towards that goal, we and others have previously demonstrated that specific frequencies of weak nonthermal radiations of electromagnetic waves change gene expression [15]. We have also found that electromagnetic radiation with specific wavelengths protects DNA from damage in cell culture (not yet published). Yet, much more remains to be done to demonstrate the role of DNA in the creation of the biofield.

The main challenge is that the resonance language of DNA is still not deciphered. We find it very unlikely that frequencies by themselves carry information. We believe that, as it is in technological communications, certain frequencies serve the role of carrying waves, and the information in the biofield is transmitted through the modulation, shape, and interference patterns of electromagnetic waves. In addition, as we discuss below, we believe it is possible that DNA transmits information through other types of waves and structures.

Our computational studies of DNA resonance

We will now review our results on the computational tracing of resonance signaling in the genome. Our research starts from a series of conjectures, but then it comes to testable hypotheses, the testing of which produces substantial evidence. The human genome was sequenced 20 years ago. By now, the complete genomes of 5,300 animal and 1,500 plant genomes have been sequenced [16] and much of the functional genomic data have been accumulated. By conditions of academic grants, the researchers are obligated to upload their genomic data into public databases. So, the amount of useful genomic information is exceptional. A large number of large genetic studies have been accomplished in the last 25 years, including studies for psychiatric, neurological, metabolic, and other genetic disorders. With all this achievement, much is still unknown and this causes disappointment among funding organizations, the researchers, and the public because even with all this powerful data, many questions remain unanswered and many therapies are still not possible. For example, there is no cure for cancer, AIDS, MRSA, and many other infections, arthritis, autoimmune and psychiatric disorders. Existing drugs often don't use the vast genomic information and are still selected by chemical trial and error. We view this to be a result of the limitation of mechano-chemical materialistic scientific dogma. Mainstream scientists refuse to accept already proven results on biofield and stigmatize research in biofield and bioresonance therapies. Although the ideas of DNA resonance introduced by us 46 years ago [17,18] are embraced by some of the public, they remain prohibited and largely unknown to mainstream scientists. One of the main mistakes of mainstream science is the failure to adequately research the function of so-called junk DNA.

Noncoding 99% of the genome

The initial publication of the human genome 20 years ago demonstrated that protein-coding sequences comprise only 1% of the genome but there is an additional 2% of the genome that are noncoding but highly conserved (as is the coding 1%), suggesting that these sequences are functionally significant. Yet, mainstream science almost exclusively focused on the coding part of the genome, ignoring the vast 99% of the noncoding part of the genome. The ENCODE project initially was able to publish the evidence for the importance of noncoding parts of the genome [19], but then this work was criticized by the more conservative side of the mainstream science [20] and thus the funding for the research of noncoding parts of the genome was slowed down [21]. We reason that these functional noncoding sequences may function as resonators, antennas, and electronic circuits in natural DNA resonance signaling. This is in agreement with the experimental results

published by us and others that light affects gene expression [15,22]. Also, our yet unpublished experiments demonstrate that pretreatment of cultured mouse fibroblasts with certain wavelengths of the low power millimeter waves protects DNA from damage by subsequent treatment with UV light.

The model

Our model of the genomic biofield is based on thorough literature research, discussions with biophysics researchers, laboratory experiments, and on our own abilities to perceive biofields. Each author of this chapter is trained in the Eastern healing energy arts. RAM and MMR taught the subject and have published books on the topic. Here we describe the current version of our genomic biofield model. Currently, it is largely hypothetical. We found some supporting evidence for it, but more research is needed to verify and prove it.

Electron and proton chains

Every cell in our body except red blood cells contains two copies of the genome. The genome sequence consists of 3.2 billion basepairs A-T and G-C. Each basepair oscillates between its tautomeric states [23] with an estimated frequency in the megahertz-terahertz range. GC basepairs oscillate between three tautomeric forms and AT basepairs oscillate between two tautomeric forms. Each purine (A or G) of the basepair contains an aromatic ring. In the tautomeric oscillations, the aromatic ring oscillates between the aromatic and non-aromatic states. The GC basepairs exist in a predominantly nonaromatic state and switch to an aromatic state in short pulses. AT basepairs, on the other hand, exist predominantly in an aromatic state and switch to nonaromatic states in short pulses. Stretches of purines (like for example, AAAAAAA or AGAGAGAG) are frequent in the genome. Aromatic rings in purine stretches are united in one system and their electrons delocalize along the entire stretch. Oscillations of electrons in purine stretches are coordinated and thus formed aromatic electron chains are among the main oscillators in the genome. While stacks of aromatic electron chains of purine stretches are negatively charged, there are also oscillations of proton chains that are positively charged. These proton chains are longer on average than electron chains made of stacked aromatic rings and are formed by longitudinal hydrogen bonds.

In contrast to classical transverse hydrogen bonds, which have been well-known since the discovery of the double helix, longitudinal hydrogen bones have been described, but are not well-known [24]. We have developed an algorithm that predicts the structure of longitudinal hydrogen bonds in DNA and demonstrated that repetitive elements (called HIDERs) containing stretches of longitudinal hydrogen bonds are enriched by evolution and conserved in evolution [25]. Therefore, the chains of protons are also defined by the DNA sequence and are frequent in a genome. The hydrogen bond protons are partly delocalized along these chains. We believe that these proton chains are a second major type of oscillators in a genome alongside the aromatic electron chains. The oscillations of electron chains and proton chains in DNA are coordinated between each other. This coordination is must be complex since protons are 800 times heavier than electrons. These oscillations are likely fueled in part by thermal motion. Importantly, the oscillations of charges within the base stack are insulated from surrounding water by the hydrophobicity of the base stack and highly charged sugar-phosphate backbone. Due to this insulation, the oscillations of electric charges in DNA don't necessarily lead to the mechanical oscillations in DNA and this may be protected from being dumped by the viscosity of the nucleoplasm.

Therefore, according to our model, the genome contains a large number of electron and proton chain oscillators. These oscillators are interconnected into one computer-like system by the conductivity of DNA. The conductivity of DNA was experimentally demonstrated and quite well-studied in the early 2000s [26,27]. It has been demonstrated experimentally that DNA is highly conductive, has little or no resistance to electric current, and the base stack of DNA works as an insulated wire, ensuring that charges do not escape from the base stack.

DNA resonances in chromatin

Based on our molecular models of charge oscillations, we observed that DNA methylation, the epigenetic markup language in eukaryotes, doesn't block the resonances but likely affects their frequencies. The DNA in

our cells is packed in a complex chromatin structure. In each cell nucleus, the double-stranded DNA is coiled into 30 million nucleosomes made of histone proteins. Each nucleosome is shaped like a short spindle of hockey puck proportions. In nucleosomes, the negative charge of the DNA is balanced by the positive charge of the proteins of the core nucleosome particle. These nucleosome DNA protein complexes are highly organized and likely serve as units of oscillations as well. Nucleosomes are very mobile, they roll along the DNA strand. We believe that nucleosomes might read the resonance code of DNA while rolling along the DNA strand. To illustrate the idea, consider videotape players which were popular around the 1980s. The videotape was positioned at an angle and coiled around a spinning hockey puck-shaped reading head. The head rolled through the tape, inducing electrical oscillations in the tape, and retrieving the information stored in the tape. This is pretty much how we envision reading of resonance patterns by nucleosomes: DNA is wrapped around nucleosomes in a very similar fashion to the reading head and the videotape player (except that videotape makes 0.5 turns around the reading head, while DNA makes 1.7 turns around nucleosome). As the nucleosome rolls through DNA, it reads the resonance information from it and converts it to acoustic signals that it broadcasts to the nucleoplasm. Since there is a large number of nucleosomes in the nucleus (30 million), they collectively create a moving sound pattern, which directs the work of the cell and controls the movement and function of proteins. In other words, nucleosomes play a symphony using DNA as sheet music, and proteins dance to this music. The principle of using sound to direct biological processes is known as cymatics [28]. Sonotherapy is known from ancient times and recently was revived [29]. We believe that sound oscillations created by multiple cells direct the process of embryogenesis.

DNA resonances in the body

In addition to sound signals that are produced by the cells, there are also electrical signals, electrical oscillations, voltage oscillations, and electromagnetic waves that are exchanged between the cells. The tissues of the body are connected into a unified fiberoptic network provided by fascia tissue. This network is known from ancient times as traditional Chinese meridians. The extracellular matrix contains protein filaments that work as fiberoptic guides. They collect information from the outside of the cell membrane and direct it into the unified fiberoptic network of the fascia tissue.

This fiberoptic network is directly connected to our brain and is part of our mind. DNA of the whole body is directly involved in the thinking process. This way, a well-known thinking process that goes through the electrical neuronal firings is supplemented by a faster and more complex fiberoptic network thinking process. The electrical neuron firing component is responsible primarily for the control of movement, sensation, and communication. The fiberoptic component is responsible for the thoughts, intuition, and nonlocal communication of the brain.

Resonances in noncoding DNA

Only 3% of our genome is coding for the protein. The rest is termed “junk” DNA. It’s puzzling for materialist scientists why the genome contains so much noncoding DNA. Especially puzzling for them is the fact that a large portion of noncoding DNA is conserved in evolution indicating that it is functional. We believe that noncoding DNA is responsible for resonance signaling and it is a biocomputer. It performs computational and coordination functions responsible for the control of development and metabolism of the organism.

Resonances of repetitive elements

Over 50% of our genome is represented by highly repetitive sequences. Some of the repetitive sequences are tandem repeats. In tandem repeats, short sequence units are repeated periodically as wagons in a train. Other repetitive elements are interspersed repeats, which are scattered around the genome without any perceivable order. The Alu element is the most abundant and most interesting of the repetitive elements. It belongs to the category of interspersed repeats. There are over 1.1 million copies of the Alu element in the genome. Alu sequence is unique to primates. Other species have Alu-like elements but they differ substantially in sequence. The DNA string of the Alu element coils around almost two nucleosomes: one complete nucleosome and a part of another nucleosome. The Alu element is also bound by a special protein called an Alu-binding factor. Alu elements are enriched in gene promoters, and minor variations in Alu element sequences are responsible for

variations in gene activity. We believe that Alu elements are the "control elements" predicted by Barbara McClintock 70 years ago. We believe that Alu elements receive the wave information and convert it into biological information by controlling gene expression. Also, since Alu elements are unique to primates, it's likely that it is the main DNA sequence that makes us human and that they are responsible for the abilities of our mind. We also think that Alu elements may function as memory units of our mind. Although 1.1 million Alu elements per genome (2.2 million per cell) are similar in sequence, patterns of their methylation vary. Since methylation patterns are stable for years, Alu elements could serve as long-term memory units of our mind.

As we showed previously [23], each basepair is working as a logical unit switching between intuitive and choice-making states. In the process, it turns on and off the aromaticity of the purine aromatic ring. Multiple basepairs share protons and electrons in an organized discrete fashion, thus coordinating and making interdependent tautomeric oscillations in different basepairs. An Alu element contains 300 basepairs and this makes it a minicomputer. Since the Alu element occurs 2.2 million times per cell and occupies about 10% of the genome, it's likely that it is responsible for a large portion of the cell's computation.

Several other interspersed repetitive elements likely have unique vibrational properties and functions. The seemingly random localization of the repetitive elements in the genome is likely nonrandom. The repetitive elements are likely the words in a highly organized text of the genome, and the combinations of the repetitive elements make sentences. Local groups of repetitive elements likely serve as vibrational units performing a specific function and having a specific logic.

Genes in a genome are written sequentially. The gene has a beginning and is read from the beginning to the end. However, the vibrational information doesn't have to be read from the beginning to the end. The whole genome could be vibrating at once and be read as a holographic record [18].

Coordination of chromatin dynamics

As mentioned above, chromatin is highly mobile in living cells. When a gene is expressed, a piece of DNA containing the gene is unwrapped, and when the expression is over, it is compacted back to its original location. The genome is stored in chromosomes and each chromosome is a separate macromolecule. We believe that each chromosome has its unique set of frequencies.

Each chromosome is located in a specific chromosomal territory occupying a part of the nucleus [30]. Movements of the parts of the chromosome are highly coordinated. We believe that DNA moves by itself by using nucleosomes as acoustic propellers. The nucleosome, which is a complex of DNA and protein, creates vibrations which propel the nucleosome in a specific direction within the chromosomal territory. The nucleosomes or groups of nucleosomes might be sensing their position in the nucleus via vibrations and coordinate their movements using this vibrational information. The nucleosome might serve as an interface between the vibration in the DNA and the biochemistry of the cell. We believe that the nucleosome converts the DNA sequence information into the vibrations which are sent outside into the nucleoplasm and vice versa: the nucleosome may receive the vibrations from the nucleoplasm and direct it into the DNA, thus modifying the pattern of its oscillations.

We believe that collectively, the genome within the nucleus directs the work of the cell, it creates a field that coordinates the locations and the movements of the macromolecular complexes and similarly, the totality of the DNA (300 g) of an organism creates the field which coordinates the growth and the health of the organism.

Experiments needed to test the DNA resonance hypothesis

The above model is based on a series of conjectures. It is a hypothesis that requires extensive verification and all of its components should be experimentally verified. A typical experiment would require discovering and recording the fields and frequencies produced by the genome, reproducing them, and demonstrating that these frequencies and fields are responsible for the biologic effect. In order to prove that these fields are produced by the genome, manipulation of the DNA sequence is required. Also, this manipulation is needed to decipher and read the vibrational language (code) of the genome.

Genetics and genome manipulations already firmly established that that genomic sequence defines the shape, physiology, and behavioral qualities of the individual. Yet, the current inability of science to decipher the 99%-noncoding part of the genome doesn't yet allow scientists to predict the shape, physiological, and behavioral qualities of the individual. Nonetheless, even without understanding the vibrational code of the genome, the emerging field of personalized medicine is now developing algorithms for this purpose based on the empirical associations of genomic variations (SNPs) with health and behavior. This has now become possible due to the availability of high throughput genotyping and vast electronic medical records. Understanding the vibrational code of the DNA would greatly facilitate this development. Once the vibrational code of the genome is understood, the sequence of the genome of a person would allow recreating the photograph, health, and behavioral profile of the person, or more precisely, to the extent in which these qualities which are defined genetically, and this genetic component for many qualities is over 50%.

The initial experiments for deciphering the vibrational code of DNA may start from spectroscopic studies of natural DNA in physiological conditions. By manipulating the sequence of the DNA, it should be possible to demonstrate that its vibrational properties change when its sequence is changed. This set of basic experiments will be the key to deciphering the resonance code of the genome. Spectroscopic studies of reconstituted nucleosomes are likely to demonstrate their functions as vibrational units. These are basic experiments that need to be done for the verification of the DNA resonance model.

Although the experimental verification of the model remains to be done, we were able to confirm some of its basic statements using computational genomics. Computational genomics is cheaper and faster than experimental research.

Our computational results on DNA resonance

Many academic funding sources require that scientists upload their experimental genomics data into public databases. So, the deciphering of the resonance code of the genome can be started and did start from using the public data.

Based on the resonance model, we approached the genomic sequence as a program that contains resonating elements. We assumed that the main resonating elements of the genome are repetitive sequences, but we also assumed that there must be some resonating elements among the nonrepetitive unique parts of the genome. Here, we utilized the principle of redundancy. The principle of redundancy is known from the genetic code, which is partly redundant: the same aminoacid is often coded by different triplets. For example, Tryptophan aminoacid is coded by AGA, ACC, ACA, and ACG triplets. We assumed that in the resonance code, it is also possible that multiple nucleotide sequences could code for the same resonating structure. For example, purines A and G are strikingly similar to each other. Similarly, pyrimidines C and T are also similar to each other. Since purines A and G contain the aromatic ring in the same position, we assumed that the basic resonating structure made out of purine rings depends only on the purine/pyrimidine structure and would be independent of the specific nucleotides that compose this structure. For example, the sequence GTGT would resonate with the sequence ATAT because A and G are purines with a similar chemical structure and have similar positioning of the aromatic ring. Therefore, we formulated the concept of HIDERs (Homologous If Decoded Elements Repetitive). A HIDER is a special kind of repetitive elements. Sequence fragments are called "purine HIDERs" if they have a different primary sequence (comprised of A, G, C, and T letters) but have an identical purine sequence (comprised of R and Y letters). In physical terms, HIDERs are resonating sequences that vary in outside appearance but have similar forms of their resonators (antennas). To illustrate this, consider smartphones. They vary in their appearance but their antennas (located inside) are tuned to the same carrying frequency allowing them to connect to the same network.

Next, we explored the possibility that our genome might be enriched with HIDERs, especially in functionally important regions. We did a computational search for purine HIDERs in the genomes of various organisms and found that purine HIDERs are enriched by evolution with high statistical significance and also are located in conserved areas of the genome. This gave support to our resonance model and pointed to the functional significance of HIDERs since evolutionary conservation is a sign of function.

In addition to delocalized electron chains, we investigated the delocalized proton chains in DNA. Based on molecular structure, predicted the existence of longitudinal hydrogen bonds in the DNA and the existence of delocalized proton chains created by hydrogen bonds [25]. We formalized the algorithm by which the DNA sequence can be converted into the sequence of the hydrogen bonds and formulated the idea of proton HIDERs. Proton HIDERs are defined as two DNA sequences that differ in the primary DNA code and have a common sequence of hydrogen bonds. We have screened genomes of multiple species using this algorithm and demonstrated that proton HIDERs are strongly enriched by evolution and are located in the conserved areas of the genome, suggesting their functional importance.

Typically, sequence elements located in transcription start sites control gene expression by modifying the chromatin structure near the transcription start. We observed that proton HIDERs are colocalized with gene transcription start sites with high statistical significance, suggesting that they are involved in gene regulation. Most likely, HIDERs located near the transcription start receive vibrational resonance signals at a distance and convert this vibrational information into biochemical information by controlling gene expression. The reverse information flow should be also considered. The resonance elements located in transcription starts will receive biochemical information from the gene expression and convert it into vibrational information and transmit this vibrationally at over a distance. This way, the computational genomics approach provided support for our model of DNA resonance signaling.

DISCUSSION

Approaches to the research of DNA resonance

Traditionally, the research of biofields is done either through experimental or theoretical approaches. In the above research, we went the third way, which was somewhat hybrid. We used 3D molecular models and computational genomics. In the 3D molecular modeling approach, we utilized public high-precision crystallographic experimental data, and in the computational genomics approach, we utilized the experimentally identified public genome sequences of multiple organisms. We also utilized public data about conserved genomic regions and experimentally identified locations of the transcription starts. Currently, we are utilizing experimentally identified public data on mutations in the genome and their functions.

We now also utilize the extensive published experimental data on the biological effects of electromagnetic fields, on the physics of electromagnetic and sound waves, quantum mechanics, cellular biology, and many other pieces of information that were obtained experimentally by others. While experimental data in biology is often imprecise and requires many replication studies, the data on genomic sequences and 3D molecular structures is digital and highly reproducible. It is rare to find reproducible digital data in biology, but the genomic sequence is an exception. It's highly reproducible and is composed of very specific digital sequence information.

Morphogenetic function of biofield

The biofield has unique properties at distances comparable with the size of the organism and yet its effects are not mediated by chemical signaling or neuron firing. The idea of DNA resonance signaling implies that specific sequences exchange information at a distance without using chemical messengers. This is a radical and timely departure from the conservative materialistic worldview. While the details of chemical messaging, morphogene gradients, and neuronal firing are well-established, we find these mechanisms to be insufficient to explain the complexity, precision, and speed with which organisms develop their structure and function. Similarly, we find neuronal firing and biochemical regulation in neurons to be not sufficient to explain the work of the mind.

The theories and experiments of the biofield pioneered by Gurwitsch and others [6–8] demonstrated the existence of field-based morphogenetic mechanisms and their importance for organism development. Some 45 years ago we have proposed that it is the mass of the organism's DNA that produces this biofield. Now, with the emergence of experimental and computational genome research methods, it is necessary to investigate how does the 3.2 billion nucleotide-long genomic sequence produces the biofield and interacts with it. The key to that will be deciphering the resonance language (same as vibrational language or resonance code) of the

genome.

Opportunities for research of resonances in noncoding DNA

As with any book, the genome is far from being uniform. Genome sequence recorded as a computer file occupies about 0.8 Gigabytes. When the first draft of the human genome was completed, the participants of conferences were given CDs with the complete genome sequence on them. Our genome could be printed in about 6000 books of average size.

There's a treasure trove of public genomics databases and functional genomics data that can be used to start deciphering the resonance code of the genome. Among this data, there is much data that can not be explained under the purely chemical paradigm. It is waiting for being reinterpreted using the DNA resonance signaling paradigm. As mentioned above, the importance of the non-coding DNA, also referred to as junk DNA, has been highlighted by the first publication of the human genome and by the publications of the ENCODE project [19].

As we previously mentioned, repetitive elements are the best candidates for being the universal resonating sequences in the genome. Alu elements are present in large numbers (1 million copies, 10% of our genome), colocalized with gene promoters, and are involved in the regulation of gene expression. We believe that the large numbers of repetitive elements of the genomes of complex organisms have several explanations.

1. These repetitive elements are used for DNA resonance signaling.

2. They define the program of the organism's development. More complex organisms have more repetitive elements.

3. We believe that repetitive elements also participate in the work of the mind, and this agrees with the observation that organisms with more complex behaviors have more repetitive elements.

4. A large number of repetitive elements also helps the problem of dissipation of the signal. For example, if only two identical sequences (resonators) are located in distant areas of the nucleus, the waves coming from the first resonator would dissipate before reaching the second resonator. This would make the communication impossible. On the other hand, the 1 million Alu sequences occupy the whole nucleus, are connected to each other by chromosomal DNA, which serves as an electric conductor of waves, and by the nucleoplasm which we believe also serves as a conductor of waves; the nuclear membrane works as a reflector, thus containing the waves produced by the mass of the Alu sequences. This prevents the waves from dissipating and makes them self-sustainable, allows them to shape the liquid crystalline structure of the nucleoplasm, and provides the main vibrational pattern for our biofield.

Ideally, experimentation is required to isolate waves produced by the Alu element. It's quite possible that for the appropriate vibration, Alu DNA would need to be in its natural environment, bound to nucleosomes and to Alu-binding protein, but it is also possible that just a purified Alu DNA could produce a signal in spectroscopic studies. Proper controls should be done to make sure that the signal is specific to Alu.

Another approach to assemble Alu with nucleosomes in vitro thus creating reconstituted chromatin. By modifying the DNA sequence of Alu, it should be possible to isolate the vibrations of the natural Alu sequence. Once the vibration is isolated and identified, then it should be reproduced and its biological effects should be studied. It is quite possible that the field produced by the Alu elements would have therapeutic and psychological effects.

Discussion of our computational results

On the other hand, even without the experimentation, it is possible to see the traces of resonance signaling in the genomic data. To identify the resonance elements, we utilized the redundancy principle similar to that known from the aminoacid genetic code.

We started with 3D DNA modeling and formulated an algorithm for the conversion of the primary genomics sequence into the sequence and shape of proton and electron chains. We identified repeated proton and

electron chains (called HIDERs) and found that with high statistical significance these are HIDERs enriched by the evolution of the genomes of multiple species, colocalized with conserved areas indicating that they are functional and colocalized with transcription start sites of genes indicating that they are involved in the regulation of gene expression.

It is not possible to explain the obtained results via chemical signaling because HIDERs have different chemical structures on the outside and can not be recognized by transcription factors. The only quality that connects them is that they harbor proton and electron chains of similar shapes. So, the observed statistically significant enrichment of HIDERs in evolution and in conserved regions supports the idea of that HIDERs function as resonators in DNA resonance signaling.

Also, the evolutionary conservation of HIDERs is another indication of their functional importance. Conservation of sequence elements between species is a reliable indication that the element is important and has not changed during the million years of evolution. Thus, the fact that HIDERs are located in conserved areas suggests their functional importance and that they also have been conserved during the million years of evolution.

We also observed that HIDERs colocalize with transcription starts with high statistical significance. This suggests that HIDERs receive the field signal, and convert it into biochemical information by controlling the gene expression.

These computational genomic results are supportive of the idea of DNA resonance signaling, but more work is needed to obtain more evidence. Wave signals from HIDERs need to be identified. The creation of HIDERs using DNA synthesis and modification of them using CRISPR should be used to demonstrate their function. For example, it should be shown that those mutations of HIDERs that don't change the electron and proton chains, don't affect the function, but those modifications of HIDERs that do affect electron and proton chains do change the function. Signals produced by HIDERs should be identified and technologically reproduced to prove their function. It is likely that HIDERs are the important words in the resonance language of the genome. Identification of them was the first step in deciphering this language. Once the resonance code of the genome is interpreted, it would be possible to predict the structure and function of the organism based on its genome. Based on the genomic sequence of the individual, it would be possible to predict the genetically determined components of their appearance, health, and character.

On the physical nature of DNA resonances.

Once we realized that the mass of DNA of an organism creates a biofield, this led to a number of questions and predictions [25,31–33]. The questions were: What is the frequency of oscillation? How is it that the oscillations are not dumped by the viscosity of nucleoplasm? How are these frequencies protected from being absorbed nonspecifically by other biomolecules? How is biological information included in the waves? What are the mechanisms of converting biochemical information into wave information and conversely - from the wave information to biochemical? In other words, how could the genome sense the biochemical information and how could the genome control and direct the biochemical processes, including morphogenesis?

Let's now consider the role of sound in physiology and the organism's development. One of the reasons we turned our attention to sound, is because the electromagnetic resonances in DNA don't seem to be sufficient to explain the ability of the biofield to control the movements and activity of proteins. For example, we described a vast network of resonators in the genome and the system of transmission of the information through electromagnetic waves from one part of the genome to another and from one group of cells to the whole organism, yet this information has to be expressed into material action. For the biofield to regulate physiology and development, a mechanism is required that would allow the biofield to enforce its informational decisions onto the proteins. In other words, the question is how can the DNA control the proteins within the nucleus and within the cytoplasm beyond the nuclear wall? Can the electromagnetic waves alone be responsible for driving the protein molecules to their location and controlling their activity?

We find that unlikely. Although there is a phenomenon of laser tweezers where laser light is used to hold tiny

drops of water containing biomolecules. We found it hard to extrapolate the idea of laser tweezers to the control of proteins by biofield. The power density of the electromagnetic fields in an organism doesn't seem to be strong enough to explain the control of the proteins. On the other hand, electroacoustic and optoacoustic explanations seem more plausible to be responsible for the control of proteins by biofield.

Electroacoustic model

Cymatics is a technique that creates lifelike patterns using interference patterns of sound. There are many cymatics experiments on YouTube where the sound is used to create interference patterns that develop in real-time which strikingly resemble chromosomal rearrangements in mitosis, embryo development, the morphogenesis of plants, and the formation of the skeleton in vertebrates. In such experiments, platforms of the square, round, or other geometric forms are vibrated by a sound speaker attached to the bottom of the platform, the sound frequency is varied, and rearrangements of sand or magnetic particles on a vibrated platform is recorded on video. Alternatively, the water wave arrangements vibrated by ultrasound are recorded using a microscope. The platforms of about 80 cm size use audible frequencies. The microscopic experiments use ultrasound frequencies, and therefore, if the sound is used by nature to drive and direct the motion of the proteins in the cell, the frequencies of this sound must be extremely high.

We believe that DNA creates sound interference patterns using optoacoustic and electroacoustic principles. The genome consists of billions of electromagnetic oscillators, which are basepairs, chains of protons, and electrons. These oscillators are vibrationally linked into one complex oscillator. These oscillators are insulated from each other electrically but are coupled to each other electromagnetically. Together, they create complex oscillating currents in the DNA. There possibly are some insulated domains within the chromosome that represent complex vibrational units and are vibrationally insulated from each other by so-called genomic insulators. We believe that the unit that converts electrical oscillations in the DNA into sound using the electroacoustic principle is the nucleosome. The nucleosome looks like an induction coil and the DNA, which is a conductor, is wrapped around it 1.6 turns. The nucleosome is surprisingly symmetrical in structure. It consists of a highly negatively charged sugar-phosphate backbone of the DNA and a highly positively charged nucleosome core particle made out of histone proteins. Charge oscillations in DNA cause charge oscillations in the nucleosome. In the nucleosome, these charge oscillations result in mechanical oscillations, which create and radiate the sound beams in specific directions from the nucleosome. The nucleosome has a number of cavities, which may serve as resonant cavities and work as speakers shooting the sound beams into the nucleoplasm.

The genome contains about 300 million nucleosomes, and we believe that together they create a three-dimensional cymatic interference pattern. This pattern is responsible for the movement and regulation of the proteins and loops of DNA within the nucleus, as well as the compaction and decompaction of chromatin. This vibration pattern is structured and integrated by the network of protein fibers called the nuclear matrix, and these vibrations are directed to the cytoplasm and control the protein movements and function in the cytoplasm. It is likely that the nuclear membrane serves as an integrator of the vibrational information and creates sound interference patterns in the cytoplasm using the holographic principle. The nuclear membrane is known to harbor lipid rafts organized in complex patterns. These lipid rafts on the nuclear membrane are organized by the sound and serve as a moving holographic record, which creates the holographic patterns in the cytoplasm.

Electroacoustic frequencies

Consider a model of electroacoustic conversion: When the electromagnetic wave of a certain frequency creates a resonance charge oscillation in a proton or electron chain, the oscillation frequency remains the same as in the incident wave, and when this charge oscillation creates a sound wave in the nucleoplasm, the frequency also remains the same. MAKE FIGURE OPTOACOUSTIC CONVERSION Therefore in the electroacoustic conversion, the frequency remains the same. It's only the wavelength that changes. The conversion of the electromagnetic wavelengths to sound wavelengths and the reverse is quite simple. The wavelength is equal to the speed of the wave divided by its frequency. To calculate the optoacoustic

conversion we used 1500 m/sec sound speed in saltwater and $224*10^6$ m/c speed of light in saltwater.

light wavelength	frequency	sound wavelength	
1.5 mm	150 GHz	10 nm	nucleosome diameter
3.6 mm	63 GHz	24 nm	tetranucleosome width
3.7 mm	60 GHz	25 nm	millimeer wave therapy frequency
4.2 mm	53 GHz	28 nm	mm wave therapy, chromatin fiber diam.
5.3 mm	42 GHz	36 nm	millimeer wave therapy frequency
7.5 mm	30 GHz	50 nm	millimeer wave therapy frequency
1.5 cm	15 GHz	100 nm	Alu repetitive element, 300 bp
3.74 cm	6 GHz	250 nm	millimeer wave therapy frequency
15 cm	1.5 GHz	1.0 um	mitochondrion length
30 cm	753 MHz	2.0 um	Line repetitive element, 6 kbp
1.0 m	214 MHz	7 um	mammalian nucleus
3.0 m	75 MHz	20 um	mamallian cell
75 m	3 MHz	500 um	ultrasound imaging frequency
224 m	1 MHz	1.5 mm	ultrasound imaging frequency
2.2 km	100 kHz	1.5 cm	many biological objects
22 km	10 kHz	15 cm	chromosome length
224 km	1 kHz	1.5 m	human height
299 km	750 Hz	2 m	human height and genome length
12742 km	18 Hz	85 m	Earth diameter
28637 km	7.83 Hz	192 m	Schumann resonance frequency

Fig. [Wavelengths] Electroacoustic conversion of wavelengths. *(Currently, the shortest described wavelength for ultrasound is 250 nm, so the shorter wavelengths are shown in grey as tentative)*

Fig. [Wavelengths] demonstrates the conversion of electromagnetic oscillations to sound and back via the oscillation of a charged particle. Shown are wavelength conversions for the popular therapeutic frequencies

and essential biological objects of various sizes.

A rough estimate of DNA frequencies

Although the existence of the biofield is well-established in experiments [34,35] and the energy field is used every day by energy healing practitioners, its physical nature is largely unclear. And since we believe that the biofield is generated by DNA, the physical nature of DNA resonance is also far from being clear. As we previously discussed, we have demonstrated that traces of DNA resonance are imprinted on the genomic sequence. In other words, the patterns of genomic sequence evolved in such a way to support DNA resonances and generate the biofield. For our predictions of proton and electron chains as resonance oscillators in DNA, we use molecular modeling, but our molecular models are as yet very vague about the frequency of such oscillators. More precise modeling and experimentation are needed to find the frequencies of the DNA resonances. Nonetheless, since our models rely on the oscillations of charge chains of known shapes and dimensions, with proper modeling, it should be possible to estimate the oscillation frequencies. Clearly, these are charge oscillations and as such they must produce electromagnetic waves. The frequency of these waves must depend on the size of the proton and electron chains. Since, as we believe, proton and electron chains are vibrationally linked together in part through electrical DNA conductivity, these oscillations must have complex patterns. In Fig. [Wavelengths], we estimate approximate oscillation frequencies of various genomic elements and compare them to known therapeutic electromagnetic frequencies.

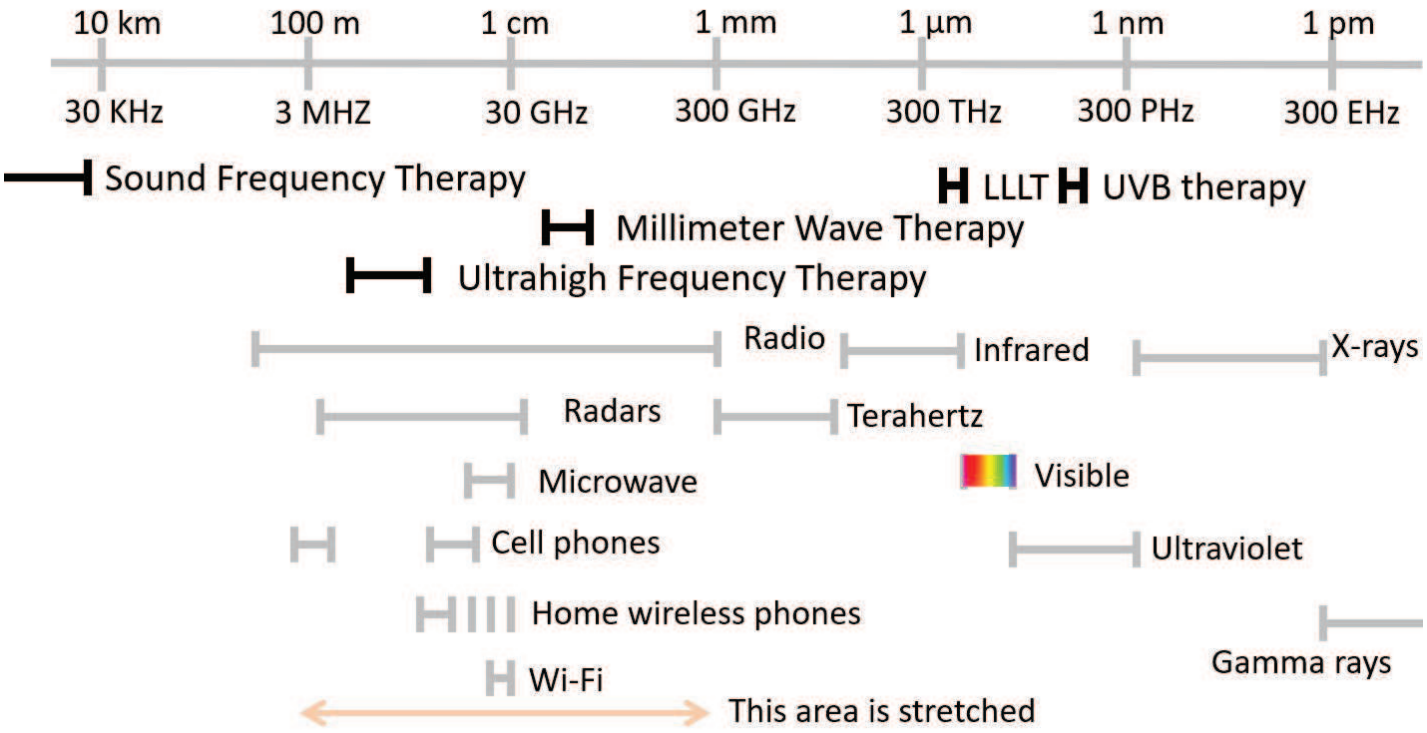

Fig. [Frequencies] Therapeutic electromagnetic frequencies

For therapeutic electromagnetic frequencies, it is helpful to distinguish high power therapies such as heat, light, and radio waves, which act nonspecifically, and low power therapies such as UVB, low-level light, infrared, millimeter-wave, and ultrahigh-frequency, which act specifically. With low-level energy therapies, a low dose amount of electromagnetic field causes a substantial health improvement, suggesting that this frequency is of signaling in nature and that it taps into the existing signaling language of the DNA. We and others have published experiments suggesting that a low-level light therapy at wavelengths of 660 nanometers and 850 nanometers affects gene expression. We have also discovered experimentally that pretreatment with low-level

millimeter waves of cell culture protects it from DNA damage. Yet many more experiments are required to decode the vibrational DNA language.

Frequencies by themselves are not therapeutic

We think that it is a misconception in the physical therapy field that certain frequencies are therapeutic, which we think is an oversimplification. We believe that in most cases it's not the frequencies that convey information to the body. The waves of the biofield generated by the DNA must have complex patterns. For example, we rarely use single continuous tones to convey the information in our speech. Our speech is highly modulated and contains variable tones, pulses, clicks, and hissing sounds. Even similar simple tones are often colored by harmonics and complex shape waves. Similarly, in music, many notes are combined and producing a balance of harmony and disharmony. Each instrument colors the tone, adding harmonics and modulating the shape of the wave. The patterns of electromagnetic waves can also be complex. Multiple frequencies can be combined. Waves can be polarized and circularly polarized. The phases of various frequencies and frequency patterns can be shifted relative to each other. The directionality of the waves is important too. Waves from multiple sources can create interference patterns. Accordingly, we believe that biofield patterns are also of complex interference nature and find it very unlikely that the natural language of DNA can be represented by simple frequencies. Most likely, simple therapeutic frequencies open the communication channels with the genome of the body, but the direction of the therapy must be dependent on the intentions of the therapist and of the patient. This must be one of the reasons why many wave therapy experiments fail double-blind tests. We believe that simple frequencies don’t convey therapeutic information. They only open the channels for the intentions of the healer and the patient. Keeping in mind these limitations, electromagnetic wave therapy provides us with starting points towards understanding the physics of DNA resonance signaling and its language.

Local nonelectromagnetic component of the biofield

For practical research purposes, it is very important to differentiate between local and nonlocal effects of the biofield. We don't know whether they have similar or different nature, but it is clear that local biofields can be studies using traditional experimental approaches and nonlocal effects are very hard to study using traditional approaches and so, they would require very different approaches. The existence of non-local information transfer and intentional influences is well established experimentally [36–38], but the information on local nonelectromagnetic components of the biofield is scarce. When we speak about "local nonelectromagnetic components of the biofield" we imply that there are likely fields that are attached to the body like an aura, or an energy field, but which can not be measured by common electromagnetic measurement devices and which penetrate shields such as metal and water barriers which common electromagnetic waves do not. Nonlocal effects of consciousness certainly penetrate electromagnetic shields and often are independent of distance, but these are hard to study experimentally. The local nonelectromagnetic fields of the body even though may not be registered by electromagnetic meters, still could be detected using energy-sensitive people and biological model systems such as DNA solutions, cell culture dishes, and plants. The key property distinguishing the local biofield from nonlocal is its attachment to the body. It should move with the body and fade with distance.

One of the authors of this paper, MMR, is a Reiki healer; as such, he works with the biofield frequently and is attuned to feel it. In Reiki healing, many practitioners, about half of them are able to feel the energy of a patient by moving their hands at about 2-10 inches from the body. For those who are able to feel it, it is normal to feel the energy of the patient about 80% of the time. When energy-sensitive Reiki practitioners are being treated by other healers, they feel the energy from the hands of the healer. Reiki energy is not unique to Reiki. MMR experienced energy healing from many other forms of energy healing including Chi-Gong, Johrey, "healing touch", Pranic Healing, and traditional Ukrainian energy healing -- and the healing energy felt very similar in all these modalities. From the physics perspective, the nature of this healing energy is puzzling since the healing sessions are done through clothes and often through blankets. About half of these healing treatments are done from a distance between 1 inch and 6 feet. Many of the electromagnetic frequencies are absorbed by clothing and blankets: UV, visible light, near-infrared, infrared, and millimeter waves. Moreover, if it was a classical

electromagnetic field, the healing treatment would be more effective at shorter distances, but for example, Johrey practitioners prefer to do the treatments at about 6 ft distance.

It is very normal for Reiki healers to direct Reiki energy from one hand to another as a focused biofield beam as a warmup exercise. During this exercise, the receiving hand feels the incoming energy beam as a gentle physical sensation resembling a gentle blow off the air. To verify whether this sensation is real, MMR tested it with other people and with Reiki patients. Very often, beams of energy can be detected coming out of Reiki patients in certain locations near the body. In group training and healing sessions, multiple Reiki practitioners independently scan the energies of the patients and report their observations. Using such approaches, MMR was able to verify for himself that the sensation was objective and verified by the other Reiki practitioners.

Next, to see whether the Reiki energy beam was of physical nature, MMR tested whether it penetrates the water. For that MMR used repeated simplistic experiments in a swimming pool, a bath, and a freshwater lake. MMR was sending a beam of Reiki energy from the fingers of one hand to the open palm of another and he would move one or another hand to make sure the sensation of the beam is moving across the open palm. While doing this, MMR was immersing himself and the hands in the water. Surprisingly the perceived position of the beam on the open palm didn't change from the immersion of both hands in water. This experiment was repeated many times and produced the same result. It suggests that the Reiki energy might be local and yet, not of classical electromagnetic nature. An infrared, millimeter wave, microwave, and gigahertz waves would be absorbed by water. A near-infrared beam would be somewhat deflected as does visible light when passed through water. Only extremely low frequency (ELF) 3 Hz - 30 kHz radio waves can penetrate water, but since the diameters of Reiki energy beams are often small (5-10 cm in diameter), it is very unlikely that they can be made of ELF radio waves since the wavelengths of these waves are extremely large (10^4-10^5 Km). We can in a preliminary way conclude that there is a type of field which is specially organized, but capable of penetrating a layer of freshwater unhindered and this suggests that this beam has unusual properties different from usual electromagnetic waves. Since (as we believe) biofield and Reiki energy, in particular, are generated by DNA, these simplistic experiment sheds a bit of light on the nonphysical nature of at DNA resonances, or at least one of the components of the fields produced by DNA.

In respect to DNA resonance and the biofield, it's important to differentiate:

(1) electrical currents that go through a conducting medium,

(2) sound (that is transmitted better through the tissue than the air),

(3) electromagnetic waves (that go through the air unhindered and are often scattered by the tissues)

(4) local nonelectromagnetic component of the biofield (that is goes through the air, water, and clothing unhindered), and

(5) nonlocal biofield and psychic phenomena (that pass through large distances unhindered).

In summary, to properly understand the nature of DNA resonance, it would be important to differentiate traditional physicochemical signals, such as chemical signaling, electric currents, electromagnetic waves, and sound, from nontraditional biofield waves and signals that pass through shields such as water. Among the nontraditional signals that pass through shields, it is important to differentiate the local ones and nonlocal ones. We believe that there are parts of the biofield that penetrate through shields but still are localized. They are generated by the body, are located in and around the body, and move with the body.

The nonlocal nature of the locality

The question of locality is essential for the understanding of biofields. At the atomic scale, in living tissues, nonlocality is a norm, and localization of the wave function for each atomic-scale object occurs only occasionally due to decoherence which is caused by outside influence such as infrared radiation [39]. On the other hand, at the macro scale of the human body, the locality is a norm, in agreement with the quantum math, since the collapse of the wave function for large objects happens instantaneously [39]. The biofield seems to display the nonlocal properties since it penetrates clothing and water, as well as local properties since it is

perceived to be attached to the body. In other words, it seems to have hybrid borderline properties between locality and nonlocality and is able to collapse from nonlocal into a local state under the influence of the intention of an observer.

Parallels with the subtle bodies of the ancient Eastern teachings

The idea that the health of the physical body is supported by the subtle bodies is ancient and is already mentioned in Upanishads dated before the 5th century BCE. The physical body is taught to be accompanied by 4 subtle bodies: vital energy, mind and memory, consciousness, and divine bliss.

Once a yogi traveled by air. When the airplane landed, the yogi stepped out, sat on the asphalt, and started to meditate. People asked, “Why don’t you go?” “I'm waiting for my soul to catch up,” said the yogi.

Speaking of the soul, we suggest that DNA may serve as the primary interface between the physical body and the soul. The soul is vast and multidimensional, and it interfaces with the physical body through DNA resonances at different frequencies corresponding to the subtle bodies.

Those who communicated to Alzheimer’s sufferers might have noticed that much of the time, they are only partly conscious. We suggest that this is because a big part of the soul is disconnected from the body. Yet, once in a while life becomes interesting to them. Their eyes light up and they come to their normal senses. We suggest that this is when the DNA resonance has kicked in and the soul reconnects to the body.

Here we attempt to unite metaphysical and physical sciences, restoring the true unified science. The divide between the natural sciences and the science of spirituality was never scientifically justified. Much of the divide needs to be healed and much would need to be learned. Psychology and psychiatry would have to return to the study of the soul (the psyche), which gave the origin to their names, and understanding of DNA resonance would likely produce practical improvements in psychology and psychiatry.

Brain-computer interface and synthetic telepathy

Moreover, deciphering the DNA resonance code will result in deciphering the language of the brain, thus enabling another practical application: the brain-computer interface and synthetic telepathy. Brain-computer interface is a field of technology that is well-funded by agencies and industry and is making quick progress. Synthetic telepathy is the connection of minds of people via a technological link and circumventing the conventional modalities of communication: light, sound, and touch [40]. Without understanding the language of the brain, or the brain code, technological communication with the brain will be limited by the speed of perception of light and sound by the brain, which is very slow. Currently, scientists have only very crude ways of deciphering NMR (nuclear magnetic resonance) and EEG (electroencephalographic) readouts. Currently, the noisy spikes on the EEG plots are interpreted as noise. Deciphering DNA resonance code, we believe, will lead to deciphering the brain code and this way will radically improve the speed of technological communication with the brain. Once brain-computer interface and synthetic telepathy are healthy is of sufficiently high speed, this will radically improve the efficiency of communication between people. We believe that telepathy will be a most important leap that will change the future of humanity for the better.

Nature of local nonelectromagnetic waves

The local and nonlocal biofield phenomena were scientifically studied with a few scientific approaches. The nature of nonchemical signaling was studied by several methods: (1) it was shown that one biological sample, such as a fish embryo, a plant, or a cell culture dish can transfer biological signals to another biological sample via air or a quartz glass [7,9,10,41], (2) electromagnetic waves were recorded coming from a perturbed biological sample or a developing embryo, and the properties of the waves were found to be indicative of the state of the sample [9,42,43], or (3) it was demonstrated that electromagnetic waves of specific properties can produce specific effects in biological samples [5,6,9,41]. The nonlocal information transfer between people, sending thoughts and messages at large distances, influencing people at a distance and distant healing effects were demonstrated with high statistical significance [34–36,38,44,45]. Remote viewing was found to be statistically significant [46,47]. Local energy healing with hands at short distances was found effective with

statistical significance [45,48]. We were not able to find publications that specifically investigated the effects of barriers such as water and metal sheets on the penetration of Reiki-like energy fields, but there are publications describing the significant effect of distance on the perception of healing energies [45,49].

Naming

So, far, there is no consensus for the naming of the special biofield waves that are local and nonelectromagnetic in the classical sense. Konstantin Meyl described local waves that form the biofield as "scalar waves", a special form of helical electromagnetic waves, where the magnetic and electric components of the wave are phase-shifted relative to each other and where frequency and wavelength change along the path of the wave. Other suitable names for local nonelectromagnetic biofield would be etheric or pranic field - after the etheric body of Theosophists which is the pranic body of Hinduism responsible for life energy, one of the five subtle bodies.

DNA as a dimensional portal

It is likely that DNA works as a dimensional portal, meaning that it mediates the information transfer and serves as an interface between the physical body and nonphysical biofield. This would explain why it is so difficult to detect the biofield with traditional physical devices. Since physical devices are located in this physical dimension, they typically are not able to register the signals transmitted in a parallel "subtle" dimension, the "subspace" and this would also explain why a biological entity is able to detect the biofield of another biological entity. Say one biological entity is disturbed; its DNA is specifically excited and sends the information into the subspace. If another biological entity is tuned to the proper subspace frequencies, its DNA will receive the proper frequencies, become vibrationally activated, and convert this specific vibrational signal into a specific structural change or a biochemical signal such as gene expression. Some of the subspace communications will be local and fade with distance, as do physical waves, which normally fade proportionally to squared distance. Other biofield components will be nonlocal and will not fade with distance. We believe that DNA resonances are multimodal; that is, capable of communication with sound, electric currents, electromagnetic waves, and nonphysical waves, local and nonlocal.

Scientific method

There is widespread confusion between the scientific method and materialism. The overwhelming majority of scientists believe that the scientific method is applicable only to matter and material objects, and that anything immaterial such as the biofield and soul cannot be studied scientifically and are beyond science. This is an oversimplification. Quantum physics, for example, is a subject where the scientific method forces researchers to question the reality of the matter. From quantum physics, we learn that the experience of the material world is an illusion and can only be obtained at macroscales comparable to the size of our bodies. At microscales, such as the scale of DNA, things become less real. Positions and states of molecules become uncertain. Quantum nonlocality, entanglement, quantum coherence, and quantum delocalization become a norm. This illustrates that the scientific method applied consistently does not lead to materialism. With our commitment to the scientific method, the consistent use of it inevitably leads us to DNA resonance and genomic biofield.

Structural oscillations in liquid crystals

Until now, we considered three types of waves: electromagnetic waves, sound waves, and nonelectromagnetic (in the classical sense) local biofield waves. Let's now consider whether DNA resonance may happen through the waves which don’t oscillate in time. Although it sounds like a misnomer, such waves exist. Consider waves in the sand. These clearly are waves and yet, they don’t move. Consider also periodic patterns in crystals; these have many qualities of waves, but they are static.

The nucleoplasm (the thick inner solution of the cell nucleus) is a concentrated solution of DNA (about 1% [50]), histones, and many other proteins and molecules [51]. Unfortunately, there is no information on the biochemical content of the nucleoplasm, although, with modern methods of laser capture it is possible to measure it. Although it seems that no one has yet measured the biochemical content of the nucleoplasm, molecular biologists were able to make many enzymes work in vitro, such as polymerases, ligases,

phosphatases, kinases, and other enzymes used in gene engineering. Since these enzymes are practically useful, much effort was placed into optimizing their work in vitro. So, the buffers used for the enzymes can give us a glimpse into what could be the natural content of the nucleoplasm. These buffers often contain sodium, potassium, magnesium and chloride ions, ATP, and a large amount of albumin which is considered inert. The pH is approximately neutral. One thing is clear: it's not fresh water. It's buffered salty water saturated with DNA, histones, and other proteins in such a way that DNA and histones undergo a constant process of crystallization and dissolution. It is very likely that nucleoplasm is a highly structured liquid crystal and that DNA plays a key role in structuring it. This way, it is possible that the mechanism for DNA resonance involves changing the structure of the nucleoplasm and sensing the changes in the structure. For example, one piece of DNA would send a signal by creating a special structure which would then propagate through the nucleoplasm and then be sensed by another piece of DNA in the same nucleus. This way, self-propagating periodic patterns would be created, but these patterns would not be wiggling as light and sound waves do. The periodicity would be semi-static. A structural change in one place of DNA would result in the propagation of the new structure through the nucleoplasm and lead to changes in another piece of DNA.

Although it seems a bit unconventional, there is a field of science that describes such events. It is the theory of chaos and self-organization [52] popularized by fractal pictures of Mandelbrot. Such self-organization would require that nucleoplasm is pumped with energy and eager to accept and propagate new structures. An example of this would be the propagation of new memes through social networks. Another example is fashion. Fashion starts in one place and then propagates through the system. So, many components copy it. People who live in a cold climate are familiar with the growth of crystals of ice in cold weather on the inner surfaces of windows. When the outside temperature is colder than the inside temperature, window frost condenses the water from the room and then crystals of ice start growing in this water, and this pattern propagates at long distances. Furthermore, as with daily cycles of temperature, this pattern creation repeats every day in a different way. Interestingly, videos of developing model embryos show that during the development embryos undergo oscillations. It is likely that the cell allows the patterns to form, propagate and then the cell dissolves them, and then, it allows new patterns to be created and propagated. And likely, the DNA is the primary source of these patterns.

This idea seems to be novel and testing it would require new experimental approaches. Possibly, it would require recreation of the nucleoplasm in vitro, stimulating the pattern creation, propagation, and dissolution via oscillations of temperature in the nucleoplasm (not unlike it is done in PCR) and using DNA as a template to prime the pattern formation in the nucleoplasm. Much in this respect can be learned from the science of liquid crystals, which are used for computer and smartphone displays.

Ideas for experimental testing of DNA resonance theory

The biological sciences have perfect tools for studying DNA resonances. For example, it would be interesting to compare the information transfer between various biological objects while varying their similarity on the genetic level. If our model is correct, organisms with identical DNA, such as twins and clones will be able to exchange vibrational signals with more ease, than genetically different organisms. The amount of genetic similarity could be easily varied in this order: identical clones and twins, siblings, distant relatives, same species, different species located close on the genetic tree, species located far apart on the genetic tree.

Genome manipulation using CRISPR technologies and artificial chromosomes would allow us to identify those sequences that are responsible for DNA resonances and signal transmission. It would be also interesting to see if the effects of signal transmission can be reproduced in cell culture or in reconstituted chromatin in vitro, in synthetic DNA in solution, or in nanoelectrodes with synthetic DNA strands anchored on the surface. It's quite possible that for proper vibrations, DNA would require the natural protein-rich broth of the nucleoplasm and even some of the electromagnetic and sound oscillations that are likely present within the nucleus. DNA might behave like a laser and would need to be pumped up with energy to properly resonate. The structure of DNA is also of importance. The level of supercoiling of the double helix is essential for its ability to form electron and proton chains. Therefore, purified DNA and short synthetic oligonucleotides might not be sufficient to produce DNA resonance. Longer DNA pieces in physiological conditions of the nucleoplasm would likely be

needed. Pumping them with coherent electromagnetic and sound waves might be required. Yet, all these experiments are quite possible and would be trivial for a laboratory specializing in chromatin structure. We estimate that there are about 20,000 laboratories in the world having the expertise and experience to do such experiments.

The key to studying DNA resonance is understanding its language. That's where genetically modified biological systems such as cell cultures will be useful. It would be interesting to insert big fragments containing human Alu DNA into mouse cells and see if they gain the ability to communicate with human cells. This would be a properly controlled experiment, allowing us to isolate the exact sequences that are required for nonchemical communication between the cells.

To isolate the specific waves and wave patterns produced by DNA resonances, spectroscopic studies will be useful of various DNA sequences in solutions mimicking the protein content of the nucleoplasm, or in reconstituted chromatin and living cells to isolate the waves which are produced by the DNA resonances. Varying sequences of DNA it would be possible to identify a specific wave frequency and pattern for each sequence pattern. For example, telomeric and centromeric sequences contain large numbers of copies of repeats: telomeric TTAGGG and centromeric 169 and 171 bp alphoid repeats.

Currently, the researchers are puzzled by the fact that the number of single nucleotide polymorphisms NSPs in our genome (about 12 million), is somewhat too small to explain the large extent of variation among individuals. Unsurprisingly, novel methods of long-range mapping allowed the researchers to observe that telomeric and centromeric regions contain a large number of variations often involving regions in the range of 20 Mb size. Telomeric and centromeric regions are poorly studied because they are noncoding. Yet, due to their highly periodic nature, they make a perfect candidate to be carrying resonance information, and variation in their periodic patterns must be responsible for individual differences in biofield patterns. This opens a vast research opportunity for geneticists to discover the genomic variations explaining behavior, metabolic and physical variations between individuals.

Practical applications of DNA resonance theory

The acceptance of the DNA resonance theory might take a long time since it shatters many misconceptions in biology and medicine, but its practical applications can be embraced by the market much sooner. That's what happened to the small RNAs and RNA silencing around 2010. The mainstream stigmatized the theories about the importance of small RNAs until a practical application of small interfering RNAs for gene silencing demonstrated their exceptional practical value. MMR's collaborator, the pioneer of small RNA research, Irina Konstantinova, died prematurely when her project, which published great works on small RNAs, was shot down. That was in the year when the RNA silencing was finally recognized by mainstream science [53]. We hope to see DNA resonance theory recognized in our lifetime, in particular, because of its practical potential.

The potential areas of application of DNA resonance include medicine and biomedical research. The immediate useful applications can be developed in computational genomics. The reason for this is that computational genomic development is much faster and computational applications often don't require regulatory approvals.

GWAS application of DNA resonance theory

The first application is for GWAS (genome-wide association study) data analysis. GWAS became popular when genotyping of single nucleotide polymorphisms (SNPs) was automated. In the past two decades, several thousand large GWAS studies have been completed [54]. GWAS is a powerful tool for locating genes responsible for genetic diseases and traits, such as psychiatric disorders, autoimmune disorders, and metabolic disorders. GWAS studies point to genes responsible for addictions, obesity, aging, and other important traits. Many large GWAS studies were funded and continue to be funded with the hope to find drug targets for many important traits. Yet there is a problem with the GWAS approach, which was obvious from the very beginning: only a tiny fraction of found causative mutations result in mutations that affect proteins or the level of their expression. The vast number of causative mutations - over 99% of them - don't cause any

changes in proteins, and this is where mainstream science and molecular biology exhausted their ability to explain their own results. Numerous bench-to-bedside conferences and programs failed to deliver practical results because the underlying molecular theory avoids considering DNA resonance and the biofield. We believe that the majority of causative mutations affect biofields via DNA resonance.

In our computational analysis of public GWAS data, we observe that causative mutations affect in one way or another the chains of protons and electrons in DNA (MMR, unpublished). We suggest that large numbers of noncoding SNPs serve signaling purposes and are part of a sophisticated quantum computer, which is the genome. Our computational algorithms allow us to prioritize the SNPs based on their resonance properties and predict which ones are functional and which variations are detrimental to health. This is the immediate practical result that can help GWAS researchers to prioritize their SNPs and select some for functional wet lab CRISPR testing. A typical GWAS study starts with over 10 million SNPs in the human genome, proceeds to genotype many of them in thousands of people, and, based on the obtained genotypes, identifies the so-called association peak. A typical association peak is between 0.2 and 5 MB and contains between 100 and 10,000 SNPs. These SNPs need to be prioritized. Our algorithms allow us to prioritize these SNPs and pinpoint the ones that are predicted to disrupt DNA resonance. This application can be expanded into genome data mining. A large number of GWAS results are publically available, and this data can be re-analyzed using our DNA resonance algorithms, providing candidate SNPs for functional CRISPR wet lab analysis.

Gene expression analysis application

The next practical application is the analysis of gene expression data. High throughput gene expression analysis has been available for over 25 years, and by now, it has become much more affordable and precise. This analysis takes a small amount of biological material or even a single cell and measures the amount of RNA of every gene. This is a powerful tool that allows the correlation of gene expression with biological function and disease. There are a large number of software services and packages that analyze gene expression, yet molecular biologists are unable to predict gene expression changes based on current molecular models. This we believe is again because they take into account only molecular mechanisms for analysis and to account for DNA resonance signaling. We believe have developed computational DNA resonance models that should help to explain and predict gene regulation.

Personalized Medicine

The price of identifying the majority of mutations (about 11 million) in a genome of an individual (the nonrepetitive part of it), which is nearly equivalent to sequencing the individual's genome, is now about $10K and is expected to go down to $1K within a few years. It is already possible in still rudimentary ways, based on the genomic sequence to predict the metabolic profile of the individual, predisposition to diseases, sensitivity to medications, and some of the psychological and character traits, to prescribe individualized diet and healthy lifestyle. Currently, the algorithms for such predictions are imperfect. One reason for that is the lack of high-quality data that can be used for training of the algorithms. Another reason is the delay in governmental regulations that would properly enable full-genome diagnostics and recommendations. The other problem with current analysis algorithms that they are developed by the scientists unaware of the DNA resonance layer of regulation in the genome and are not likely to discover it by chance. The incorporation of DNA resonance algorithms in the genome analysis will allow reading the genome "between the lines", once the DNA resonance language of the genome is known, it will become much clearer how the mutations disrupt the healthy resonance patterns. In our current analyses, we already see the evidence that the genome is patterned by evolution to enable resonances and how the mutations disrupt the resonance patterns.

Other biomedical applications

The next set of applications is biomedical. It is slower to develop but is even more promising. We believe that one of the primary purposes of the genomic field is to control an organism’s development that is morphogenesis. The experiments of Burlakov with the manipulation of the biofield [41,42], which manipulated biofield precisely enough to modify fish embryo development and control the number of heads and tails developed by the embryo, lead us to believe that therapeutic manipulation of the biofield would allow us to

introduce previously unthinkable biomedical applications to control the shape of the body, including obesity, as well as to grow and repair organs including teeth, bones, joints, heart, kidneys, liver, spleen, and eye retina. This is in line with some of the scattered reports on millimeter-wave therapy results related to morphogenesis. Yet, in these experiments and therapies, the researchers so far have been using empirical approaches by modifying the waves without understanding the basic mechanisms of their origination. Our models of DNA resonators, which include proton and electron chains, provide the immediate key to the identity of the source oscillators, that is DNA sequences, and in particular Alu, centromeric and telomeric repeats. Therefore, the experiments can be devised where millimeter waves are used to treat synthetic DNA samples of varied sequences containing candidate source resonators. This way, the wave treatments can be optimized to achieve the desired outcomes using a spectroscopic or nanoelectronic readout.

Therapeutic devices

There are already many electromagnetic and light therapy devices on the market. Light and megahertz therapy devices are already approved by FDA. Above, proposed experiments to identify wave patterns of the genomic field for various sequence elements. Once the proper parameters for the wave shape and wave modulation are identified, these can be embedded into the therapeutic devices. Similar approaches can find application in veterinary medicine, agriculture, food production, and biotechnological production. Since biotechnological production does not require sophisticated approvals, this application might get to the market first, followed by agriculture, food production, veterinary care, and human therapy.

Brain-computer interface

Brain-computer interface is another promising application for DNA resonance technologies. This R&D field is well-funded by public and private money, and it is aimed at the direct connection of electronic devices to the mind, circumventing the use of vision, hearing, voice, and touch. The intention is for people to be directly plugged into the computer and internet. The current speed of communication is limited by the speed of speech, which is about 5 bytes per second. The goal of the brain-computer interface is to speed it up manyfold. Although we see the dangers of abuse of this emerging technology, there is one potential benefit that we believe will outweigh the dangers: synthetic telepathy, see our review of synthetic telepathy [40]. Synthetic telepathy is the communication of one mind to another via the technological interface, which circumvents natural ways of communication including voice, hearing, vision, and touch. We believe that once people are able to communicate with each other at higher speed and precision than is currently possible, this will allow humanity to develop a hive-like mind and shift to a new evolutionary level. The benefit of the evolutionary shift outweighs the potential dangers of the misuse of the technology.

The problem with the brain-computer interface technologies currently developed by mainstream science is that scientists don't understand brain signals. As 99% of the genome looks like junk to molecular biologists, and similarly, the brain waves look like noise to neurologists. We believe that the genome is a biocomputer based on DNA resonance and the work of our mind is based primarily on the resonance of DNA sequences in the genome. So, the key to the brain-computer interface should be to understand the resonance language of the genome which we believe is the resonance language of the brain.

The first step in that direction is already done. We have already identified proton and electron chains, which are the key resonators [25,31], and we already identified the logic circuits of the genome, which are tautomeric conformational changes of basepairs [23]. Therefore, the deciphering of the DNA resonance language will immediately lead to the understanding of brainwaves. Once the language of brainwaves is understood, the brain-computer interface can move from vocal language to the language of the brain, which will be manifold faster and more precise.

Therapeutic device for psychiatric and psychological disorders

Similarly, we believe that the major mechanisms of psychiatric and neurological disorders are based on DNA resonance. The psyche is the soul. Psychology and psychiatry are the sciences that should study the soul and DNA resonance is a mechanism with which the soul is attached to the body. Treatments of psychological and

psychiatric disorders with red and near-infrared light and millimeter-wave therapy already produce substantial results [55,56], but these results so far are obtained by empirical approaches. Understanding the DNA resonance-based mechanisms of disorders will allow us to treat them much more efficiently.

Transitional Chinese medicine practitioners and Reiki healers are taught to identify blockages in energy flow in the body, clear these blockages, and rebalance the energy flow. Introducing the devices that would be able to measure biofield imbalances and rebalance them using the biofeedback principle is a promising approach to psychological and psychiatric disorders. Some of these therapies have been developed using empirical approaches. The addition of DNA resonance codes to these modalities will improve the diagnostics and therapy.

Ecological applications

Energy practitioners (intuitives and sensitives) can already clearly perceive the healthy energies of nature and the unhealthy energies of cities. We believe that electromagnetic pollution is nowadays the major cause of sickness. Similarly, the biofields of healthy foods are healthy and coherent, many processed foods are unhealthy due to discordant vibrations. These effects were measured by Fritz Albert Popp using biophotonic amplifiers [57]. We suggest that understanding the role of DNA resonance in the creation of the biofield will make it possible to measure and characterize the fields of environments of water and food, thus giving the public an objective measurement of biofields in food, and ecological fields in water, homes, and devices. One of the concerns is that 5G bands for smartphone communication are located near the therapeutic bands for millimeter-wave therapy, which we believe directly affects DNA. We cannot say that 5G smartphones produce necessarily negative effects, but based on millimeter-wave research, they should certainly produce biological effects positive or negative. Most likely, 5G radiations will affect the mood and behavior of people. This effect should be properly studied, especially keeping in mind their influence on DNA and chromatin structure.

Current status

Here we will summarize the current status of DNA resonance theory. With all the progress in DNA resonance research summarized above, the question remains whether it is real. We don't have any doubt that the biofield is real. Well documented are the existence of the biofield [34,35,58] and of nonchemical cell-to-cell communication [9,10]. But the experimental evidence biofield is produced by DNA is still lacking. At the moment, our theory is based on a series of conjectures aimed to explain and can solve a number of mysteries or unsolved problems that are typically swept under the carpet. The resulting model of DNA resonance provides a preliminary explanation for a number of mysteries outlined below.

Morphogenesis

Current mainstream biology provides only one explanation for the mechanism of morphogenesis, which is the chemical gradients of signaling proteins, called morphogens. Although these mechanisms are well established, they are clearly insufficient. The morphogenetic effects of the morphogen gradients are clearly real, but it's also clear that they cannot define the high precision and complexity of large complex organisms. The gradients are produced by the synthesis of the morphogenetic protein in one location and the gradual diffusion of it through the tissue. This can only work locally. It's irrational to believe that morphogen gradients can work in such sizes as the size of a human, a tree, an elephant, or a whale. Also, gradients are very imprecise and depend on the movement of the fluids and the temperature. There is clearly a need for a mechanism that will guide and sustain the complex structures. The morphogenetic field makes much more sense. Genetics provides solid evidence that the genome defines the shape of the organism. Developmental abnormalities are caused by many identified genomic mutations. It was experimentally demonstrated that the positions of organs in drosophila were swapped when the positions of genes were swapped. Therefore, it was logical to conclude that the genome defines and produces the morphogenetic field [17,18,59].

Genomic field

So, our next question was: what is the mechanism for that? How could the genome define the structure of the morphogenetic field? If the field is created by oscillators, then we should look for ideal oscillators among the

biomolecules. The most periodic and harmoniously structured biomolecules are DNA, microtubules, and centrioles, which are also made from microtubules. These are nearly perfect helixes with highly periodic structures within them. While microtubules are made out of identical monomers, DNA's monomers are organized in a sophisticated sequence. This makes DNA the most likely source of the biofield because the genetic program is organized into structures that should be capable of oscillation and the oscillations in those structures will be dependent on the genomic sequence.

Oscillators within DNA

Next, we started to look for the identity of possible oscillators. The key requirement for these was that the oscillations should depend on the DNA sequence and should not be dumped by the viscosity of the nucleoplasm. This brought our attention to the chains of protons and aromatic electrons in the base stack. An additional advantage of these oscillators is that they are charged, so their oscillations would immediately result in the production of electromagnetic waves. The oscillations would require energy and we considered two major sources for this energy. One was thermal motion and another one was ATP, the universal fuel of the cell. Next was the problem of the possible dissipation of the signal within the cell. This brought our attention to the repetitive elements. It is very rational to suggest that repetitive elements are the key resonators in the genome. For example, the Alu element comprises 10% of our genome, making it the main resonator. When the number of resonators per cell is low, and they're diluted by other resonators, the signal will be lost due scattering and nonspecific absorption. But when resonators are present in large numbers and in high concentration, they become linked in a unified resonating system and less energy is required to sustain the signal.

There is much evidence (unnoticed by mainstream science) that Alu elements may play the key regulatory role in the genome and may be those control elements predicted 65 years ago by the Nobel prize winner, Barbara McClintock [60]. We thoroughly reviewed this evidence in ref. [61].

It would be interesting to use spectroscopy to identify the specific waves produced by Alu elements and use cell culture experiments to measure the effects of those waves. Next, we realized that we can use the redundancy of the resonance code to prove its existence using computational genomics. We devised the algorithms that predict which different sequences (HIDERs) will resonate with each other based on the similarity of their proton and electron chains. We demonstrated that those sequences are strongly enriched by evolution and located in conserved regions, suggesting their functional importance. We also demonstrated that part of them is colocalized with the transcription start sites, suggesting that they take part in regulating gene expression.

This is the best supportive evidence for DNA resonance we have so far. Direct experimental studies with manipulation of DNA sequences are required to prove the existence and function of HIDERs. Next, we looked at the detailed structure of proton and electron relocations in their chains, and based on molecular structure, we discovered that each basepair (among 6.4 billion basepairs per cell) works as a miniature logic circuit. The sequence of basepairs defines how these logic circuits are connected. Therefore, we discovered the principle of how the DNA is organized in a quantum biocomputer [23]. In our models, we see the initial glimpses of how protons and electrons are moving along the base stack and how these movements are interdependent. For example, the relocation of protons turns on and off the aromaticity of the aromatic electron rings in purines. We found substantial evidence that these oscillations of aromaticity have key importance for the function of DNA and the work of the mind. Therefore, even without direct experimental evidence, the main principles of the design of the quantum biocomputer within the genome begin to become clarified without experiments, just based on the existing three-dimensional molecular structures of the DNA. More experimental and computational work is required to further detail those structures.

Moreover, these studies begin to reveal the resonance language of the DNA. This solves the next mystery: the vast amount of noncoding DNA in the genome. Only 1% of DNA is coding for the proteins. The function of the remaining 99% is a mystery to biochemists. On the other hand, our models of DNA resonance already laid the foundation for deciphering the resonance language of DNA by identifying HIDERs and Alus as elements in this language.

Another mystery of biochemistry is how macromolecules find their way and propel themselves within the cell. The complexity of the cell is so immense that it is very irrational to think that macromolecules find their locations by random diffusion. We believe that the real mechanism is very different. The cell and the nucleus resemble a three-dimensional city where each macromolecule is a car minding its own business and navigating to its own location using an optimized trajectory. We believe that the biofield within the cell directs macromolecules to their locations and regulates the speed of the work of the enzymes. When more components are needed, the biofield senses the lack of the components, increases their production, and redirects them to their destinations. This model is supported by experiments in cymatics where sound waves are used to arrange and move patterns of particles. We suggested that DNA produces three-dimensional patterns of ultrasound. We further suggested that these patterns are moving and they move the macromolecules to their location according to the cymatic models. We proposed that nucleosomes work as sound generators by converting DNA sequence into patterns of sound.

Mind and memory

The next mystery is the mystery of mind and memory. Current neurobiology teaches that (1) the mind works through electric impulses and action potential propagation in the brain, (2) that learning occurs through neuroplasticity or in other words, because a network of neurons is changing its topology, and (3) that memories are recorded in a topology of neurons and strength synaptic connections. Although we accept the functional importance of the above mechanisms, we find them largely incomplete. It is unlikely that the topology of neurons and the strengths of synaptic connections are retained for a lifetime. Neuron topology and synaptic connections are pretty malleable while memory lasts for a lifetime. Proteins are also very short-lived whereas DNA is very stable and remains unchanged for a lifetime. So, it's very likely that memory is recorded and methylation marks in DNA and that Alu elements serve as universal memory units in the genome and store methylation marks for long periods of time. As we mentioned above, we believe that DNA is a biocomputer and is directly involved in the work of the mind and that Alu elements, which are specific to primates, provide a universal resonator circuit for our mind, working as universal memory and logic units. An additional advantage of this model is that it moves the mind from an amorphous continuous model into a digital one. The genome is digital while the neuronal network is not. The advantage of a digital mechanism of the mind is that it can be programmed and reprogrammed that the information can be copied and may be interpreted as a language. The genome has addresses, which are defined by unique sequences, and linear, providing a linear structure to the code.

Gene regulation

The next mystery is gene regulation. Although genomics produces excellent data on gene expression, the current paradigms based on the binding of transcription factors to DNA are insufficient for modern biochemistry to be able to explain and predict gene expression results. We believe that the DNA resonance model will provide the missing mechanism and will improve the prediction ability of the gene regulation models. We believe that genes and different pieces of DNA communicate with each other through DNA resonances and that similar sequences resonate with each other, synchronize and exchange information. We believe that the incorporation of DNA resonance-based algorithms in the gene expression analysis will produce much better results and allow us to explain the existing data and improve the predictive ability of gene regulation models.

Energy healing

Energy healing involves the use of hands to send energy to the patients and provide healing for those disorders that do not well respond to allopathic medicine. We believe that DNA resonance plays a key role in energy healing. The healer senses the energy patterns of the patients and modifies these patterns by creating new energy patterns. There is resonance communication between the healer’s DNA and the patient's DNA, and this is the key to the ability of the healer to change the patterns in the energy of the patient.

Conclusions

In summary, the DNA resonance theory illuminates the mechanisms for a number of puzzling subjects: the

nature of biofield, morphogenesis, coordination of the work of proteins in the cell, gene regulation, mind, memory, and energy healing. While these explanations are hypothetical, they illustrate how DNA resonance theory can improve our understanding of a number of scientific problems once it is proven. We hope that this promise will motivate further research of DNA resonance and its funding.

Authors contributions

MMR developed the DNA resonance theory to its current state and wrote the chapter. RAM outlined the fundamentals of the Embryonic Holography [18], the predecessor of the DNA resonance theory in the 70s, and here, he contributed to the discussion of the holographic principle, physical nature of the biofield, locality, and nonlocality of the biofield and the role of biofield in the self-organization of the biological matter. IVS, as a research assistant, helped with the development of the theory, literature research, and computational work.

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