QED, Water, Experiments

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- QED and Coherent Domains
- Marc Henry
- Hans Geesink and Dirk Meijer
- Experiments

The Coherent Domain

- Coherent Domains form in water
- Once a critical density is reached
- Size of Coherent Domain is the wavelength of the oscillation
- Molecules oscillate in unison between two single-particle states
- In tune with a non-vanishing EM field trapped in the ensemble of molecules
- Understand this with Quantum Electrodynamics {QED}

Ivon Bono et. al. *Emergence of the Coherent Structure of Liquid Water*, **Water** Vol 4, 2012, pp. 510-532.

How Does Coherence Begin: Zero Point Energy

- Zero-point Energy is the lowest possible energy that a Quantum Mechanical system may have
- Quantum Systems constantly fluctuate in the lowest energy state
- Oscillations in a coherent domain are governed by the potential fields
- In accordance with the Heisenberg uncertainty principle

$$\Delta x \Delta p \geq \frac{h}{4\pi}$$

Zero Point Energy

- Zero-point Energy is the lowest possible energy that a Quantum Mechanical system may have
- Quantum Systems constantly fluctuate in the lowest energy state
- In accordance with the Heisenberg uncertainty principle
- Oscillations are relative to the potential fields

The Ground State

- The random fluctuations of the quantum system constitute the ground state
- The small fluctuations (oscillations) are not independent and uniformly distributed
- There could be a Markov dependence
- There may be a tendency for one frequency over time to dominate

The Excited State

Arani et. al. write

> *Above a certain density threshold, due to a fundamental instability, the small quantum fluctuations of the wave-field between the ground state and the singled out excited state will grow to a large value leading the quantum system matter plus EMF to a state where matter oscillates in phase with the modes of the EMF that are in resonance with the matter transition.*

Arani et. al., *QED Coherence and the Thermodynamics of Water*, **Int. J. Modern Physics B**, No. 15, Vol. 9, 1995, pp. 1813-1841.

Coherent Ground State

- The zero point fluctuations produce a Perturbative Ground State
- And with the build up of a dominant frequency, the system migrates to the Coherent Ground State
- The system oscillates between the Perturbative Ground State and the Coherent Ground State
- In the Coherent Ground State, the electrons are all in unison
- And the electrons are acting as if they are free electrons
- The volume occupied by each molecule in the Coherent State is larger than the volume occupied by the molecules of the incoherent state

Size of Coherent Domain

- Suppose the wavelength of oscillation is 100 nm
- The ultraviolet band: 10nm to 400nm
- Size of spherical Coherent Domain is 100nm
- Water molecule has a size of .1 nm
- Spherical Coherent domain diameter is 1000 times larger than water molecule!

The Coherent System

- Large number *N* of particles
- Whose density N/V exceeds a critical threshold
- Whose temperature *T* lies below a critical value
- Settles into a new minimum energy ground state
- Where particles oscillate coherently between two states
- Belonging to their individual spectrum
- In tune with an EMF whose wavelength is on the order of the size of the coherent domain

Remark on Coherent Domain Oscillations

- Water Molecules Oscillate between
  - The ground state, relatively small $eV = .26$
  - And an excited state 12.06 eV
- The ionization potential of water is 12.56 eV
  - $H_2O \rightarrow 2H^{++} + 2e^- + O$
- If the coherent domain water molecules were to be oscillated at an energy about .5 eV volts more
  - Water would Split
  - Making H^+ available to burn in the body

- Why should molecules move in unison?
- Collectively tune their oscillations?
- Respond in unison to external perturbations?
- This is what prompted Herbert Frölich to introduce quantum mechanics
- As a theoretical tool for biology
- And to put coherence
- The property of an assembly of elementary components to have
  - The same rhythm of oscillation
  - The same phase
  - At the center of biological dynamics

Quantum Mechanics and Coherent Domains

- Water molecules oscillate in unison between two single-particle states
- In tune with a non-vanishing EM field trapped in the ensemble of molecules
- The new state is termed coherent
- The relevant physical variable is phase ϕ, a scalar function of (x, y, z, t)
- Quantum Mechanics connects ϕ to the EM potential fields
  - $\vec{A}$, The vector magnetic potential field
  - Φ, The electric potential field

$$\vec{A} = \frac{h}{2\pi e}\vec{\nabla}\phi$$

$$\Phi = -\frac{h}{2\pi e}\frac{d\phi}{dt}$$

Ivon Bono et. al. Emergence of the Coherent Structure of Liquid Water, **Water**, Vol 4, 2012, pp. 510-532.

$$\vec{A} = \frac{h}{2\pi e}\vec{\nabla}\phi$$

$$\Phi = -\frac{h}{2\pi e}\frac{d\phi}{dt}$$

The energy carrying Magnetic Flux field designated by $\vec{B}$ is related to the vector magnetic potential field $\vec{A}$ by

$$\vec{B} = \vec{\nabla} \times \vec{A}$$

But the curl of a gradient is always zero. So $\vec{B} = 0$.
How can there be an electromagnetic wave without a $\vec{B}$ field?
When the wave is a Longitudinal wave, not a Transverse wave.
The Longitudinal wave is allowed in the Generalized Maxwell's equations.

Marc Henry: Quantum Mechanics and Density

- Quantum mechanics matters as soon as density of solvents or concentration of solute species becomes higher than a characteristic threshold
- Reformulate the problem in terms of density
- For water, this density threshold is approximately .322 *grams*/*cm*^{3}
- Solute concentrations higher than 100*mM*
- The usual approach is to work things out using hydrogen bonding above this critical density threshold
- Classical physics with ad hoc models with water molecules of fixed size
- But quantum mechanical effects must be considered in the high-density region

Hofmeister Series

- Hoffmeister worked in the 1880's
- The Hofmeister series is a classification of ions in order of their lyotrophic properties
- Salting out: solubility in water decreases with increasing salt concentration
- Salting in: solubility in water increases with increasing salt concentration
- Salting out was the common method of protein precipitation
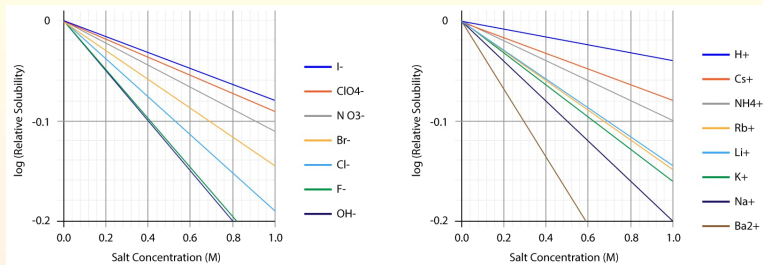
Salting Out

Anions   Cations

$$\log \frac{S}{S_0} = -K_S C$$

S_0 is the solubility of a substance in pure water
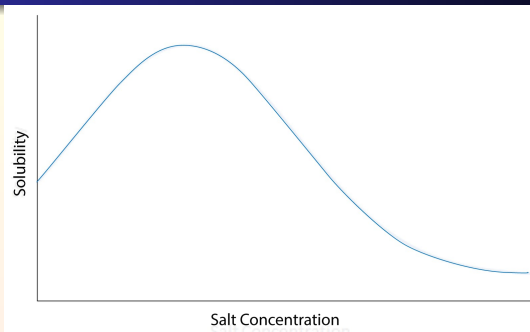C is the concentration of the salt
K_S is the salting out coefficient (Setschenov constant, 1889)
$K_S > 0$ Salting out
$K_S < 0$ Salting in

https://www.crawfordscientific.com/chromatography-blog/post/the-hofmeister-series

Solubility versus salt concentration curve for a typical globular protein, illustrating salting-in and salting-out at low and high salt concentrations, respectively.

$$\log \frac{S}{S_0} = -K_S C$$

https://www.crawfordscientific.com/chromatography-blog/post/the-hofmeister-series

Characteristic Frequencies

- Crude Derivation of Characteristic Frequencies
- Mass Energy Equivalence
    - $E = M * c^2$
- Planck-Einstein Relation
    - $E = h * f$
- $M * c^2 = h * f$
- $f(Hz) = 2.981 M(g/mol)$
- The relation $f(Hz) = 2.981 M(g/mol)$ is transposed 76 octaves down to get to audio frequencies
- Characteristic frequency for water, $18 g/mol$, is 54 Hz

$$f(Hz) = 2.981 * 18 = 53.65$$

Ion	M.W./g-mol	f(Hertz)	Note	Scale Interval
$Li^{\oplus}$	7	21	E0 (21)	4
$F^{\ominus}$	19	57	$A^{\sharp}$1 (58)	m2
$Na^{\oplus}$	23	69	$C^{\sharp}$2 (69)	M3
$MG^{2\oplus}$	24	72	D2 (72)	4
$CL^{\ominus}$	35	104	$G^{\sharp}$2 (104)	M7
$CL^{\ominus}$	37	110	A2 (110)	1 octave
$K^{\oplus}$	39	116	$A^{\sharp}$2 (117)	m2
$Ca^{2\oplus}$	40	119	B2 (124)	M2 (d)
$Mn^{2\oplus}$	55	164	E3 (165)	5
$Fe^{3\oplus}$	56	167	E3 (165)	5
$CO_3^{2\ominus}$	60	179	F3 (175)	A5
$HCO_3^{\ominus}$	61	182	$F^{\sharp}$3 (185)	6

Table: Predicted Harmonic Relationships. A1 = 55 Hz.
$Li^{\oplus}$ > $Na^{\oplus}$ >> $K^{\oplus}$ since $Li^{\oplus}$ (4) is more harmonious with water than $Na^{\oplus}$ which is (M3) which is more harmonious than $K^{\oplus}$ (m2).

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Coherent Frequencies

- Geesink and Meijer (2016) surveyed 175 articles (1950-2015)
- Identified a universal electromagnetic (EM) principle that underlies life sustaining effects
- In *in vitro* and in *in vivo* life systems
- Discrete coherent frequencies of EM waves stabilize cells
- Other frequencies cause a destabilization
- The coherent frequencies are organized beginning in a tempered Pythagorean acoustic scale
- Whose harmonics continue to the Terra Hertz range

4-8 Hz:
4.0, 4.22, 4.5, 4.74, 5.06, 5.33, 5.70, 6.0, 6.32, 6.75, 7.11, 7.59 Hz

32-61 Hz:
32.0, 33.7, 36.0, 37.9, 40.5, 42.7, 45.6, 48.0, 50.6, 54.0, 56.9, 60.75 Hz

64-122 Hz:
64, 67.5, 72, 75.78, 81, 85.3, 91.18, 96, 101.1, 108.0, 113.8, 121.5 Hz

255-487 Hz:
256, 269.8, 288, 303.1, 324, 341.2, 364.7, 384, 404.5, 432, 455.1, 486 Hz

16.3-31.2 kHz:
16.38, 17.25, 18.43, 19.40, 20.74, 21.84, 23.34, 24.58, 25.91, 27.65, 29.13, 31.10 KHz

16.7-32 MHz:
16.77, 17.66, 18.87, 19.86, 21.24, 22.36, 23.90, 25.17, 26.53, 28.31, 29.83, 31.85 Mhz

4.2-8.2 GHz:
4.293, 4.520, 4.831, 5.085, 5.437, 5.724, 6.119, 6.443, 6.792, 7.247, 7.636, 8.154 GHz.

1.1-1070 THz:
1.10, 1.158, 1.237, 1.302, 1.391, 1.466, 1.566, 1.649, 1.738, 1.855, 1.955, 2.088 Thz
2.20, 2.316, 2.474, 2.604, 2.783, 2.931, 3.133, 3.298, 3.475, 3.710, 3.909, 4.175 THz
4.40, 4.633, 4.948, 5.208, 5.566, 5.863, 6.266, 6.597, 6.950, 7.420, 7.819, 8.350 Thz
8.80, 9.266, 9.897, 10.42, 11.13, 11.73, 12.53, 13.19, 13.90, 14.84, 15.64, 16.70 THz
17.59, 18.53, 19.79, 20.83, 22.26, 23.45, 25.06, 26.39, 27.80, 29.68, 31.28, 33.40 THz
35.19, 37.06, 39.59, 41.66, 44.53, 46.90, 50.13, 52.78, 55.60, 59.36, 62.55, 66.80 THz
70.38, 74.13, 79.18, 83.33, 89.05, 93.80, 100.3, 105.6, 111.2, 118.7, 125.1, 133.6 THz
140.8, 148.3, 158.4, 166.7, 178.1, 187.6, 200.5, 211.1, 222.4, 237.5, 250.2, 267.2 THz
281.5, 296.5, 316.7, 333.3, 356.2, 375.2, 401.0, 422.2, 444.8, 474.9, 500.4, 534.4 THz.
562.9, 592.9, 632.7, 666.5, 712.4, 750.4, 802.0, 844.4, 889.6, 949.8, 1000.8, 1068.8 THz

Water: Cradle of Life

- Geesink et. al. (2020) analyzed 500 biomedical studies
- Published from 1950 though 2017
- Dealing with EM oscillations in tissues, cells, and biomolecules
- They did a meta-analysis of 700 measured frequencies
- Water with various solutes were present
- The solutes change the weight per mole
- The weight per mole is related to the resonant frequency.

They inferred that the resonant frequencies were organized as a 12 tone tempered Pythagorean chromatic scale over 48 octaves, from 1Hz to THz.
These are the coherent electromagnetic field bands for fluid assemblies in living cells.

Geesink et. al., *Water the Cradle of Life via its Coherent Quantum Frequencies*, **Water**, 2020, pp. 78-108.
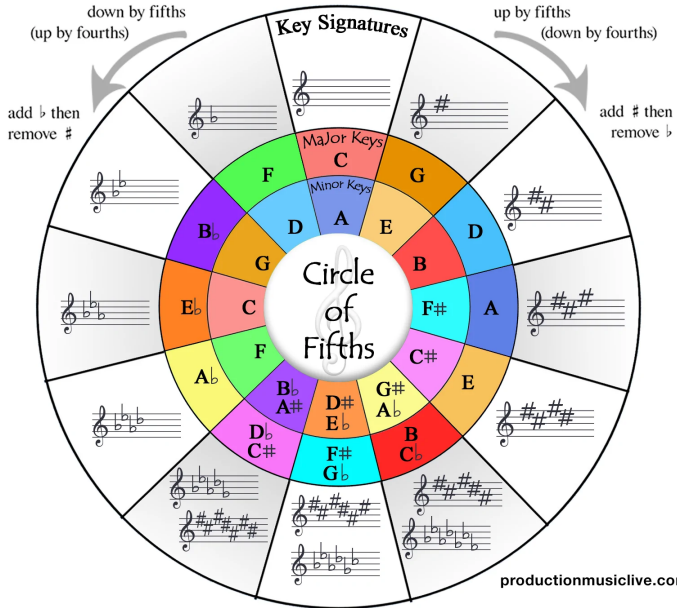
Augmented 4th	$F^\sharp$	$(\frac{3}{2})^6$	$\frac{729}{64}$	$\frac{1}{8}$	$\frac{729}{512}$	1.4238
Major 7th	B	$(\frac{3}{2})^5$	$\frac{243}{32}$	$\frac{1}{4}$	$\frac{243}{128}$	1.8984
Major 3rd	E	$(\frac{3}{2})^4$	$\frac{81}{16}$	$\frac{1}{4}$	$\frac{81}{64}$	1.2656
Major 6th	A	$(\frac{3}{2})^3$	$\frac{27}{8}$	$\frac{1}{2}$	$\frac{27}{16}$	1.6875
Major 2nd	D	$(\frac{3}{2})^2$	$\frac{9}{4}$	$\frac{1}{2}$	$\frac{9}{8}$	1.1250
Perfect 5th	G	$(\frac{3}{2})^1$	$\frac{3}{2}$	1	$\frac{3}{2}$	1.5000
Unison	C	1	1	1	1	1.0000

Unison	C	1	1	1	1	1.0000
Perfect 4th	F	$(\frac{2}{3})^1$	$\frac{2}{3}$	2	$\frac{4}{3}$	1.3333
Minor 7th	$B^\flat$	$(\frac{2}{3})^2$	$\frac{4}{9}$	4	$\frac{16}{9}$	1.7778
Minor 3rd	$E^\flat$	$(\frac{2}{3})^3$	$\frac{8}{27}$	4	$\frac{32}{27}$	1.1852
Minor 6th	$A^\flat$	$(\frac{2}{3})^4$	$\frac{16}{81}$	8	$\frac{128}{81}$	1.5802
Minor 2nd	$D^\flat$	$(\frac{2}{3})^5$	$\frac{32}{243}$	8	$\frac{256}{243}$	1.0535

Pythagorean Chromatic Scale

Unison	C	1	1	1	1	1.0000
Minor 2nd	$D^\flat$	$(\frac{2}{3})^5$	$\frac{32}{243}$	8	$\frac{256}{243}$	1.0535
Major 2nd	D	$(\frac{3}{2})^2$	$\frac{9}{4}$	$\frac{1}{2}$	$\frac{9}{8}$	1.1250
Minor 3rd	$E^\flat$	$(\frac{2}{3})^3$	$\frac{8}{27}$	4	$\frac{32}{27}$	1.1852
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Perfect 4th	F	$(\frac{2}{3})^1$	$\frac{2}{3}$	2	$\frac{4}{3}$	1.3333
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Major 7th	B	$(\frac{3}{2})^5$	$\frac{243}{32}$	$\frac{1}{4}$	$\frac{243}{128}$	1.8984

In the tempered Pythagorean Tuning, Geesink and Meijer use
$\sqrt{2} = 1.4142$ instead of 1.4238.

Water: Cradle of Life, Conclusions

1. Intrinsic frequencies of water molecules measured across the electromagnetic spectrum using various spectroscopic technologies show that semi-harmonic frequency patterns found in purified water are similar to those found in biological systems.

2. The water molecule assembly shows electromagnetic and electronic collective states that contain *quantum imprints or molds* for living cells.

3. Since water molecules have a comparable distribution of coherent electromagnetic field bands to that of fluid assemblies in living cells, a resonant wave interaction is expected between the cytoplasm and surrounding water molecules.

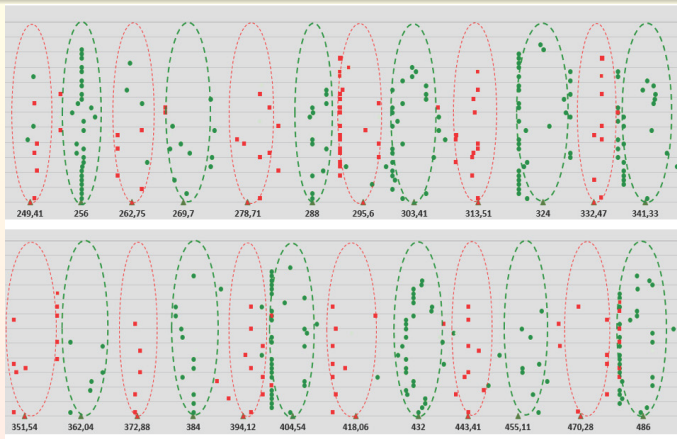**4.** The resonant frequencies follow a tempered Pythagorean tuning.

Geesink et. al, *Water the Cradle of Live via its Coherent Quantum Frequencies*, **Water**, 2020, pp. 78-108.

Factor	$F_{1,m}$	$F_{2,m}$	$F_{3,m}$	$F_{4,m}$	$F_{5,m}$	$F_{6,m}$	$F_{7,m}$	$F_{8,m}$	$F_{9,m}$	$F_{10,m}$	$F_{11,m}$	$F_{12,m}$
m=0	1.0000	1.0535	1.1250	1.1852	1.2656	1.3333	1.4142	1.5000	1.5803	1.6875	1.7778	1.8984 Hz
m=1	2.0000	2.1070	2.2500	2.3704	2.5312	2.6666	2.8284	3.0000	3.1606	3.3750	3.5556	3.7968 Hz
m=2	4.0000	4.2140	4.5000	4.7408	5.0624	5.3332	5.6568	6.0000	6.3212	6.7500	7.1112	7.5936 Hz
m=5	32.000	33.712	36.000	37.9264	40.4992	42.6656	45.2544	48.000	50.5696	54.000	56.8896	60.7488 Hz
m=8	256.00	269.70	288.00	303.41	324.00	341.33	362.04	384.00	404.54	432.00	455.12	486.00 Hz
m=12	4.0960	4.3151	4.6080	4.8546	5.1839	5.4613	5.7926	6.1440	6.4729	6.9120	7.2819	7.7759 KHz
m=2^{24}	16.777	17.675	18.874	19.884	21.233	22.370	23.726	25.166	26.513	28.312	29.827	31.850 MHz
m=2^{32}	4.2950	4.5248	4.8318	5.0904	5.4357	5.7266	6.0739	6.4425	6.7873	7.2478	7.6356	8.1536 GHz
m=2^{40}	1.0995	1.1583	1.2370	1.3031	.3915	1.4660	1.5549	1.6493	1.7376	1.8554	1.9547	2.0873 THz
m=2^{48}	281.47	296.53	316.66	333.60	356.23	375.29	398.06	422.21	444.81	474.99	500.41	534.35 THz

	532.5	505.6	473.4	449.3	420.8	399.5	376.6	710.1	674.0	631.3	599.1	561.0 nm

Marc Henry relates the molecular weight M of any solvent or solute species to a frequency f using the mass-energy equivalence coupled to Planck-Einstein relations. He finds that water characterized by $M = 18 g/mol$ leads to a characteristic frequency $f = 54$ HZ.

Green Life Sustaining, Red Life Detrimental
Shown from factor $m = 8$ Octaves

Conclusions

The frequencies involving ratios of 2:3 and 3:2 and their powers placed in higher octaves shows that

a close relation between the frequencies of the surveyed water spectra. Pure water absorption spectra show precisely the same frequency pattern as found for the living cells and biomolecules with the investigated range of UV to GHz.

Ivon Bono et. al. Emergence of the Coherent Structure of Liquid Water, **Water**, Vol 4, 2012, pp. 510-532.

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Holy One of All Being,
All Encompassing Cosmic Consciousness,
We Bless You with all our hearts,
With all our bodies and souls,

We are thankful
For all that You have created,
For all that You have given,
And for all your daily miracles.

We are about to embark on a subtle energy experiment,
To search out and reveal some your mysteries:

Mysteries about energy, consciousness, aliveness, and memory;
Mysteries about one consciousness communicating to
And influencing another consciousness;
Mysteries about how liquid and solid crystals are conscious,
Have memory and are alive;
Mysteries about how liquid and solid crystals
Can participate in helping humans
To have greater health and be better people;
Mysteries of how we can participate in helping
Liquid and solid crystals fulfill their purpose for being.

Our collective intent is use the knowledge
Obtained by the experiment
To help improve the lives and health of humanity.

Choose one:
———————————————

We want the experiment not to depend
On the consciousness of the experimenter.
We ask that the observer consciousness effect be deactivated.

———————————————

We want the experiment to depend
On the consciousness of the experimenter,
We ask that the observer consciousness effect be activated.

———————————————

With deep respect,
We ask permission to do the experiment.
We ask permission from all the experimental apparatus,
Including the involved liquid and solid crystals
For your participation in the experiment.

We activate our intention to clear any noisy imprinting
For all items that might be on the experiment table.
We ask that all life nurturing and beneficial energies
That affect us, and everything involved in the experiment
Increase and be enhanced.

We ask that all life negative and detrimental energies
That affect us and everything involved in the experiment
Decrease and be diminished. No one shall be harmed.

For now, and into the future,
For as long as appropriate.

With deep gratitude,
Thankyou for receiving our good intentions and prayer.
We remain your loving helpers.

nD: 1.32000 to 1.58000

nD: ±0.00002

Temperature Controlled by Peltier
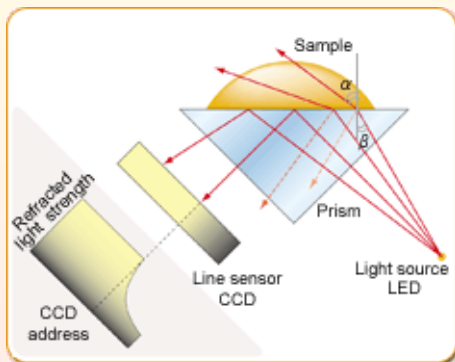
We set the temperature to be $23°C$

- Accuracy of Reading ±2%
- Repeatability ±1%
- Temperature Accuracy ±0.15°C
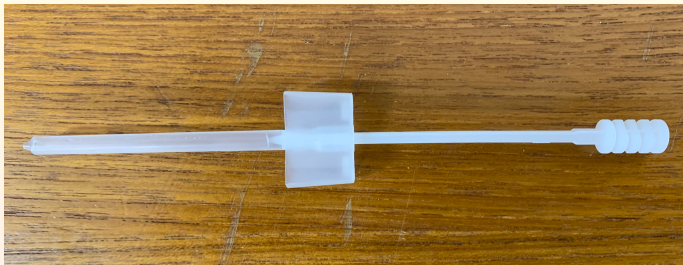
- The pipette consists of a plunger and a usual pipette
- The pipette nominally holds 400 μl
- It takes between 10 – 200μl to prime the microVISC
- Each measurement takes about 60μl

Litewater: Deuterium Depleted Water

- Most waters have about 150ppm - 180pmm *HDO* instead of H_2O
- Litewater has about 10ppm *HDO*
- Made using massive distillation columns
- Deuterium and Health
    - Deuterium slows down energy production
    - Interferes with mitochondrial function
    - Increases damaging free radicals

IC pad from infopathy.com website

IC pad from infopathy.com website

Experimental Results

- 24 no treatment measurements in five pipette refills
- Treatments were for a minimum of 60 minutes
- Temperature equilibration at $23°C$ at least 1 hour
- 21 treatment measurements in four pipette refills
- Using the Rheosense microViscometer
    - The average no-treatment viscosity was .95868 mPa-s
    - The average treatment viscosity was .9289 mPa-s
    - T-Test p-value for viscosity difference was $1.9x10^{-5}$
- No significant difference in refraction index

Possible Unwanted Influences

- Bubble in pipette
- Pipettes were reused for the same treatment class
- Pipettes were placed on the table and not on lint-free surface
- Placement of beaker on IC-pad is off center
- Time of Treatments varied; was always greater than a minimum 60 minutes
- Time of Treatment finished until time of pipette loading varied
- Time of Temperature Equilibration varied
- Temperature enclosure was held open longer than 10 seconds

Group Max-Min (mPa-s)

	P1	P2	P3	P4	P5
DDW	.018	.007	.012	.006	.027
T DDW	.006	.031	.018	.004	

Future

- Spectrometry (250nm-1500nm)
- Viscometer
- Calorimetry
- Surface Tensiometer
- Vector Network Analyzer
- Impedance Analyzer
- Electrochemical Impedance Spectroscopy
- Densitometer
- pH, ORP DO,Conductivity
- Dark Field, Phase Contrast Microscopy
- Filtered Water, Spring Water, Divinia, John Ellis Water, Double Distilled Deonized Water

Thankyou for Listening