25: $3^2 + 4^2 = 5^2$

365: $10^2 + 11^2 + 12^2 = 13^2 + 14^2$

2030: $21^2 + 22^2 + 23^2 + 24^2 = 25^2 + 26^2 + 27^2$

$$\frac{4}{\sqrt{\Phi}} = \pi$$

Beyond Standard Model of Electromagnetism

Jan Rak

NAMITECH

$$e^{i\pi} + 1 = 0$$

Jan Rak October 3, 2023

$$\sum_{n=1}^{\infty} n = -\frac{1}{12}$$

The day science begins to study non-physical phenomena,
it will make more progress in one decade
than in all the previous centuries of its existence

NIKOLA TESLA

$$\phi^2 - \phi = 1$$

$$F_n = \frac{2}{\sqrt{5}}(-i)^{n-1} \sin\left[n\left(\frac{\pi}{2} - i \ln \phi\right)\right]$$

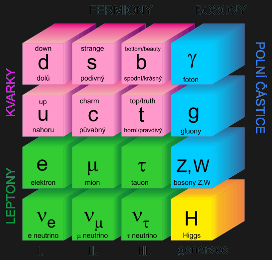
Proud generation of 21st century

Scientists Confirm Einstein's Theory again, GW, BH...

Standard Model

Although very impressive

- Seems to have limited practical implications.
- Greatest WRONG theory in the history of science*



Limitations:

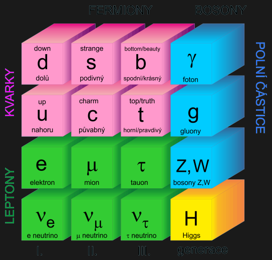
- Strong CP problem
- Hierarchy problem
- Neutrino oscillations
- GTR $\times$ QM incompatibility

*Chad Orzel, Forbes, 2017

Standard Model

Although very impressive

- Seems to have limited practical implications.
- Greatest WRONG theory in the history of science[†]



Limitations:

- No over unity possible
- No superluminal propagation
- No longitudinal, scalar....

[†] Chad Orzel, Forbes, 2017

21st Century – NO OVERUNITY

All modern technology based on

- ElectroMagnetism (iPhone, E-cars...)
- Quantum Physics (semiconductors, Qbits....)

Coefficient Of Performance (COP)

$$\text{COP} = \frac{Q_{\text{Out}}}{\text{Work}_{\text{In}}} < 1$$

On the other hand - Solar Panels COP≥ 10

J. Ji et al. / Solar Energy 82 (2008) 43–52

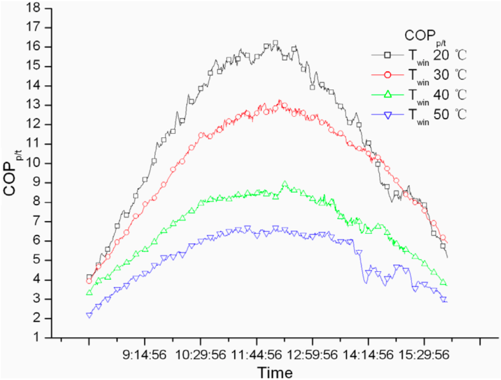
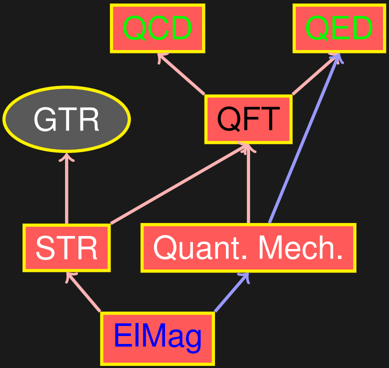


Fig. 10. Daily variation of $COP_{p/t}$ of the PV-SAHP system for different condenser supply water temperature.

Prohibitted term “over unity” - kind of irony...

Current paradigm



- GTR and Quantum Field Theories.
- Next is STR and QM.
- Elmag. Theo. – mother of all.

The mother of all - Classical ElectroMagnetism (CEM) theory is unshakable. Born 150 years ago. There is nothing to add, right?

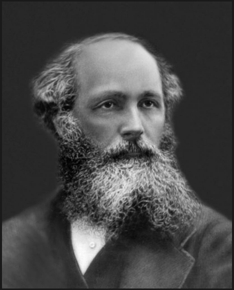
Back to 19th century

CEM theory has been completed about 150 years ago

James-Clerk-Maxwell (1831-1879)

Maxwell-Heaviside Eqs in SI units

1. Gauss El $\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\varepsilon_0}$
2. Gauss Mg $\vec{\nabla} \cdot \vec{B} = 0$
3. Faraday $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$
4. Ampère $\vec{\nabla} \times \vec{B} = \mu_0 \left(\vec{J} + \varepsilon_0 \frac{\partial \vec{E}}{\partial t} \right)$

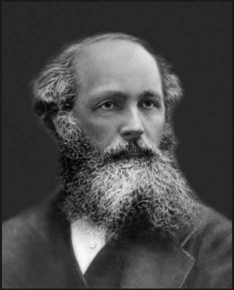


"A dynamical theory of the electromagnetic field" *Philosophical Transactions of the Royal Society*, vol. 155, pp. 459–512, 1865.

Maxwell Original Theory

Maxwell's field equations:

- Formulated in Quaternion Algebra (later).
- 20 eqs. for 20 unknowns.
- Displacement current controversy.
- Admits scalar fields solutions.



That's why ME theory was largely ignored. Until Heinrich Hertz, in 1888, has proven an existence of RF waves.

- Hertz - Transverse elemag Waves (TEM).
- Tesla - Scalar Longitudinal Waves (SLW).

Maxwell Original Theory

Maxwell wrote

$$\begin{aligned} p' &= p + \frac{\partial f}{\partial t} \\ q' &= q + \frac{\partial g}{\partial t} \\ r' &= r + \frac{\partial h}{\partial t} \end{aligned}$$

Modern Notation

$$\vec{J}_{\text{tot}} = \vec{J} + \frac{\partial \vec{D}}{\partial t} \qquad \in \mathbb{C}(2D)$$

Maxwell Quaternion notation

$$\mathfrak{Y} = \mathfrak{R} + \frac{\partial}{\partial t}\mathfrak{D} \qquad \in \mathbb{H}(4D)$$

$\tilde{q} = a + i \cdot b + j \cdot c + k \cdot d$, where $a, b, c, d \in \mathbb{R}$ and

$i^2 = j^2 = k^2 = ijk = -1$ and $ij = -ji = jk = -kj ...$

$\mathbb{H}$ too complex for Maxwell's contemp.

Quaternions mathematics $\rightarrow$ New Electrodynamics.

Overlooked by "mankind". Vector calculus, arose as a result of the tendency of simplified calculations in $\mathbb{H}$.

Dequaternionization or vectorization

$$\tilde{q} = a + \underbrace{i \cdot b + j \cdot c + k \cdot d}_{\text{3D space: i,j,k ortogon.}}$$

then "magic" $\sqrt{-1}$ abandoned $\rightarrow$ birth of vectors

$$\vec{V} = a \cdot \vec{x} + b \cdot \vec{y} + c \cdot \vec{z}$$

Maxwell–Heaviside Equations

Gibbs and Heaviside‡ re-expressed original ME in the modern vector form. Now we have

1. CEM and STR are NOT GENERALIZATION of lower order theory – Newtonian physics. No invariance wrt Galilean trf. in the low relative speed limit !?
2. CEM is over-parametrized. Eight field equations for six unknowns.
3. Lorentz force law violates Newton's Third Law.
4. Electrodynamic energy-momentum 4/3 problem.
5. QED and CEM are inconsistent. Force field vs potential field. Aharonov-Bohm effect.
6. Sagnac Effect, Maxwell-Lodge Effect, The Josephson effect...

‡O. Heaviside, Electromagnetic theory, vol. I. The Electrician Publishing, 1893.

Paradigm shift?

There are many attempts to rectify e.g. broken Galilean symmetry $\rightarrow$ Extended Classical Electromagnetism.

- Neo-Hertzian Theory (e.g. *T.E. Phipps, "Old Physics for New"*)
- Bi-quaternion formulations (e.g. A. Waser *"Application of Bi-Quaternions in Physics"*)
- Extended CEM (e.g. K.J. van Vlaenderen. *"General Classical Electrodynamics"*)
- Weber's Relational ElectroMag. (e.g. A. Assis *"Weber's Electrodynamics "* Kluwer Academic Publishers, 1994)

1) Are Maxwell-Heaviside and Einstein STR covering theories?

Very natural requirement is that in the low-speed limit NEW becomes to same as OLD!

CME invariance wrt Galilean trf.

Galilean Transformation (GT)

$$t' = t \tag{1a}$$
$$\mathbf{r}\,' = \mathbf{r} - \mathbf{v}\,t. \tag{1b}$$

Spatial and temporal derivatives:

$$\nabla' = \nabla \tag{2a}$$
$$\frac{\mathrm{d}}{\mathrm{dt}'} = \frac{\mathrm{d}}{\mathrm{d}t} \tag{2b}$$
$$\frac{\partial}{\partial t'} = \frac{\partial}{\partial t} + \mathbf{v}\cdot\nabla \tag{2c}$$

∇ is differential operator $\nabla = (\partial_x, \partial_y, \partial_z)$.

All it stems from a Faraday's observation

Faraday observed

$$\oint \vec{E}\mathrm{d}\,\vec{l} = \frac{\mathrm{d}\Phi}{\mathrm{d}t} = \frac{\mathrm{d}}{\mathrm{d}t}\iint \vec{B}\cdot\mathrm{d}\vec{S}.$$

Everybody assumes that one can replace the last term with partial derivative

$$\frac{\partial}{\partial t}\iint \vec{B}\cdot\mathrm{d}\vec{S}.$$

But this is exactly the term which spoils th GT invariance.

Neo-Hertzian theory

The main reason why the GT invariance is broken is the use of partial instead of total derivatives. See e.g. *T.E. Phipps, "Old Physics for New"* Faraday law:

$$\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$$

become

$$\vec{\nabla} \times \vec{E} = -\frac{\mathrm{d}\vec{B}}{\mathrm{d}t}$$

then, however, "spacetime symmetry" is broken

$$\left(\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z}, \frac{\partial}{\partial ict}\right) \rightarrow \left(\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z}, \frac{\partial}{\partial ict} + (\vec{v} \cdot \nabla)\right)$$

Fist-order invariance of Special Relativity

Lorentz trf.

$$t' = \gamma(t - \frac{\beta x}{c}) \tag{3a}$$

$$x' = \gamma(x - \beta c t) \tag{3b}$$

$\beta = v/c$, $\gamma = 1/\sqrt{1-\beta^2}$ and c is the speed of light. The low-speed limit comes from The Maclaurin expansion of the γ-factor

$$\gamma|_{\beta \ll c} = 1 + \frac{1}{2}\beta^2 + \frac{3}{8}\beta^4 + O(\beta^6) \tag{4}$$

while neglecting terms of $O(\beta^2)$mation (neglecting $O(\beta^2)$), the time coordinate transformation yields

$$t' = \left(t - \frac{vx}{c^2}\right)$$

Fist-order invariance of Special Relativity

time interval between these events can be written as

$$\Delta t' = \left(\Delta t - \frac{v \Delta x}{c^2} \right) \tag{5}$$

It is always possible to identify a pair of events for which the difference in spatial coordinates, Δx, is sufficiently large such that the term involving Δx dominates over the Δt term.

Galilean transformation ($t' = t$), which implies that simultaneous events are always simultaneous in all reference frames. In contrast, the Lorentz transformation in the $\beta \ll 1$ limit, asserts the simultaneous events in one frame are are never simultaneous in any other reference frames.