This page introduces the complete pdf of the poster entitled:-

How stars grow massive despite radiation pressure, triggering star-bursts; insights from gravitation.

Presented by **Miles Osmaston** in Session ISM1**,**

‘Interstellar medium and star formation’, convened by Matthew Bate & Andreas Burkert

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How stars grow radiation pressure, Insights from

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massive despite triggering starbursts: gravitation

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Abstract

(with ref titles in full)

Although high-mass stars range up to >100$M_\odot$ they are evidently shedding up to 90% of their mass at very high rates. This has been attributed to radiation pressure, the only mechanism apparently available. But thermonuclear light-up occurs at well below one solar mass, so why doesn't radiation pressure inhibit accretionary growth to that high mass in the first place?

New work on the physics of the gravitation mechanism [1], outlined on this poster, has revealed an expectation that the Newtonian force of any gravitationally-retained assemblage is inescapably accompanied by a radial positive-body-repelling electric field, the Gravity-Electric (G-E) field. So this may be responsible for much of the mass loss, primarily of highly ionized material, with radiation pressure playing a smaller rôle.

In that case, accretionary infall of very dust-opaque materials will not be opposed by the G-E field until stellar heat evaporates the dust and ionizes it, very close-in. The Newtonian force will prevail and the star will grow. So the ability to build a high-mass star now depends upon the source cloud's opacity. But the rapid evolution and mass loss of those stars will further increase that opacity - a positive feedback mechanism that could be the trigger for the starburst phenomenon.

[1] Osmaston MF. (2006) A new scenario for forming the Sun's planetary system (and others?): dynamics, cores and chemistry (pt 2). *Geochim Cosmochim Acta* **70**(18S), A465. Goldschmidt 2006, Melbourne, Australia.

— (2009a) A two-stage scenario for forming the Sun's planetary system, with good links to exoplanet findings, arising from new physical insight on the gravitational process. *European Planetary Science Congress, Potsdam, EPSC Abstracts* 4, EPSC-2009.264.

— (2009b) A new, mainly dynamical, two-stage scenario for forming the Sun's planetary system and its relation to exoplanet findings. *EGU Gen. Assy, Vienna. Geophys. Res. Abstr.* **11**, EGU2009-12204.

— (2010) Implementing Maxwell's aether illuminates the physics of gravitation, yielding galaxy dynamics without CDM, high-a.m. planetary systems, and how high-mass stars are built. Abstr # 174. In *JENAM 2010, Lisbon* (ed. A. Moitinho et al) *Abstract Book* (Version 2.0) p.159.

— (submitted). What can Triton's retrograde orbit tell us about the Giant Planet interiors and how they acquired their gas/ice envelopes? New implications for gravitation and planetary system construction. *Planetary & Space Science.*

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Introduction

On this poster I outline one of the several* apparently fruitful consequences of asking a fundamental physical question which seems never to have been asked before; namely, What is the physical mechanism whereby mass-bearing fundamental particles and gravitational assemblages of them generate Newtonian fields around them? (NOT to be seen as identical to the one now being asked at CERN)

This question, also applying to explaining particle magnetic moments, has been rendered illegitimate by the current physics tenet that all such particles (supposed to be ~200, all different, in SU5!) occupy zero ('infinitesimal') volume within which to generate those external properties, which are therefore regarded as 'intrinsic' to each. I reject the 'intrinsic' view, as inventing new 'laws of convenience' for physics. Rigour calls for deeper inquiry. We have, after all, Ampère's law for generating magnetic fields.

But, because the path of such inquiry is not at a level

that has been trodden before, comparisons are not available, so the best way to judge it is by the fruitfulness, or otherwise, of its outcome(s). That is my purpose here, in relation to the problem of stellar construction to high masses.

The path of my inquiry at the fundamental level has had a dual starting point:-

(1) the approximately quantitative implementation, as a continuum of electric charge, of the Maxwell's equations aether for the existence and propagation of transverse electromagnetic waves;

(2) an implementation of the suggestion, originated by William Thomson (Kelvin) but subsequently taken up by others, that mass-bearing particles be regarded as dynamical constructs of vortical aether motion, not as dichotomously different from aether.

Immediate benefits of these are that both the Michelson-Morley result and the wave-particle duality may be satisfied.

The outcome pursued on this poster is that the mutual

interaction of particle vortices endows them with an attraction for one another - their mass - and, in an assemblage, has the effect of reducing aether charge density in the interior, which is a radial electric field - which I have named the Gravity-Electric (G-E) field.

Important in the present context is that this field is embedded in the inter-particle aether, so it is not affected by the departure of charged particles during mass-loss, except insofar as reduction of the stellar mass reduces the gradient. Extrapolation from that observed, in different ways, in the Earth's ionosphere and upper troposphere, suggests that at the solar photosphere level the G-E field is of the order of 10 V/m, but uncertainties are still large.

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*** My poster entitled "Close-in exoplanets, but none of ours. Guidance from Triton's orbit and the physics of gravitation" in PL2 (Exoplanets) during the second half of this meeting will present another - that of the dynamics of planetary system construction, borne out as big consequences for their evolution. Please note that the last six words of its title are lacking in your programme books, but now appear on the website.**

Logic of the gravity-electric (G-E) field

as an inevitable facet of gravitation

[Extracted in part from:- ***Osmaston, M.F., (2011)*** *A* ***continuum theory (CT)*** *of physical nature: towards a new 'ground floor' for physics and astronomy, including gravitation and cosmogony, with major tangible support.* In: MC Duffy, VO Gladyshev, AN Morozov, & P Rowlands, eds, Physical Interpretations of Relativity Theory, Proceedings of the International Meeting - 'PIRT-2006', 8–11 Sept. 2006, Imperial College, London. — Moscow: Bauman Moscow State Technical University, 2011. – pp.287-317**]**

Maxwell's equations (1865, 1873) define the nature and propagation of transverse electromagnetic waves (TEM-waves). We know they work to perfection. They prescribe the presence of an 'elastic aether'; specifically one that is elastic in shear.

Successively, Maxwell (1865, 1873, 1878), W. Thomson (Kelvin)(1867), J.J.Thomson (1883), Larmor (1892, 1897, 1904) and Milner (1960) envisaged that material particles are, in some, possibly vortex-like, rotational way, 'made out of aether'. But, faced with Lorentz' (1892) insistence upon a total dichotomy, followed by J.J.Thomson's (1897) identification of the electron as the corpuscular unit of electric charge, this idea was effectively abandoned by Einstein and has been ever since.

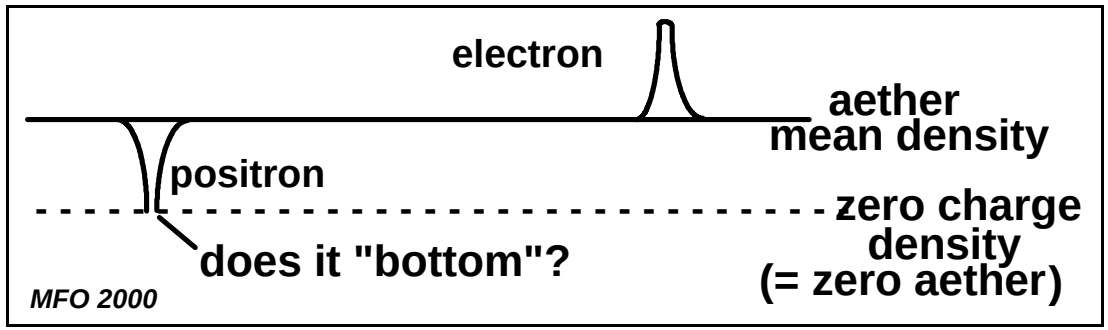
So the idea of an aether has fallen into oblivion and Maxwell's

equations have remained insufficiently implemented, by supposing that TEM-waves could exist without an aether. To overcome that, we recognize Maxwell's aether as a massless, compressible superfluid continuum of electric charge. It is not a bearer of electric charge; electric charge is its very nature. Being ubiquitous, its presence is not confined to particulate habitats. Magnetic coupling and field energy storage, when charge undergoes displacement in shear, provides 'elasticity'.

But what is its charge density? And what is the polarity of that charge?

Particle-scattering experiments at CERN (*G.E.Kalmus, pers comms 1992, 1994*) show that electrons and positrons do have similar, but finite 'effective size' (~10^{-16} cm or less; *much* smaller than the 'classical' value) and we know each contains the same amount of charge (1.6 x 10^{-19} coulombs). This yields a density in their interiors of >3 x 10^{29} coulombs/cm^3 - the highest there is for any particle? One wonders how this is held together against the explosive force of self-repulsion.

With an aether made of only one sort of charge, the simplest way to make one particle positive and the other negative is to make one include *more* aether and the other *less*, like this:-



Notional aether (charge) density profiles that would equip electron and positron aether dynamical configurations with equal and opposite amounts of aether. Diagram drawn for an aether with negative polarity (see below). Less than 'zero aether' is not an option. In this way electron-positron pairs are easily made - a possible clue to cosmogony. In high energy experiments, proton-antiproton pairs are of frequent occurrence also.

So the mean density of the aether is equal to or greater than the deficit in the core of a positron, namely >3 x 10^{29} coulombs/cm^3 !!! And electron cores have twice that.

To provide gravitational attraction between particles and thereby to equip them with the property of mass, we now suppose (as did Maxwell 1878), that their constituent aether motion makes them act like vortices, sucking aether through themselves and pulling themselves towards one another. The

inverse square law gradient makes this predominate statistically, so no negative gravity. The particles forming such an assemblage are therefore 'busy' sucking aether out of the interior. This reduction is opposed by the restorative elastic self-repulsion of the aether's electric charge, which is therefore the underlying nature of Newtonian gravity. The extremely high charge density of the aether makes very large force available if the 'sucking' is intense.

But the resulting radial gradient of aether density is an electric field - the G-E field. Similar interaction with the rest of the Universe causes the G-E field to extend indefinitely outside the body too, as does its Newtonian gravity field also.

So the Newtonian field and the Gravity-Electric (G-E) field are but facets of a single physical mechanism. Because of this direct relationship to the Newtonian field, G-E field intensity at the surface of an object will depend directly upon the gravitational potential there, being highest at neutron stars, with white dwarfs second.

Solar mass loss by expulsion of positive ions tells me that lower aether density = positive behaviour. Hence the aether charge polarity is negative in conventional terms. Simple calculation shows that removal of all the negative aether in the Sun would yield ~40 orders more coulombs of effective positive charge than is required to expel all its protons. So the Sun and other stars can never lose their electrically positive behaviour, manifest as their G-E field.

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Some references

Larmor, J., 1904, *On the ascertained absence of effects of motion through the aether, in relation to the constitution of matter, and on the Fitzgerald-Lorentz hypothesis*: Philosophical Magazine, Ser.6, v. **7**, p. 621-625.

Lorentz, H.A., 1892**,** *La théorie electromagnetique de Maxwell et son application au corps mouvants,* Archives Néerlandaises **25,** p. 363.

Maxwell, J. C., 1865, *A dynamical theory of the electromagnetic field*: Phil.Trans.Roy.Soc. London, v. **155**, p. 459-512.

Maxwell, J.C., 1873, *Treatise on electricity and magnetism, 1st Ed*. (2 vols): Oxford, at the Clarendon Press.

Maxwell, J.C. 1878, ETHER or ÆTHER. Encyclopaedia Britannica 9th Edn**.** v. **8,** p. 568-572. Also quoted *in extenso* by F. Winterberg, 2002, PIRT VIII Proceedings II, pp. 652-3.

Milner, S. R., 1960, *The classical field theory of matter and electricity. I: An approach from first principles*: Phil. Trans. Roy. Soc. London A, **253**, p. 185-226.

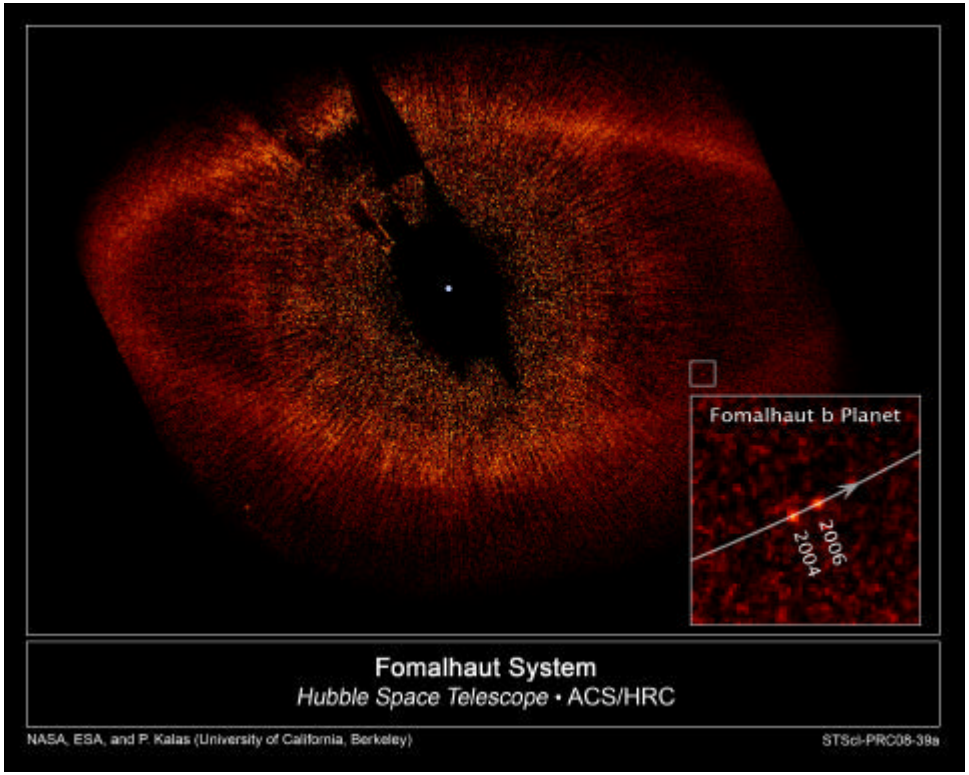
Osmaston, M. F., 2000 (Published July 2003), *A particle-tied aether: indications of a deeper foundation for physics and relativity*., In: Duffy, M. C., ed., Proc. 7th Intl. Conf. on Physical Interpretations of Relativity Theory (PIRT VII). Late Papers. British Society for the Philosophy of Science. Imperial College, London, 15-18 Sept. 2000, PD Publications, Liverpool, UK. ISBN 1 873 694 059, p. 230-240.

Osmaston, M. F., 2002 (Published 2004), *Continuum Theory (CT); major implications of the 'particle-tied aether' concept for gravitation, rotational effects, and the strong nuclear force*: *in* Duffy, M. C., ed., Proc. 8th Intl. Conference, Physical Interpretations of Relativity Theory (PIRT) VIII, Imperial College, London; 6-9 Sept 2002, PD Publications, Liverpool. ISBN 1 873 694 07 5, p. 355-385. (Note: *Various single lines of text were accidentally omitted in the printed version; a complete one*

can be obtained from me at <miles@osmaston.demon.co.uk>).
Osmaston, M.F. 2011 (PIRT X), in press 2007**.** See citation at the head of this Section. Also from <http://osmaston.org.uk>
Thomson, J.J. 1897 *Cathode rays.* The Electrician **39**, 104-109, and Phil. Mag. **44**, 269-316**.**
Thomson, W., 1867, Phil. Mag. XXXIV, 15-24.

The discriminatory action of the G-E field

The G-E field is a powerful dynamical agent upon sufficiently ionized materials but, for neutral particles, dust and larger bodies, the dynamical action of the G-E field is zero and the dynamics reduce to pure Newtonian, unless supplemented by aerodynamic effects.



I. The Fomalhaut b example.

A remarkable example of these different forces acting (now) within the same astronomical object is provided by the bright young A4 star Fomalhaut and its 'planetary nebula'. Here, as in other planetary nebulae, the light-emitting ring is seen to be made up of hundreds of narrow streaks aligned almost perfectly radially from the (quite distant) central star. I see these as due to plasma-rich mass loss wind from the central star, but being aligned like the plasma tails of comets (also strictly radial from the Sun (Fernández 2005)) by the G-E field. BUT a planet, named Fomalhaut b, just within the ring (Kalas *et al* 2008), is *not* moving radially but on a CCW orbit. This is a nice demonstration that an uncharged object (planet) senses no G-E field but only the Newtonian one.

II. The Beta Pic b example

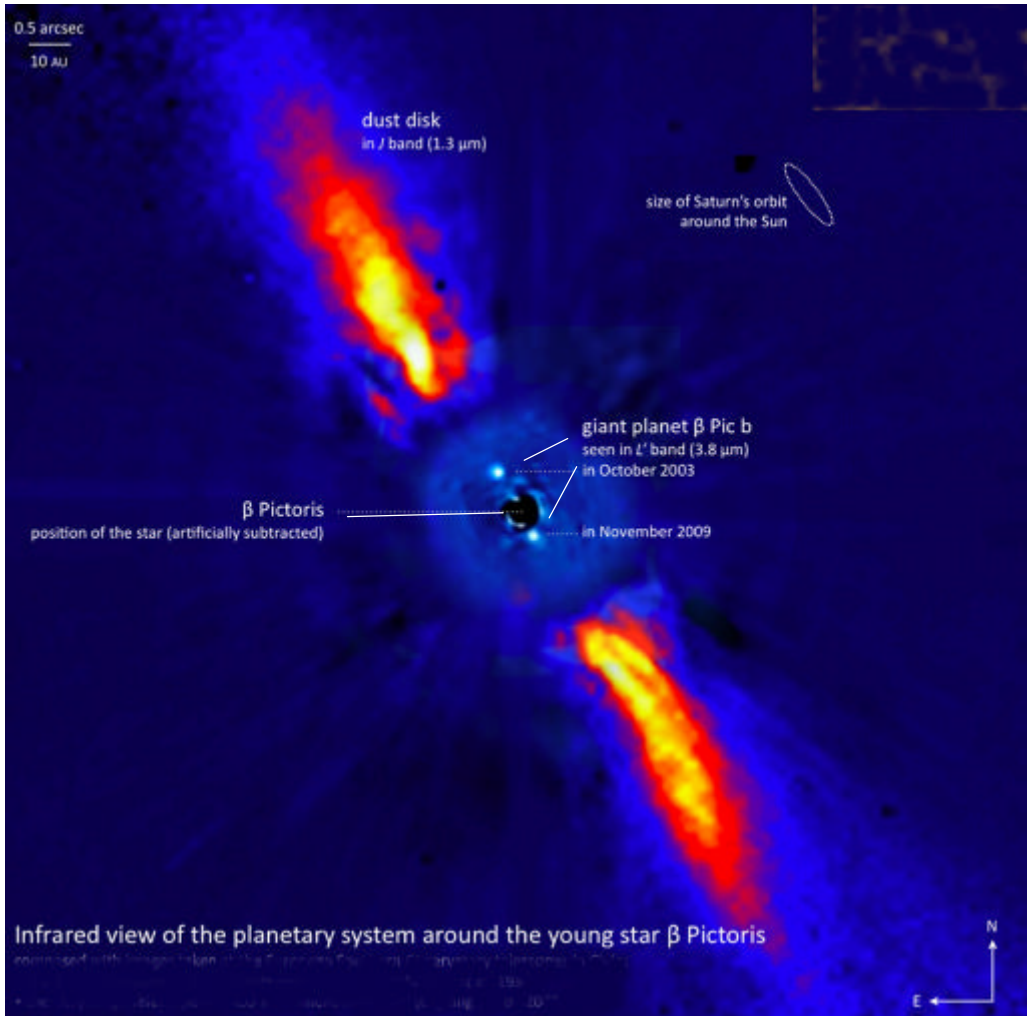


Image modified from NASA APOD 2010 July 3. Credit: A.-M. Lagrange, D. Ehrenreich (LAOG), et al., ESO.

I interpret this image (see my poster in PL2 later this week) as showing the G-E field-driven OUTWARDS clear-out of the remaining still-warm dust and plasma of the protoplanetary disc from which the planet b Pic b has been formed. Visually, the outwards morphology of the flow seems irresistible. Very hard to reconcile with the standard view that all motion was INWARD, under Newtonian force control.

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Discussion

This discriminatory action by the G-E field must cause a major difference between the conditions during infall-accretion by a star and those resulting in mass loss from it.

The accretionary infall of very dust-opaque materials will not be opposed by the G-E field until stellar heat evaporates the dust and ionizes it, very close-in. The column to far outboard of that will have sensed only the Newtonian force, so this force will prevail and the star will grow. In a dynamic infall situation, higher dust-opacity in the infall column will probably depress the level at which ionization by the star initiates G-E field action. So accretion is thereby facilitated, the higher the opacity of the source cloud.

This situation will prevail so long as high-opacity infall material is provided by being within the dust cloud. On emergence from the cloud, however, not only is there now no Newtonian infall pressure but this depression of the ionization level will cease, so ionization and G-E field action

will now extend to far from the star. In that the G-E field strength varies directly with the mass of the star, this would drive mass loss rates that increase similarly; but the hotter star and higher ionization will further increase G-E field action and mass loss rate. This may be what we observe.

So the ability to build a high-mass star now depends upon the source cloud's opacity. But the rapid evolution and mass loss of those stars will further increase that opacity - a positive feedback mechanism that I offer as the trigger for the starburst phenomenon.

So where does radiation pressure (RP) come in? As noted above, the bigger it is, the more does it emphasise the massive-star construction problem. Long pursued as the only available mass loss agent, theoretical work (eg. Puls *et al* 2008) seems to have shown that straight theory is not adequate, and would need the introduction of special features such as 'wind clumping'. So a smaller rôle for RP seems both necessary and realistic.

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The starburst phenomenon

HST APOD_2001Ap10 M51/NGC5194

Defined as a volume in which star formation seems currently to be concentrated, distinguished particularly by the presence of massive young stars whose evolutionary lifetimes are short, **starbursts** are commonly attributed to the external imposition of some major disturbance - mergers, collisions, etc.

For this reason the name has not been applied to similar but rather regularly distributed star concentrations seen within spiral galaxy arms. But positive-feedback processes, of which this poster has outlined an example, have the inherent ability to build up major discrepant features when a critical condition - opacity in this case - is reached.

I therefore suggest that the 'starburst' appellation is much more widely appropriate, but without the dynamic history implications.

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The 'Starburst Galaxy' NGC3310