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Nobel Prize laureate Luc Montagnier: His groundbreaking new work looks at the interplay of radiation with life.

New Evidence for A Non-Particle View of Life

by Laurence Hecht

Jan. 21, 2011

France's leading virologist, Luc Montagnier, has brought forth remarkable new evidence for a non-particle view of life. The emission of low-frequency electromagnetic waves from bacterial DNA sequences, and the apparent ability of these waves to organize nucleotides (the raw material of DNA) into new bacterial DNA, by mediation of structures within water, are among the important results reported to date.[1]

By demonstrating the interaction of living organisms with electromagnetic waves, perhaps including the low-frequency Schumann resonance waves in the Earth's atmosphere,[2] the work has revolutionary implications for biology and our whole understanding of the universe, extending the work begun in the 1920s by such figures as Alexander Gurwitsch, who detected ultraviolet radiations from growing plant cells.

Jiaotang University

Prof. Montagnier at Jiaotang University in Shanghai, receiving his appointment in November 2010 to a university chair. Montagnier, under attack in the West, will continue his research at Jiaotang.

The signals detected by Montagnier appear to be a property of most bacteria infecting humans, as well as many viruses, including HIV, influenza A, and hepatitis C. Further, it appears from the research, that some common diseases not previously considered to be of bacterial origin, may indeed be so. In evidence of that, signals identical to those detected in test tubes containing live bacteria, have been found in the blood plasma, and in the DNA extracted from the plasma, in patients suffering from Alzheimer's, Parkinson's disease, multiple sclerosis, chronic Lyme syndrome, rheumatoid arthritis, and various neuropathies.

Dr. Montagnier, who won the Nobel prize in 2008 for his 1983 discovery of the HIV virus, has proposed to employ these radio frequency techniques for detection of chronic bacterial and viral infections, and to explore means to use them in treatment of diseases including AIDS and autism. Montagnier also notes that such techniques might some day provide a solution to the growing problem of evolution of antibiotic-resistant organisms.

Under attack from the science establishment in Europe and elsewhere in the West, Montagnier, age 78, has now made the decision to pursue further re-

1. L. Montagnier, J. Aissa, E. Del Giudice, C. Lavalee, A. Tedeschi, and G. Vitiello, "DNA Waves and Water," (2010) http://arxiv.org/pdf/1012.5166

2. The Schumann resonance refers to the waves of base frequency 7.83 Hz and its higher harmonics which propagate in the waveguide formed between the surface of the Earth and the ionosphere. In 1952, German atmospheric physicist Winfried Schumann hypothesized that lightning activity would produce such low-frequency waves, and by dividing the circumference of the Earth by the velocity of light, he predicted the approximate frequency later detected.

search in China, at a new research institute which will bear his name at Shanghai's Jiaotang University.

The Non-Particle View

Montagnier's experiments bear upon certain crucial questions of scientific method which could not be properly addressed within the usually posed paradoxes of 20th Century physics, but which begin to find a clearer resolution when the subject matter becomes the relationship among the non-living, living, and also cognitive domains. For example, we knew already from the work of de Broglie and Schrödinger in the 1920s, that the paradoxes arising from the attempt to reduce experience within the non-living domain to a particle-based conception of substance, could be overcome by a wave conception which subsumed the phenomena of electromagnetic radiation and the old "mechanics" within a unified conception of microcosm and macrocosm.

However, Schrödinger was unable to carry over such insights into the domain of life, instead proposing a disappointing notion of local negation of entropy to explain the obvious upward organizing principle characterizing both evolutionary progress and cognitive human advance. That difficulty was resolved midway through the 20th Century by Lyndon LaRouche's recognition that human creativity, which he recognized as the driving force of human physical economic advance, and the actual source of wealth or value, as opposed to all prevailing theories of labor content or market valuation, was also the knowable principle of universal progress, or cognate with it. Therefore, the characteristics of that universally propagated creative principle must be adducible from properly constructed investigations into the relationship of cosmic radiations to life on Earth—provided that the usual flawed assumption about the completeness and efficacy of the human sensorium, the five senses, is cast aside, as LaRouche has recently emphasized.[3]

By revisiting the question of the interplay of radiation, including atmospheric and, implicitly, cosmic radiation, with life, the Montagnier experiments have brought to bear some fresh new evidence into this area of inquiry which had been declared almost *verboten* by the science establishment for most of the last century.

The Experimental Evidence

To make these matters more transparent, let us now review in greater detail the extraordinary experimental results reported by Montagnier and his colleagues.

1. Regeneration from filtrates. In a paper published in 2009,[4] Montagnier et al. reported evidence of bacteria and viruses regenerating themselves from apparently sterile solutions. After passage through filters of pore sizes far smaller than the bacterium or virus, solutions which had contained infected cultures, but tested as sterile after filtration, were able to regenerate the

International Organization for Mycoplasmology

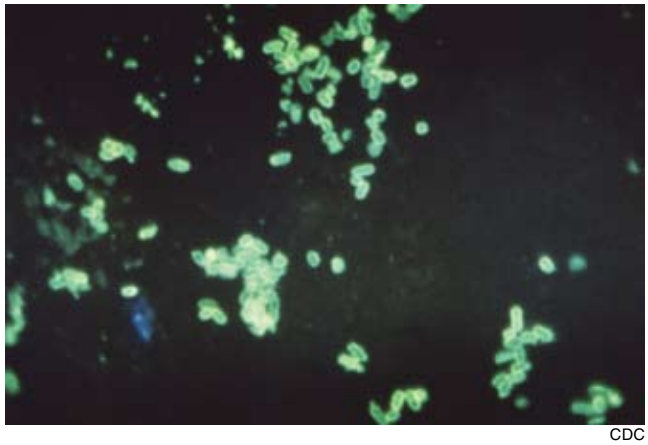
Mycoplasma hyopneumoniae *attached to swine cilia. The mycoplasma are very small bacteria, without a cell wall, which are implicated in several human diseases.*

bacteria and viruses that had infected them. The first experiments used *Mycoplasma pirum*, a species of small, cell wall-deficient bacteria, about 300 nM in size. The mycoplasma constitute a genus of very small bacteria, which are implicated in a number of human diseases and are resistant to many types of antibiotics.

After filtration of a culture of human lymphocytes infected with *Mycoplasma pirum* through filters of 100 nM or 20 nM porosities, incubation on a sterile culture of human lymphocytes showed regeneration of the original mycoplasma. The sterility of the cultures on which the mycoplasma was regenerated had been rigorously tested for traces of bacterial DNA, and showed negative. "Repeated search for traces of mycoplasma DNA by PCR [polymerase chain reaction] and nested PCR using specific primers for the adhesin gene or for the 16S ribosomal gene was consistently negative," Montagnier reports.

These were the results, first observed 10 years ago, which set Montagnier on this experimental path.

2. Emission of low-frequency waves from the filtrates. In the course of investigating this anomalous phenomenon, Montagnier and colleagues found a remarkable new property of these filtrates. After dilutions with water, the apparently sterile filtrates were shown to produce low-frequency electromagnetic



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The more classical Escherichia coli, *here shown magnified 1,250X in a fluorescent antibody stained photomicrograph.*

3. For example, Lyndon H. LaRouche, Jr., "A Wedding Anniversary: The Sixth Sense," *EIR*, Jan. 14, 2011, pp. 4-22. http://www.larouchepub.com/lar/2011/3802sixth_sense.html

See also, the report "The Extended Sensorium" by the LaRouche "Basement" Project, *EIR*, Feb. 4, 2011 and http://www.larouchepac.com/node/17172

4. L. Montagnier, J. Aissa, S. Ferris, J-L. Montagnier, C. Lavalee, "Electromagnetic Signals Are Produced by Aqueous Nanostructures Derived from Bacterial DNA Sequences," *Interdisciplinary Sciences: Computational Life Sciences* (2009) Vol. 1, pp. 81-90.

Jacques Benveniste, whose 1980s research found that an antibody remained in very diluted water—and who was then subjected to ridicule by the science mafia.

waves in a manner that was reproducible. Similar emissions were also found in apparently sterile filtrates of solutions that had been infected with a larger, more classical bacterium, *E. coli*, and with other microorganisms. But no signal was found in unfiltered solutions (Figure 1).

The waves were detected by an apparatus that had been designed by immunologist Jacques Benveniste.[5] Before being tested, the samples are serially diluted, 1 part in 10, in small (1.5 milliliter) plastic tubes, which are then tightly stoppered and strongly agitated for 15 seconds, a critical step. The sample is placed inside a coil of copper wire of 300-ohm impedance, which acts as a detector of low-frequency electromagnetic signals, attached to an amplifier. Computer software is used to separate background noise, and the signal is Fourier-analyzed. The first low dilutions were usually negative for a signal. Positive signals were usually obtained at dilutions ranging from 10^{-5} to 10^{-8}, or 10^{-12} (5 to 8, or 12 successive dilutions). Higher dilutions were again negative. The original unfiltered suspension was negative at all dilutions for all microorganisms studied (Figure 2).

When the signal appears, an increase in amplitude and in frequency over the background is detected. Frequencies close to 1,000 Hz and its multiples were found. The range of the detected frequencies falls in what is sometimes called the extremely low frequency (ELF) band of electromagnetic radiation (about 3 to 3,000 Hz). The bacteria are emitting frequencies which would be audible were they sound waves, but as electromagnetic signals are traditionally thought of as lying at the very low end of the radio frequency spectrum.

A remarkable feature of the results with bacteria and viruses is that many of the emitting filtrates are so highly di-

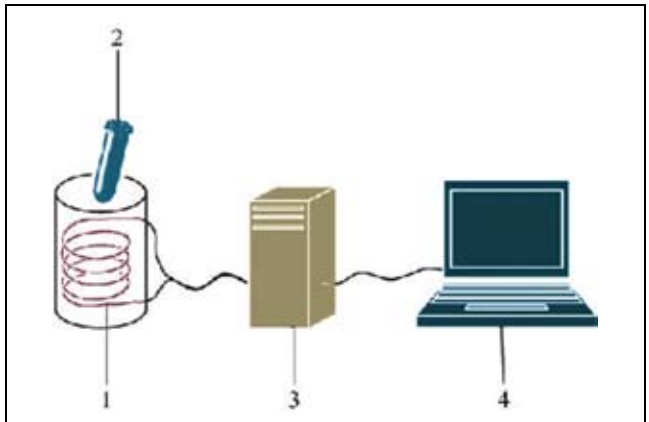

Figure 1

Device for the capture and analysis of electromagnetic signals: (1) a coil of copper wire, impedance 300 Ohms; (2) plastic stoppered tube containing 1 mL of the solution to be analyzed; (3) amplifier; (4) computer with software.

Source: "DNA Waves and Water"

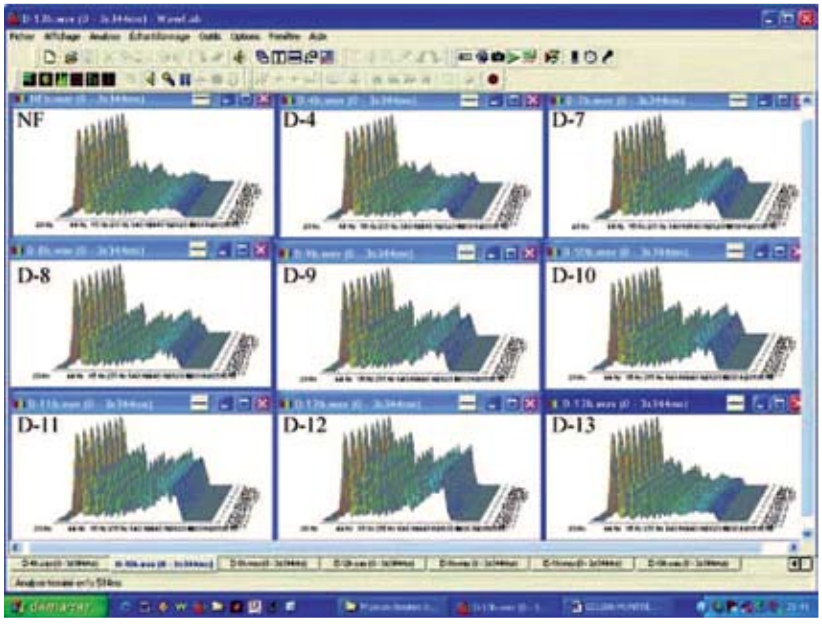

Figure 2

Fourier-analyzed signal from aqueous dilutions of Mycoplasma pirum. *The spikes at the left are the 50 Hz signal from electric circuit. The spikes at the right (prominent in D-9 to D-12) are interpreted as the positive signal of about 1,000 Hz from the bacteria.*

Source: "DNA Waves and Water"

5. Jacques Benveniste (1935-2004) had been the director of the immunology lab of France's National Institute of Health and Medical Research (INSERM). His research in the 1980s showed that water, which had once contained an antibody, but had been diluted to such a degree that no molecule of the antibody could remain, was still capable of acting upon a type of white blood cell known as a basophil. Benveniste concluded that the configuration of water molecules had become biologically active, despite the absence of the antibody. Benveniste's results were replicated by independent laboratories in Canada, Italy, and Israel, before their June 1988 publication in *Nature*. But in a follow-up visit to Benveniste's laboratory by a team including *Nature* editor John Maddox and magician James Randi, the results could be reproduced in many, but not all trials. Benveniste called the visit a mockery, and denounced McCarthy-like methods. But the high-profile defamation campaign by *Nature* caused him public discreditation.

luted as to have almost no likelihood of containing the original infectious agent or its complete DNA. In order to account for this, as well as the appearance of signals from pure water, Montagnier adopted an hypothesis developed by researchers into the anomalous properties of water, namely, that coherent, polymeric nanostructures are formed in the water. A number of physical studies have reported the formation of long polymers of hydrogen-bonded dipoles in water. However, these tended to be short lived. In Montagnier's view, the emitted signals may be a resonance phenomenon, perhaps depending upon excitation by the ambient electromagnetic noise. Their persistence after the removal of the agent which forms them might be due to a coherence effect produced by the radiations themselves, as postulated by Italian physicists Emilio Del Giudice and Giuliano Preparata.[6]

(Results dating back to the 1920s had shown the existence of emissions from living substances at the much higher frequency range of ultraviolet light.[7] Such emission was later confirmed by Fritz-Albert Popp, who named the phenomenon biophotons.

German researcher Fritz-Albert Popp continued the 1920s work of Alexander Gurwitsch, investigating emissions from living plants of high frequency untraviolet light, which he named biophotons.

Popp and colleagues demonstrated that the light was coherent, somewhat like a laser; that the emitting molecules are coupled by a coherent radiation field; and that the source is the DNA in the cell nucleus. Whole body biophoton detection in Popp's lab showed a correlation with known biological rhythms of diurnal, lunar, and other periodicity, and suggested the existence of a globally organized biophoton field for the organism.[8])

3."Cross talk" between the test tubes. In continued experimentation by Montagnier, it proved possible both to eliminate the signal from certain dilutions, and to cause others, which had not emitted, to begin emitting signals. This is the phenomenon Montagnier refers to as "cross talk."

In one series of experiments, negative (non-emitting) dilutions were combined with positive (emitting) dilutions. Thus, when 0.1 mL of a negative low dilution (perhaps 10^{-3}) was added to 0.4 or 0.9 mL of a positive dilution (10^{-8}), the latter became negative. "This indicates," writes Montagnier, "that the 'silent' low dilutions are self-inhibitory, probably by interference of the multiple sources emitting in the same length, or

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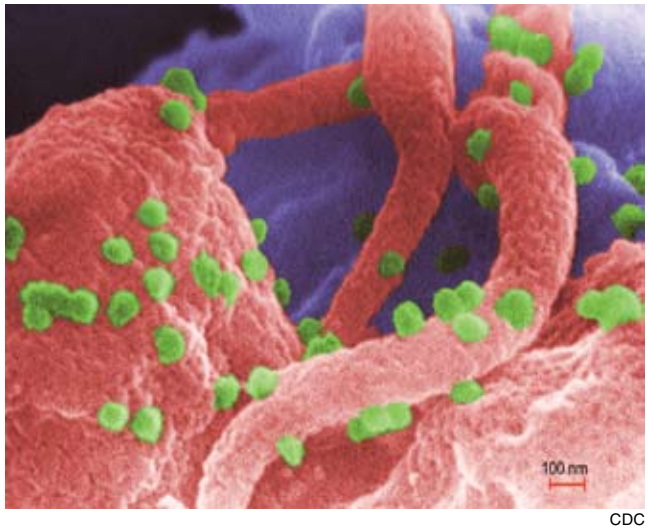
Scanning electron micrograph of Salmonella typhimurium *bacteria magnified 15,000X. Montagnier observed electromagnetic signals in dilutions of Salmonella, and other bacterial species.*

slightly out of phase, like a radio jamming. Alternatively, the abundance of nanostructures can form a gel in water and therefore are prevented to vibrate."

If this is truly a wave effect, it should be possible to demonstrate that the properties of the dilutions could be communicated, not by physically combining them, but by placing the plastic tubes containing them next to one another. This was demonstrated by placing a donor tube of a low "silent" dilution (10^{-3}) of *E. Coli* next to a receiver tube of a positive "loud" dilution (10^{-9}) of the same substance.

The tubes were placed for 24 hours inside a box surrounded by a nickel-iron alloy known as mu-metal, which has the property of suppressing low-frequency magnetic fields. The hypothesis was that the mu-metal would shield them from external



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Scanning electron micrograph of the human immunodeficiency virus (HIV-1), which is spherical in appearance. Montagnier observed electromagnetic signals from a portion of the virus DNA.

6. E. Del Giudice, G. Preparata, G. Vitielo, "Water as a free electric dipole laser," *Physical Review Letters,* Vol. 61, pp. 1085-1088 (1988).

7. See, for example, Gurwitsch & Gurwitsch, "Twenty Years of Mitogenetic Radiation: Emergence, Development and Perspectives," *21st Century Science & Technology*, Fall 1999, pp. 41-53.

8. cf. *Recent Advances in Biophoton Research and its Radiations*, edited by F.A. Popp (World Scientific, 1992).

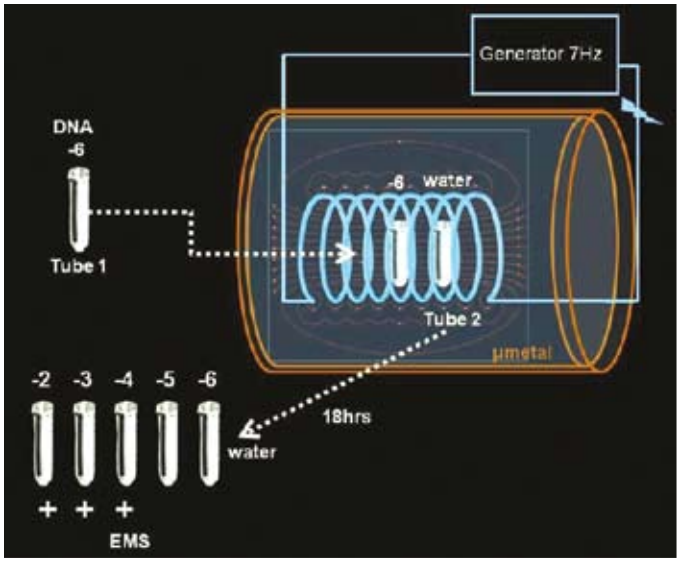


Figure 3

Small test tubes containing diluted bacterial culture, or pure water, were placed inside a solenoid of copper wire which was shielded by mu-metal to prevent extraneous magnetic influence. A generator sent an electrical signal to the solenoid, creating a low-frequency magnetic field of 7 Hz. The device could cause "cross talk" between the tubes.

Source: "DNA Waves and Water"

electromagnetic noise, permitting the active electromagnetic emissions from the bacteria to act on their own. After 24 hours in the shielded box, the donor tube was still silent, but the receiver tube had also become silent. But when the receiver tube was further diluted, a signal appeared again.

"These results suggest," writes Montagnier, "that the receiver tube was made silent by the formation of an excess of new nanostructures, which could emit signals upon further dilution." By interposing a sheet of mu-metal between the tubes, it was possible to suppress the effect.

The cross talk also proved to be species specific. Electromagnetic signals were observed in dilutions of other bacterial species, including *Streptococcus B, Staphylococcus aureas, Pseudomonas aeroginosa, Proteus mirabilis, Bacillus subtilis, Salmonella*, and *Clostridium perfringens*. The signals were detected in the same range of dilutions observed for *E. coli,* and the transfer effect was noted upon immersion in a mu-metal shielded box. But a species could only "talk" with a member of the same species.

4. Wave transmission of DNA genetic information to water. The next phase of the experimentation proved truly remarkable, for it comes close to challenging the tenet of biology, sometimes known as Redi's principle, and also strongly defended by Pasteur, that all life comes from life (*omne vivum ex vivo*). Yet, a closer analysis will demonstrate that it is not the truth of the principle, but what we mean by "life" which is actually challenged by the results.

In experiments reported by Montagnier at a 2010 conference in Lindau,[9] a tube of pure water, when exposed to a second tube emitting signals, was made to emit signals, and then to cause DNA sequences placed into the pure water to assemble into sequences similar to those of the original emitting organism. Because of its importance we will summarize the experiment in as much detail as is available.

As reported in a 2010 paper on the experiment,[10] a fragment of DNA taken from the long terminal repeat of the AIDS virus (HIV) was used as the source. (The long terminal repeat is a portion of the DNA found in retroviruses that repeats itself many times over.) The fragment was then amplified by the PCR technique, in which a naturally derived enzyme, known as polymerase, artificially stimulates the DNA to reproduce many copies of itself when the nucleotides and other raw materials are supplied. Dilutions of the PCR-amplified DNA solution were then made, as in earlier experiments, until an electromagnetic signal was detected.

The contents of the tube were then filtered through 450-nm and 20-nm porosity filters, and diluted from 10^{-2} to 10^{-15}. A second tube containing pure water was subjected to the same filtration and dilutions. The tubes were then placed near to one another inside a horizontally oriented copper coil or solenoid (Figure 3). The solenoid and tubes are placed inside a container shielded by a 1-mm-thick layer of mu-metal. A low-intensity electric current oscillating at 7 Hz was then fed to the solenoid from an external generator for 18 hours at room temperature.

When the tube containing pure water was removed after 18 hours, it was found to emit signals, as did the tube containing the diluted filtrate of viral DNA. No emission occurred under the following conditions:

- Time of exposure less than 16-18 hours
- No coil
- Generator turned off
- Frequency of excitation less than 7 Hz[11]
- Absence of DNA in the first tube.

Now comes the most remarkable step. The ingredients for synthesizing DNA by the polymerase chain reaction (nucleotides, primers, polymerase) were added to the tube containing the pure water. It is expected that the PCR reaction should re-

9. "DNA between Physics and Biology: DNA Waves and Water" from the presentation of Dr. Luc Montagnier, Lindau, 28 June 2010 http://montagnier.net/montagnier/index.php/publications/

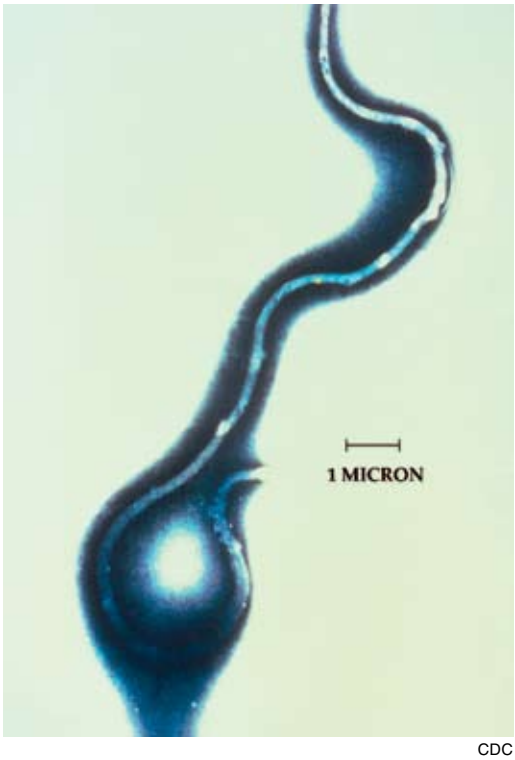
10. L. Montagnier, J. Aissa, E. Del Giudice, C. Lavalee, A. Tedeschi, and G. Vitiello, "DNA waves and water."

11. Compare the experiments of Italian biophysicist Bruno Brandimarte in applying low-frequency magnetic oscillations, both *in vitro,* and to the healing of wounds and other pathologies. Brandimarte proposes that magnetic oscillations below 10 kHz are non-Maxwellian waves, which should be called *magneto-electric*, not electromagnetic. See, Bruno Brandimarte, "Whole-Body Magneto-Therapy Speeds Wound and Disease Healing," *21st Century Science & Technology,* Summer 2010, pp. 21-30. www.21stcenturysciencetech.com/Articles_2010/ Summer_2010/Magneto-Therapy.pdf

quire the presence of at least one copy of the DNA segment which is to be reproduced, to serve as an initial template for DNA amplification. This was not added. The PCR reaction was then performed in the usual way by cycled exposure to heat. The result was that the DNA produced from the tube initially containing pure water was of the expected size and 98 percent identical in sequence to the original DNA sequence from the long terminal repeat of the HIV. Out of 104 nucleotides (the molecules which join together to make up the DNA structure), only two were different from the original. The experiment was reproducible and successful in 12 out of 12 tries. It was successfully repeated with a DNA sequence from a bacterium, *Borrelia burgdorferi*, the spirochete responsible for Lyme disease.

Montagnier concludes his report with the observation:

> These elements give support to a provocative explanation of our *Mycoplasma pirum* filtration experiment: The nanostructures induced by *M. pirum* DNA in the filtered water represent different segments of its genomic DNA. Each nanostructure, when in contact with the human lymphocytes, is retro-transcribed[12] in the corresponding DNA by some cellular DNA polymerases. Then there is a certain probability (even very low) that each piece of DNA recombines within the same cell to other pieces for reconstructing the whole DNA genome. We have to assume, that in presence of the eukaryotic cells, the synthesis of the mycoplasma components (membrane lipids, ribosomes) can be also instructed by the mycoplasma DNA. One single complete mycoplasma cell is then sufficient to generate the whole infection of lymphocytes. Recent experiments of the C. Venter group have shown [Gibson D.G., et al., *Science*, Vol. 329, pp. 52-56 (2010)] that a synthetic genomic DNA is sufficient to maintain all the characteristics of a mycoplasma. All the steps assumed in the regeneration from water can be analyzed and open to verification.[13]



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Photomicrograph of Borrelia burgdorferi*, the spirochete bacterium that causes Lyme disease. Montagnier also found electromagnetic signals from a portion of this bacterium in diluted water.*

Again, the Non-Particle View

A broad view of the results of Montagnier, as also those of the Craig Venter group, touch upon a most fundamental question as to the nature of life. In stating the principle, *all life comes from life*, a principle which has never been shown to be violated in any experiment to date, it is usual to envision some material process, such as egg and sperm, spore, or cell division, as the responsible agent. In the results reported here, however, the life principle appears to be transmitted, not by the immediate presence of a material substance, but mediately, in connection with a signal detectable by electromagnetic apparatus. The fuller elaboration of the mechanisms, whether by formation of nanostructures in water as suggested, or perhaps by additional means, remains to be worked out. However, we can say that the Montagnier results, as also the widely reported results of the Venter group in creating a bacterial cell controlled by an assembly of a complete bacterial genome,[14] require an extension of that usually limited conception of life. But it is the work of Montagnier, which sheds the greater light on the question.

The attempt to reduce the principle of life to something derivable from the laws of chemistry and physics was never very satisfactory. The argument of the vitalists, that an animating principle must be superimposed upon the presumedly self-evident material substance of living matter, also had its limitations. With the results of Montagnier, we recognize that the principle, *omne vivum ex vivo*, still holds, but only on the condition that we adopt a non-particle conception of life.

12. By this, I believe Montagnier means to indicate that the single-stranded DNA is synthesized as in a retrovirus, but without the presence of the RNA template. Instead, the aqueous nanostructure serves as the "template."

13. Montagnier, "DNA Waves and Water," *op. cit.*

14. In 2010, researchers at the J. Craig Venter Institutes reported what some called "artificial life" (Gibson, et al., "Creation of a Bacterial Cell Controlled by a Chemically Synthesized Genome," *Science*, Vol. 329, pp. 52-56, 2010). Ingeniously extending known methods of cloning, the team caused 100 components of artificially synthesized gene sequences to assemble into a structure virtually identical to the DNA of the bacteria *Mycoplasma mycoides.* Inserted into the cell of a closely related species of *mycoplasma*, the new cell grew into colonies, expressing the synthetic DNA sequence. The word "creation" in the article's title is, however, misleading. To those confused into supposing that life has been created *de novo*, some clarity might be achieved by the very rough analogy that the synthesis requires the *E. coli* and baker's yeast organisms as surrogate "father" and "mother," as it were. The synthesis requires staged insertion of the sub-products into the larger *E. coli* bacterium, and then into the DNA of *S. cerevisiae* (baker's yeast), where the artificial *M. mycoides* genome comprises about 5 percent of the total DNA length. Life is not created *de novo*, but only in the presence of life, as in the Montagnier experiments. This, apart from moral considerations as to the misuse possible in all genetic experiments, as also in the patenting of biological materials in agriculture, neither of which we take up here.