

Velocity Dependency in Photochemistry

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OUR FORMULA FOR ALPHA, THE FINE STRUCTURE CONSTANT OF SPACE

Corrections applied to Arnold Sommerfeld's (1916) derivation of α = 'speed of electron/speed of light'. Replacing the electron's circular orbital in the Bohr hydrogen atom, with a chortal path of the electron and a standing wave of 137 Compton wavelengths, λ_c , in an oblate spherical ground state 1s shell, due to changing interaction times with the moving proton nucleus (Lorentz contraction/transformations).

... our final corrected equation can be expressed as:

$$\alpha^{-1} = 137 \text{sec} \left(\frac{\pi}{137} \right) \times L$$

where: $L = \frac{3 \times 10^8 \text{ m/s}}{c}$ and $b = 1 - \frac{v^2}{c^2}$

thus: $\alpha^{-1} \approx 137 = 137.03599074$ (CODATA 2010)

when: $V = 391.9 \text{ km/s}$

PROPOSAL FOR EXPERIMENT IN NEAR EARTH ORBIT

We proposed a ZEKE, MATI experiment in 2008 for measurement of Ionisation Potentials on the International Space Station, where a higher speed wrt. Leo is changed more frequently than on Earth. ΔE of +/- 14meV was anticipated.

Current developments of PIRI, RIS techniques, with Cube-Sat availability, may be more appropriate.

THE LYMAN-ALPHA WAVE

A photon of radiant energy is emitted at 'c' by an electron's decay from the 2S atomic shell to the ground state 1S shell of a hydrogen atom. During the period (from 'c' that wave the nucleus (proton) moves by the difference of the two orbital radii at a speed of **392 km/s**

Check: The hydrogen atom's binding energy, E_0 (Rydberg energy) = 13.6 eV and $E_0 = E_0 / 4$
 $\Delta E = 10.2 \text{ eV}$; $E = h\nu$ where Planck $h = 4.14E-15 \text{ eV}$
Period, $T = 1/\nu = h/E = 4.06E-16 \text{ s}$
Radius $R_{1S} = 1.37 \times \lambda_c / 2\pi = 5.29E-11 \text{ m}$
where λ_c is Compton wave of electron = $2.426E-12 \text{ m}$
 $R_{2S} = 3R_{1S} = 3 \times 5.29E-11 = 1.59E-10 \text{ m}$
In period T, the proton moves at v to travel ΔR_{1S}
 $V_p = 1.59E-10 / 4.06E-16 \text{ ms}^{-1} = 391.6 \text{ km/s}$

thus: $\frac{\Delta R}{c} = \frac{\Delta R}{V_p}$

where c is the speed of light,
 ΔR is the difference of the radii,
 V_p is the speed of the proton in a hydrogen atom AND the Peculiar Velocity of the Solar System

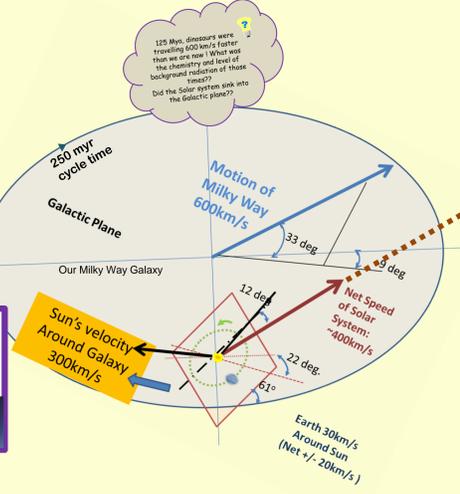
Stefan Marinov $v = 362 \pm 40 \text{ km/sec}$ (9-13 Feb 1984)

It is suggested that reproducing Stefan Marinov's Coupled Shutters Experiment would be inexpensive and justifiable. (Full details in his paper).

The Sun's peculiar velocity, in the direction of Chort (Theta-Leonis) in the Constellation of Leo: $361 \pm 54 \text{ km/s}$ (G.F.Smoot et al., (1978-80) (By measuring anisotropy of the CMB).

An amazing coincidence of independently but optically derived speeds.

The effect of velocity upon a relatively moving particle may not be apparent to an observer. Would the particle feel it?



S.E. Schnoll reported periodicity in nuclear decay and Fischbach, et al. reported Solar influence on nuclear decay.

An experiment started in March 2012. There were existing reports and some conjecture about periodicity in decay rates.

Compare de Broglie wavelengths (λ) of nuclei at v_p and v_{p0} and 'Critical speed' v_c when $\lambda = \lambda_c$ (Lattice Constant, λ_c)

Element	Including spin	nucleus #	nucleus #	Critical Velocity v_c (km/s)
Pb 82	207	5,302E-15	4,774E-15	431.4
Th 90	232	5,792E-15	4,752E-15	429.9
U 92	238	4,806E-15	4,378E-15	395.1
Th 90	232	4,774E-15	4,260E-15	388.9
U 92	238	4,678E-15	4,205E-15	380.0
U 92	238	4,616E-15	4,152E-15	375.2
Pu 94	244	4,806E-15	4,096E-15	365.9

critical speed $v_c = \lambda_c \times \nu$ (Compton) $\times 10^6 \text{ m/s}$
 $\lambda_c = 2.426E-12 / 377.4 = 6.427E-15 \text{ m}$

Our Decay Rate experiment has run for four years, this last year at two sites. Shortly to be extended to include additional sensors but awaiting programming.

Lunar periodicity is apparent, seemingly moderated by position. Other unknown factors still require resolution. We now record Solar events at LAS for consideration by their effect on radio wave reflection.

Can You unlock the factors in our DATA?

As Astrophysical Photochemistry Faraday Groups Analytical Radiochemistry Chemometrics

VELOCITY LIMITS. THE ELECTRON-POSITRON LATTICE SPACE (1990), #91A, M. SIMHONY

Chapter 9.5 Adjustment of atomic orbits in moving atoms (ie Add V_p)

Orbit adjustment of an atomic electron ...
 $E = m_e v^2/2$
 $v = |E|^{1/2} \times 600 \text{ km/s}$
From Boltzman eqn.
 $E = kT$

... This means that, in order to bring the velocity of an atom to 600 km/s relative to Earth, one must supply to the atom 1eV of energy per orbital electron for the adjustment of its orbit to the motion. Raising the velocity to 2.4 Mm/s increases the necessary adjustment to 16 eV per orbital electron. This energy is above the first ionisation energy of atoms on Earth. (M.Simhony, p89 Paperback)

Vector addition to $1/\rho$

THE ENABLING MODEL OF VACUUM SPACE

The 'epola' Model of the Active Vacuum

Attributed to M. Simhony (1973)

A structured medium of the vacuum as a polycrystalline ionic 'chemical' lattice of elastically bound electrons and positrons (with internal structure as a *Hubius Helix*) and stabilised by their frustrated magnetic spin moments.

Specification (calc'd by analogy with NaCl)
fcc lattice constant, $\lambda_0 = 4.4E-15 \text{ m}$ (4.4fm)
Mass density $1E13 \text{ kg/m}^3$
Binding Energy Density $-9.6E20 \text{ GJ/m}^3$
Melting Point $\sim 6 \text{ GK}$ ($-1 \times 10^{28} \text{ J/m}^3$)

Compare:
Surface temperature of the Sun $\sim 6.5E3 \text{ K}$ (6.5 kK)
Atomic matter: mass density $<10E3 \text{ kg/m}^3$
Atomic nuclei: mass density $\sim 2E17 \text{ kg/m}^3$

The 'e-po-la' Model was based upon three groups of Experiments: The Michelson Morley expts. (1887-etc) implying any light propagating medium cannot be continuous but discrete and rare. Rutherford's scattering expts. (1911), finding the rarity of atomic matter and Anderson's discovery in 1932 that an electron-positron pair (ref. P.A.M.Dirac) was released from the vacuum by submitting it to a 1.02 MeV photon of energy.

Menahem Simhony (1922-2015)

"Feci quod potui, faciant meliora potentes"

INTERIM CONCLUSION

The *Our* Fundamental Constants and our Physical Chemistry are locked to our motion through a structured vacuum.

ABSTRACT

Velocity Dependency in Photochemistry

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The Planck constant of space, alpha (revised as α^{-1}), was first derived by Arnold Sommerfeld (1916) as the ratio of the orbital speed of the ground state electron in a hydrogen atom to the speed of light in vacuum, assuming the Bohr model of the atom. Alpha is also the coefficient to the CODATA value for the fine structure constant, the de Broglie-Bohr concept and incorporating relativistic transformations, causing the ground state to be distorted due to the peculiar velocity of the Solar System (v_p). The measured value of v_p is 361 ± 54 km/s based on a derivation towards the constellation of Leo, as determined by George Smoot et al. (1978) and was derived as temporal and spatial variations capable by Webb and others.

The present nucleus of a hydrogen atom is shown by standard data to travel at v_p across the difference of the orbit's radii during the period of the 1S/2V Lyman-alpha transition wave emitted on collapse of the excited O to ground state.

A model of the active vacuum is proposed, predicting velocity dependency of ionisation potentials and periodicity of nuclear decay rates. The ability of matter to be a hydrogen potential element is shown to depend upon four de Broglie wavelengths and four spin speed. Details and implications are discussed for the result as an elastically bound polycrystalline chemical lattice of electrons and positrons.

An experiment is proposed for the ISS or other satellite in near Earth orbit (e.g. E.S.A. Columbus) to investigate change of ionisation potentials with velocity towards Leo.

The illustrated results of our ongoing experiment during the last four years, involving radioactive decay rates, indicate annual periodicity and correlation to gravitational potential. Collaborative and more abstract analysis of the experimental decay data are invited.

References:
1. R. Guy Grantham and G. Montgomery (2013) 'Unlocking the Vacuum as an Electron-Positron Aggregates and Experimental Evaluation: The Physics of Reality' pp. 350-357. www.researchgate.net/publication/281149742/links/55084000.pdf
2. Formula for the Calculation of Alpha from the Circular Ground State Orbital of Hydrogen: http://www.epola.org.uk/alpha.html
3. George F. Smoot et al. 'Measuring the Cosmic Microwave Background Radiation Anisotropy from Deep Space and Shallow Orbit', Nature Letters, December 16, 1978, pp. 157-161.
4. R. Guy Grantham, 'Velocity Dependency in Photochemistry', World Scientific Publishing Co., 1994, ISBN 981-02-1049-1

OUR EXPERIMENT TO INVESTIGATE POSSIBLE EFFECT OF PECULIAR VELOCITY ON NUCLEAR DECAY RATES

Monitoring the Effect of Speed on Misshapen Nuclei Prone to Decay (2011-2017...)

Check for solar poles reversal & Sunspot

Apparent correlation of count rate with Gravitational Potential as shown by phases of the Moon and indicated by coastal Tide Heights (Skagness, ~ 60 km E)

Recording decay rates of Ra source and Th source during the last four years. Annual periodicity for Ra but lesser sensitivity apparent for Th.

Invitation to raw data for further analysis

Recent Th CUSUM - Feb 2017, site2 (Leo transits at = midnight).

Note reversals in troughs of both 2 day rolling mean of Tide Ht and Decay Data CUSUMs. Sept 2015.

Some of these deep spikes seem to recur annually

SOME DERIVATIONS, IMPLICATIONS & CONJECTURES OF THE EPOLA MODEL

- Planck's Postulate justified and Planck's Constant of action derived.
- Photon defined as energy transfer between bound particles and their vibrational half-wave clusters.
- Neutrinos as excitons of the lattice. (Majorana particles). Spin carried by e-e+ pair on lattice?
- Gravitation and inertia explained by reduced B.E. of lattice due to magnetic frustration caused by spin moments.
- Foreground temperature of lattice at ~2.7K hides cooler regions in the Universe?
- A mechanism for the Faraday and Kerr effects in the di-electric aether of Faraday and McCullough?
- Loop model of electron preferred. $r_e \ll 0.1 \text{ fm}$ (Point-like fermion sweeping path of Hubius Helix).
- Electron mirrored in time by positron, the epola structure is four-dimensional?
- 'DM/DE' effects suggested as functions of binding defects at crystallite grain boundaries.
- Electron/positron sourced or freed from the lattice for Beta+/e- emission, electron capture and neutron decay?
- Fulfil: Einstein's requirement for a hidden variable. Entanglement explained as local effect of half-wave clusters.
- Structure of alternate e-/e+ enriched/depleted clusters retaining S & Z twist (vs 'id' spin) of e-/e+ loop model.
- Implications for Astro-chemistry and expanding Universe if ignoring Velocity effect for Fundamental Constants.
- Implications for nucleus and QCD, with possible unification for the Han-Nambu unitary charge model.
- Suggested alternative to Big Bang model by seeded growth of Universe from point of origin. Inflation when lattice structure formed. 'Still growing at the edges of the Universe?' Is our universe effectively e-/e+ mattering?
- Astrochemical spectroscopy at risk of confusion with Doppler shifts and velocity effect on Rydberg constant?
- Black Hole on loss of epola structure - unable to propagate light or maintain atomic structure.

A rich field for study, discovery and innovation!

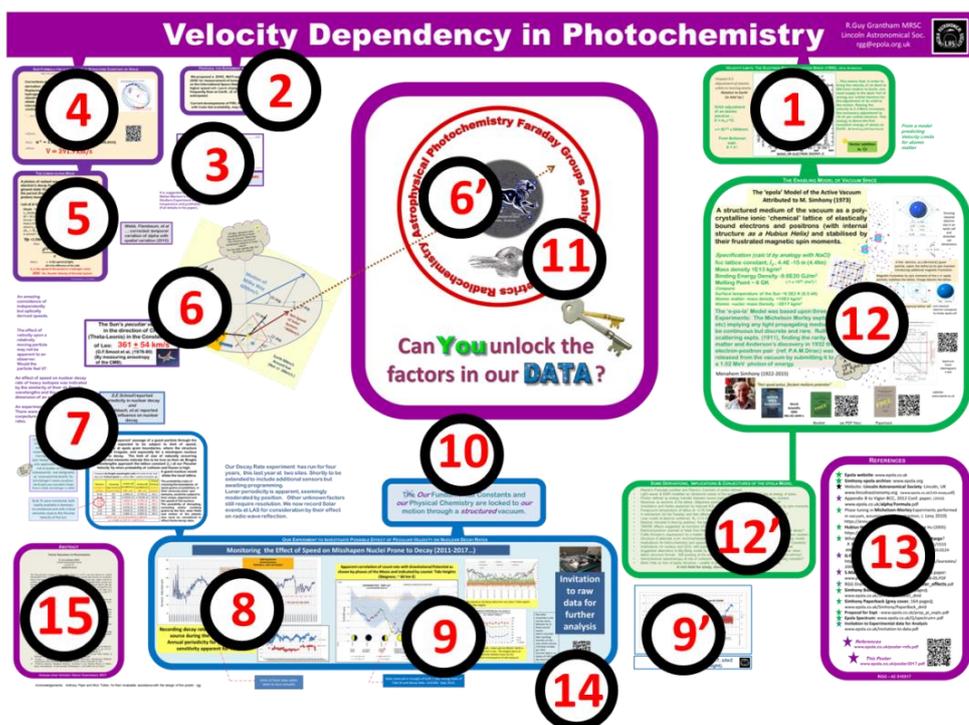
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- ★ RGG Draft: www.epola.co.uk/dark_matter_effects.pdf
- ★ Simhony Booklet (green cover, 74 pages); www.epola.co.uk/Simhony/booklet_dnid
- ★ Simhony Paperback (grey cover, 164 pages); www.epola.co.uk/Simhony/Paperback_dnid
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- ★ Epola Spectrum: www.epola.co.uk/Q/spectrum+.pdf
- ★ Invitation to Experimental data for Analysis www.epola.co.uk/invitation-to-data.pdf

References
www.epola.co.uk/poster-refs.pdf

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The Road Markers.....

1. Follow the title line or allow your eye to be drawn by the diagonal arrow to the green box at upper right. Ionisation of atoms by speed was predicted by our preferred 'enabling model' of a structured vacuum. Enter the title bar, go left.
2. Drop into the first violet framed box where experimental tests are proposed for falsification of the model (as per Karl Popper).
3. An experiment fulfilling a similar objective, conducted by S. Marinov in 1984, produced a velocity (not merely a speed). Reproduction of that experiment is recommended.
4. Upper left, violet box. Our mathematical test of the model was to seek a formula for the Fine Structure Constant of Space (FSC), alpha. Our method was guided by the epola model and provided corrections to Arnold Sommerfeld's derivation from a Bohr orbital, to 137 chordal paths of the electron with a shell of 137 closed Compton wavelengths. A Lorentz contraction to allow for charge interaction due to speed formed an oblate spheroidal shell. Inserting the CODATA value for F.S.C. produced a speed of 392km/s.
5. We found by consideration of the Rydberg energy and the Lyman alpha wavelength that the proton nucleus of a hydrogen atom would cover a distance corresponding to the difference of the two radii at a similar speed of ~ 392 km/s whilst the excited 2s electron collapsed to the 1s ground state during the period of the emitted radiant wave.
6. Each these derived speeds, at approximately 1/750th of the speed of light (not usually considered relativistic), comfortably matched the velocity of the Solar system experimentally derived by G. Smoot's team in 1976-78. They measured the anisotropy of the Cosmic Microwave background at high altitude using a radiometer mounted on a NASA U2 aircraft. Their data indicated that the Solar System has a net velocity in the direction marked approximately in our sky by the 'fixed' star θ -Leonis (6'). It is shown in

our sketch of the Milky Way how the rotation of the galaxy has in the past caused, and eventually will again cause the solar system to travel much faster than at present. The Earth's rotation around the Sun produces an annual cyclic variation of $\pm \approx 20$ km/s.

7. Another implied physical characteristic of a structured vacuum state was chosen for a further test of the model by monitoring and comparing the fissile decay rates of samples of radium and thorium as their nuclei travel through the epo-lattice. Details and calculations of critical speeds for the primordial elements, when the de Broglie wavelength of a nucleus approaches the size of the lattice constant of the epola model are shown on the poster. Other references to periodicity of nuclear decay are shown.
8. Results of our experiment, conducted for >4 years, show strong annual periodicity of daily average count rate for radium but not for thorium, as anticipated for the model. Both also show other short-lived deviations from purely random decay, some annually.
9. The statistical technique of CUSUM charts (*slopes are significant, not values*) indicate otherwise hidden trends in shorter term monthly and daily data associated with the gravitational potential, indicated by tidal data that is dependent on relative positions of Sun and Moon. Annual asymmetry is apparently connected to the positions relative to Earth of the Sun and the constellation of Leo. The transit ('noon') of Leo ranges from our midday to our midnight during a year. The recent CUSUM chart at **9'** shows daily information is hidden in otherwise featureless monthly and annual thorium data.
10. The calculations and experimental results justify our 'Interim Conclusion' for not being falsified by those Popperian tests of the model.
11. Do you see a rabbit and a duck? If not, slowly nod your head from side to side. Consider a paradigm shift as defined by Thomas Kuhn. Albert Einstein sought a hidden variable – does the epola structure fulfil that ambition? Should time dilation and fixed 'c' be replaced by localised curvature of an electron-positron lattice structure?
12. Some details with links to the electron-positron-lattice (epola) model by M. Simhony are shown. Further implications, opportunities and our possible solutions for issues (eg. Entanglement) that trouble General Relativity Theory (GRT) and modern theoretical physics are listed at **12'**
13. **References** (bold face) are listed with colour codes to match relevant frames in the poster. Most links are active' in Poster2017.pdf, though a few require 'cut and paste'.
14. Our data is offered for more advanced analysis and further tests for development of the epola model of the active vacuum space relevant to all aspects of physical science with hyperlinks including an '[Invitation to Experimental data for Analysis](#)'
15. Poster2017 was presented at the Royal Society of Chemistry Faraday Joint Interest Group Conference, held April 11-13, 2017, at the University of Warwick.

Download a detailed full-size copy of the A0 poster, with this note:

www.epola.co.uk/poster2017.pdf