Watergates:
Logic Operations in Water

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Abstract
Using frequency imprinted water, the basic reversible logic gates and their operations on frequency can be demonstrated. Whence, any reversible Boolean function can be computed. Coherence in water leads to fractal properties for imprinted frequencies and to the possibility of anticipatory signal propagation. This is interpreted in terms of the Josephson-Effect coupling between phase coherent domains in the frequency imprinted water.
Keywords: coherence, frequencies, water, logic gates, living systems.

1 Introduction

In a previous paper which the writer presented at CASYS'01, "Learning From Water, a Possible Quantum Computing Medium"[1,2], the properties of coherent systems were applied to frequencies imprinted into water and living systems and showed that the basic arithmetical operations can be performed on these frequencies.

It has now been possible to demonstrate using somewhat similar arrangements that the basic reversible logic gates and their operations also can be implemented. Any reversible Boolean function can be computed by the reversible logic gates N (not), CN (control-not) and CCN (control-control-not). With reversible logic gates, knowledge of the output states enables one to determine the input states unambiguously; irreversibility leads to de-coherence and heat dissipation.

The arbitrary choice of states for '0'and '1' was made on the basis of the biological effects of frequencies imprinted into water. The '1' and '0' probably represent two specific phases of a macroscopic wave function. For a '1', the imprint phase was that giving stimulation to a biological system, for a '0' the imprint was that giving a depressive effect. For convenience, these phases can be readily recognised by the dowsing response[3] obtained from such frequency imprinted water

A quantum computing system might be based on such phase qubits which can take up a probability of being in any state from 0 to 2π. Such gates would be able to function separately in parallel processing modes, one for each frequency imprinted into the input tube(s). In homoeopathy, *potentisation* is used to describe the general process of imprinting, *succussion* is imprinting by mechanical impact; although other methods are available.

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2 Theoretical Background

In 1967, Fröhlich gave a paper[4] at a conference on "Theoretical Physics & Biology" in Versailles which he entitled "Quantum Mechanical Concepts in Biology". In this he covered: long-range phase correlations in respect of biological order with absorption defining the range of the phase correlations; the excitation of organs to their correct frequency by energy pumping; cell division stimulated by membrane deformations; the cessation of growth when cell concentration suppresses coherent modes of oscillation. He added that he had been able to show that non-linear interactions will lead to the channelling of supplied energy into coherent modes. He combined high frequencies and collective (cooperative) behaviour with long-range phase correlation (coherence) and applied this to biological systems. This had been found to describe the order found in superconductors, superfluids and lasers. He emphasised that superconductivity was the consequence of coherence not of low temperatures, and any system which could achieve the necessary coherence would acquire these properties and that magnetic flux is always quantised. Fröhlich pointed out that superconductivity could give rise to an AC Josephson-Effect resonating with the electric vibrations in biomolecules he had postulated. He had predicted 10^{11} Hz and at the Josephson inter-conversion (2e/h) of approximately 500 MHz/μV these AC Josephson voltages would have been 200 μV. The involvement of the magnetic vector potential is implicit in the wave equations but, he did not specifically discuss the possibility of living systems being sensitive to the magnetic vector potential (**A**-field). The work of Fröhlich has been surveyed recently by the present writer[5]. The physical mechanisms which make logic gates in water and living systems a possibility are based on the properties of coherence in water. The theory of this is based on quantum electrodynamics (QED) and has been worked out by Del Guidice and Preparata[6,7,8]. Their conclusions are that liquid water as all QED condensed matter consists of two distinct interspersed phases: an incoherent gas-like phase packed between 75nm clusters within which all water molecules interact coherently with a large classical electromagnetic field. The Josephson-Effect should be available between the coherent phases separated by weak links of incoherence. They were able to predict water's critical volume; boiling temperature; latent heat of vaporisation; specific heat; the specific heat and compressibility anomaly at 230K; the density anomaly at freezing point and the low frequency dielectric constant.

To demonstrate the possibility of an anticipatory effect from a superluminal coherence velocity, water was imprinted with frequencies at ±0.6 GHz relative to the 1.42 GHz molecular hydrogen resonance. This choice was made to keep everything on the scale of a single oscillator. There is no coherence interaction and no refraction at 1.42GHz. At 1.42-0.6 GHz, the 45° critical angle for total internal reflection was as usual in the water and corresponds to a coherence velocity of 210Mm/s. At 1.42+0.6 GHz, the critical angle was 45° but on the air side of the interface corresponding to a coherence velocity of 420Mm/s. This represents a possible anticipatory channel of communication. Note that it is coherence which is propagating by diffusion, not energy. It needs to be established whether living systems can make use of this information. If they can, 'Maxwell's Demon' is potentially available.

In the course of work with electrical hypersensitive patients[9], water[10] and homoeopathic potencies, it was found that a potency and a water imprint would be erased if the geomagnetic field was shielded. The threshold magnetic field for this erasure is 367 nT, a little less than 1% of the normal geomagnetic field. It was independent of the frequency imprinted over 13-decades from 10^{-4} Hz to 10^{+9} Hz. It is inversely proportional to the absolute temperature. From this, one can assume that imprint erasure takes place when thermal energy exceeds the magnetic energy in a domain of coherence. This gives the volume of the domain of coherence involved in water memory, as that of a sphere of diameter 52.9 μm.

A direct measure of erasure was possible using a drop of frequency imprinted water placed between the jaws of a precision micrometer in the laboratory geomagnetic field. The imprint was present down to 109μm but erasure had taken place by 108μm. Again, this was independent of the frequency imprinted over 13-decades from 10^{-4} Hz to 10^{+9} Hz. The threshold magnetic field for erasure gives a domain diameter of 52.9 μm compared with 108.5μm for the micrometer method. Therefore, it must be assumed that two domains (=106μm) are required for the retention of an imprint in water between two metal surfaces. The writer has described in detail[5] how the retention of frequency information imprinted into water might involve proton precession becoming synchronised to an applied frequency so that coherent protons generate their own internal magnetic field such as to satisfy proton NMR conditions. This only depends on the size of the coherence domain and a critical number of protons becoming synchronised[11]. It is independent of frequency. Such an imprint would be stable unless the domain was thermally broken up by removing the stabilising geomagnetic field. Although the 75 nm domains are those most likely to form as water vapour is condensed, there could be a hierarchy of domains based on the exchange of radiation between any water molecule resonances. Interaction between water and the n-alkanes indicates that the far-infra-red (FIR) rotational spectrum is involved. Imprinting a frequency into water gives side-bands to the natural water resonances so if this model is correct, the imprints must also resonate with coherence domains. There is a 62 cm^{-1} difference between two water-laser lines in the FIR corresponds to a wavelength of 161 μm and this would correspond to a 'pearl-chain' of three 52.9 μm domains (= 159 μm). If one water resonance can couple to a domain, fractality should couple the others to it. It had previously[1,2] been found that a sequence of 7-unidirectional pulses of electric potential applied to a metal beaker containing a frequency source which may be an ampoule of frequency imprinted water or a toroidal coil connected to an electrical oscillator set to the required frequency, will copy that frequency into a nearby ampoule of "clean" water. Reversing the polarity of the pulses by reversing the battery reverses the phase of the imprint. If each domain in the above 'pearl-chain' of three domains has to be reset in order to couple an imprint to water resonance, this would require binary operations from 000 to 111, and explain the need for 7-unidirectional voltage pulses. For two domains of coherence separated by a thin non-superconducting barrier[12], the tunnel current that passes across such a barrier is determined by the energy gap in the respective electron states densities. Josephson suggested that a super-current could also pass by the tunnelling of electron-pairs and this would determine the phase difference

between the two wave functions characterising the domains of coherence on either side of the barrier. The electron-pairs can cross the barrier even when there is zero potential difference across it. The only requirement in crossing a potential difference V is that the electron-pairs absorb or radiate electromagnetic radiation of frequency ν given by $h\nu = 2eV$, where e is the electron charge and h is Planck's constant. This inter-conversion factor 2e/h is approximately 500 MHz/μV.

3 Experimental Logic Gates

The inputs and outputs for theses gates were in water contained in glass tubes approximately 15 mm diameter and 100 mm length (BD Vacutainer - 10 ml) each containing about 5 ml of boiled filtered water. These were placed as shown in the following diagrams so as to touch 30 ml glass jars with metal caps also about half-full with the same water. For these experiments, a frequency of 1 kHz was imprinted into the tubes indicated with un-primed letters in the phases shown in the Tables. The primed-letter tubes contained the above water which had been erased of all imprints by shielding the geomagnetic field. The gate operation or 'potentisation' was effected by a train of 7-unidirectional voltage pulses produced from a 1.5 Volt battery using the mechanical contact indicated in the Figures. The water in these jars did not acquire any imprint. They seemed to be necessary to couple the input and output tubes in the appropriate spatial arrangement for their wave functions to overlap. Their positions were found as the result of trial-and-error.

3.1 N-Gate

If the input tube A is imprinted with a frequency in the stimulatory phase (a 1-state) and the other tubes carry no imprint, then after applying the 7-unidirectional pulses, tube A' carries a copy of the imprint in tube A while tube B' carries an imprint of the same frequency but in the 0-state, and conversely as shown in Table 1.

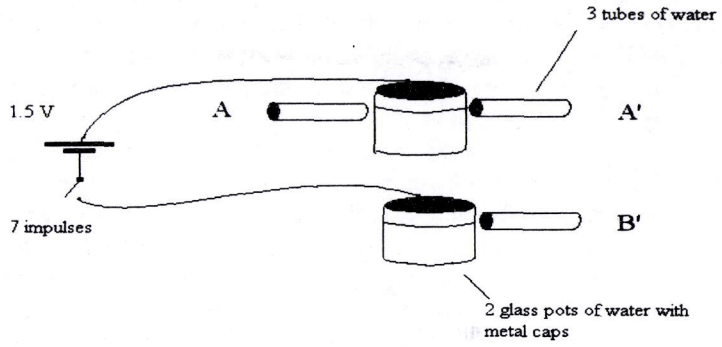

Figure 1: N-Gate

Table 1: N-Gate

A		A'	B'
Input			Output
0		0	1
1		1	0

3.2 CN-Gate

For this gate as shown in Figure 2, the observed states of the output (primed) for the given input states (un-primed) were appropriate for the CN-gate and as listed in Table2.

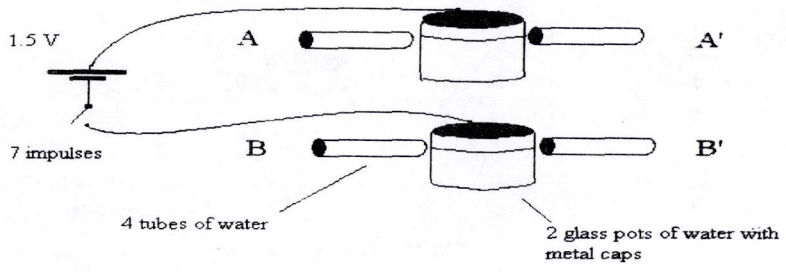

Figure 2: CN Gate

Table 2: CN-Gate

A	B		A'	B'
Input			Output	
0	0		0	0
0	1		0	1
1	0		1	1
1	1		1	0

3.3 CCN-Gate

For this gate an additional jar and two additional tubes were required as shown in the Figure 3 below; the observed states of the output (primed letters) for the given input states were as appropriate for the CCN-gate and are listed in Table 3.

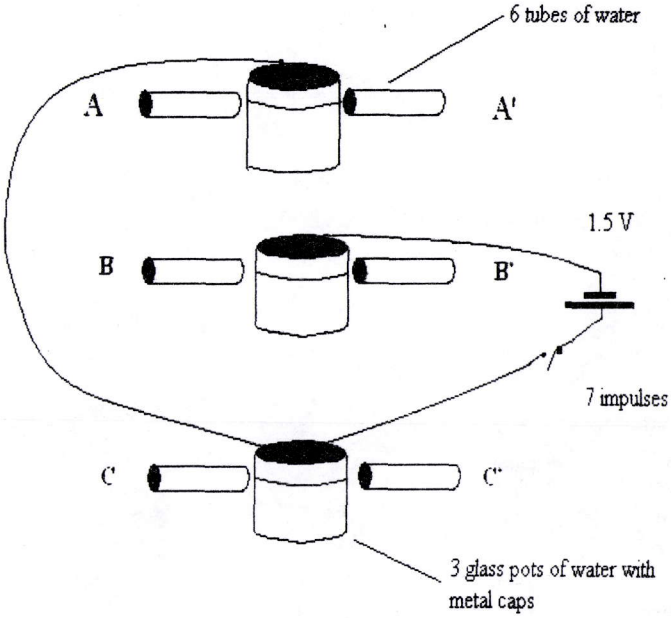

Figure 3: CNN-Gate

Table 3: CNN-Gate

A	B	C		A'	B'	C'
Input				**Output**		
0	**0**	**0**		**0**	**0**	**0**
0	**0**	**1**		**0**	**0**	**1**
0	**1**	**0**		**0**	**1**	**0**
0	**1**	**1**		**0**	**1**	**1**
1	**0**	**0**		**1**	**0**	**0**
1	**1**	**0**		**1**	**1**	**1**
1	**1**	**1**		**1**	**1**	**0**

4 Discussion

Work with electrically hypersensitive patients[9] showed that *frequency* was the parameter of prime significance to biological systems and that macroscopic quantum effects could be observed[13] through sensitivities to the magnetic vector potential as generated by a toroidal coil. Field strengths were only significant as thresholds for the observation of effects.

Living systems were found to have endogenous coherent frequencies on their acupuncture meridians extending from the target organs to the peripheral acupuncture points with additional frequencies at points where there was a connection to the autonomic nervous system as described by Voll.

The sort of effect that frequency can have on water and living systems is to change isomers of amino acids between the L- and D- structures[14]. The activity of an enzyme is highly dependent on its tertiary structure so that frequency could be used by living systems to activate or de-activate enzyme activity.

Nerve impulses in living systems are of sufficient amplitude to be able to perform such arithmetical and logic operations on endogenous frequencies. The frequency imprinting effect persists for 7-pulse trains to voltages below those of the nerve action potential. Therefore, nerve pulses in the brain could control logic gates *in vivo*. In "The Brain as a Conscious System", Marcer and Schempp[15] describe a model of the brain/mind in physically realisable processes.

To attempt to identify the biological equivalent of the above logic gate diagrams, one notes that a nerve cell has an axon connected to it and that when the nerve cell is de-polarised a nerve impulse passes along the axon to muscle fibres. The inputs come from excitatory or inhibitory synapses. Thus, interactions with the parasympathetic and sympathetic branches of the autonomic nervous system are of particular interest for possible logic operations. A physiology text remarks that, 'algebraic summation of the synaptic inputs occurs at the anterior horn cell and other parts of the central nervous system'. This may be a simplistic way of saying that logic operations occur there. The mammalian nervous system has several types of receptor or effector neurons (motor, olfactory, auditory, cutaneous, retinal) all are characterised by a dendritic zone, a nerve pulse transmission zone and terminal buttons (telodendria).

In the above diagrams, the nerve cell would be the equivalent of the water-filled glass jar with the metal lid, the synaptic terminals by the frequency imprinted water in the glass tubes which are situated close to the jars. There is of course no chemical secretion but there is field coupling. The wire and battery would represent the axon. Thus in addition to well known effects of the cell polarisation/de-polarisation voltages and chemical secretion activity, there may be additional bio-effects obtained through logical operations and frequency imprinting.

Dubois[16] describes a simple computing anticipatory system which can be simulated on a computer from an incursive harmonic oscillator equation. He redefines the classical differential equations of a harmonic oscillator with discrete time interval in a finite difference equation. This shows orbital stability but it becomes unstable when amplitudes increase. The introduction of an incursive term gives two solutions and consequently a hyperincursive system. There is uncertainty if it is required to know both the position and velocity of the system at the same time. This is equivalent to a description of Heisenberg Uncertainty in a coherent system.

There are many instances of coherent oscillations in living systems. Those on the acupuncture meridians come immediately to mind. The simplest of all bio-systems is the chemical molecule with a chain of water molecules hydrogen-bonded to its sides or ends. This it has resonance properties and Cardella et al.[17] have shown that a passive

resonator can imprint its resonance into water. It is not know at what level of biological complexity a living system might be able to compute the frequencies it needs.

This paper has tried to show that such computations are possible in principle. Dividing yeast cells develop a frequency (~8 MHz) which corresponds to the rate constant for ATP hydrolysis, the energy source. This might be an anticipatory process The snail has a giant axon giving with regular electrical impulses which are sensitive to the electrical environment and these might be able to activate in it some computing functions or generate frequencies.

5 Conclusion

This work has tried to demonstrate that logic gates can be devised using the phase states of a water frequency imprint as logic input and output signals. Physical mechanisms in water needed to implement this have been described. The results of the preceding work on arithmetical logic operations in water would enable frequency information to be transferred between different computation channels operating at different coherent frequencies. These processes should still be able to operate when scaled down to biological dimensions. Nerve pulse trains would be the equivalent of the manually generated trains of 7-impulses. The metal capped jar would become the neuron cell, the wires become the axon and the input and output tubes would be the synapses and dendrites. Each coherent frequency would be processed separately enabling parallel processing to be performed. The acupuncture meridians in living systems carry endogenous frequencies which could become involved in such logic operations. The choice of a suitable frequency would allow superluminal coherence propagation with the possibility of anticipatory effects.

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