

Physics as a Building Project in Need of Design Review

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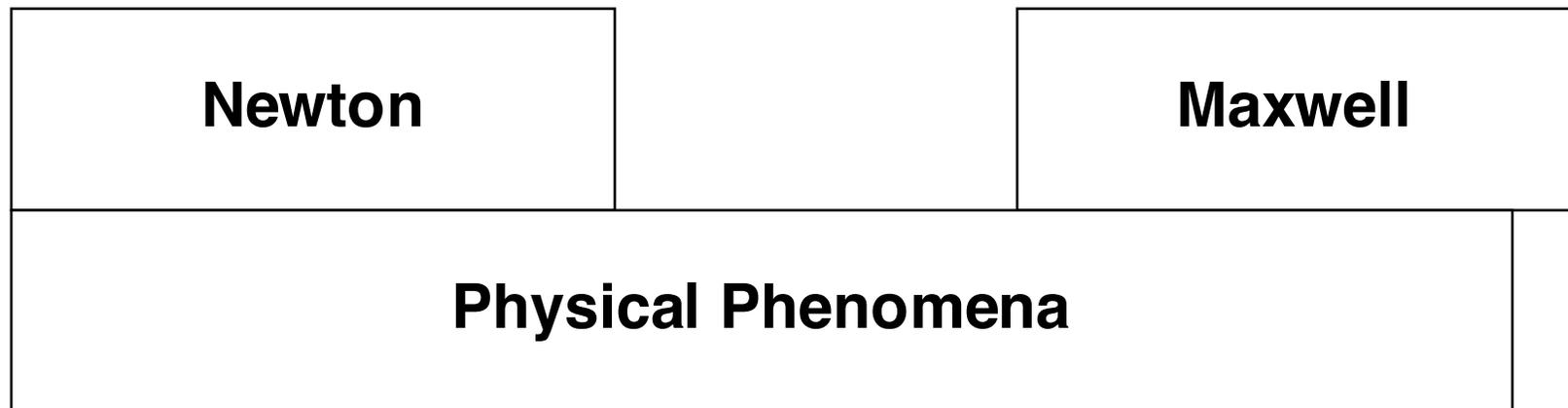
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Abstract

- This paper develops a blueprint for the historical development of physics in general, highlighting present-day amendments and revisions suggested by NPA participants in particular.
- The metaphor for physics as a building project involves a number of unwieldy building blocks, added in the sequence determined by historical accident, and now in not-completely-stable relation to each other.
- Stresses and strains are pointed out, and needed redesign/rebuilding efforts are enumerated.

The Foundation

- The first and most fundamental building block is the body of observational knowledge about physical phenomena.
- Countless names working over many centuries are involved, but let us mention just a few experiment-design and data-interpretation folks within the NPA: Halton Arp, Jorge Curé, David Dameron, Glenn Deen, Gerge Galeczki Peter Graneau, Ron Hatch, Bill Hughes, James Keele, Martin Kokus, Jaroslav Kopernicky, Eugene Mallove, Peter Marquardt, Francisco Müller, Hector Munera, Tom Phipps, Roger Rydin, Alex Scarborough, Tom Van Flandern, J.P. Wesley,...
- Two major blocks, for Newton and Maxwell, go on that foundation:



Why Newton and Maxwell are at the Extremes

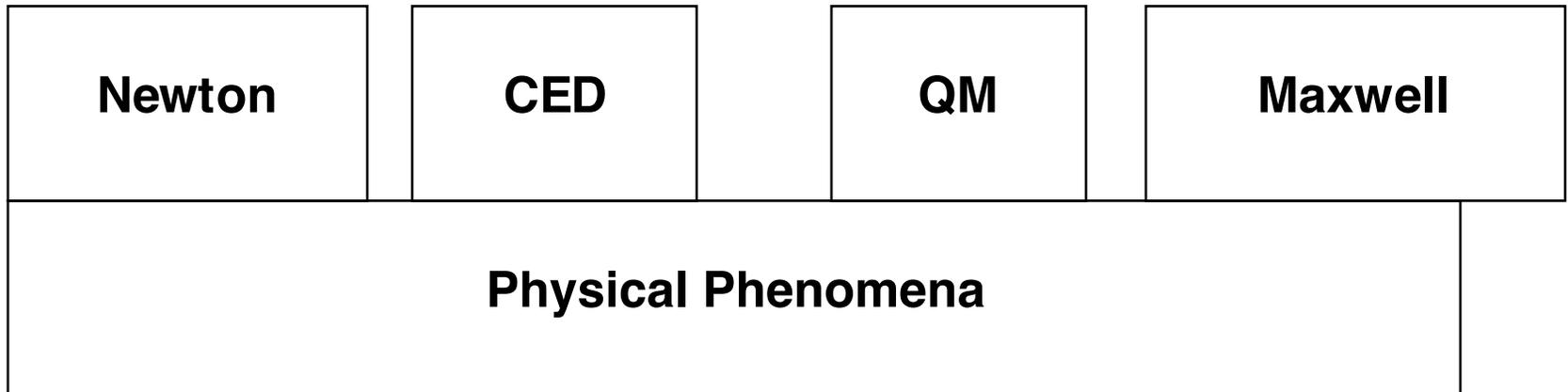
- Newton and Maxwell both helped form our definition of ‘mathematical physicist’, but they were extreme opposites in their guiding visions:
- Newton was all about point particles and action/reaction with forces dependent on particle positions; Maxwell was all about infinitely extending fields and helplessly responding test particles, and his differential equations led to continuous waves of field vectors existing at every test position.
- So Newton was ‘democratic’: physics as a ‘two-body problem’, with each body reacting to the other. But Maxwell was ‘dictatorial’: physics as a ‘one-body problem’ – a dominant body making the wavy field, with an insignificant test particle responding to that field.

Some Things to Note

- The Maxwell block has a little bit of **overhang**. That is because its match to physical phenomena is very good, but not perfect.
- Maxwell's theory has some content that apparently does not exist in physical reality: inexplicable '**advanced**' solutions, as well as expected 'retarded' solutions, to the differential equations for potentials and fields from moving sources; inexplicable '**run-away**' solutions, as well as expected 'decay' solutions, to the differential equations for trajectories of particles subject to radiation reaction.
- Maxwell's theory also does **not** explain all forces that occur; the Lorentz force law is insufficient. And Maxwell's theory does not properly treat electromagnetic phenomena at the micro scale of atoms. **That was a big part of the motivation for developing Quantum Mechanics (QM).**
- Finally, Maxwell's theory was built on the idea of 'aether', which was, and is, not detectable. The aether idea was a sort of 'intellectual scaffolding', now removed.

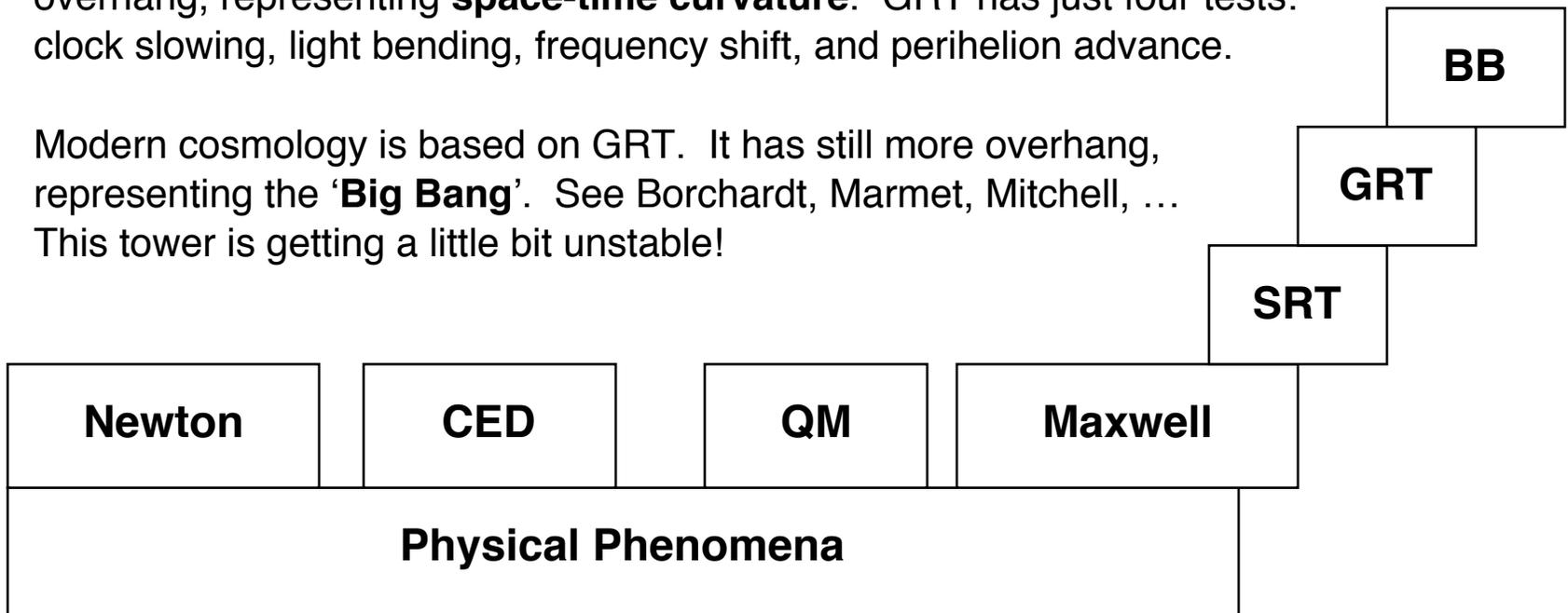
Two Major Blocks go Between Newton and Maxwell

- Consider the other early practitioners of Classical Electrodynamics (CED): Gauss, Weber, Ampère, Neumann... They all approached electrodynamics in a Newtonian way, by extending the idea of force to depend not only on particle **position** but also on particle **velocity**. That idea doesn't go as far as Maxwell, for whom the fields, and hence the forces, also involve **acceleration**.
- Consider the developers of Quantum Mechanics: Planck, Born, Schrödinger, Heisenberg, Bohr,... The discipline they created is Maxwell-like, in that it features differential equations and waves. But it is different from both Newton and Maxwell in that it features the phenomenon of '**uncertainty**'.



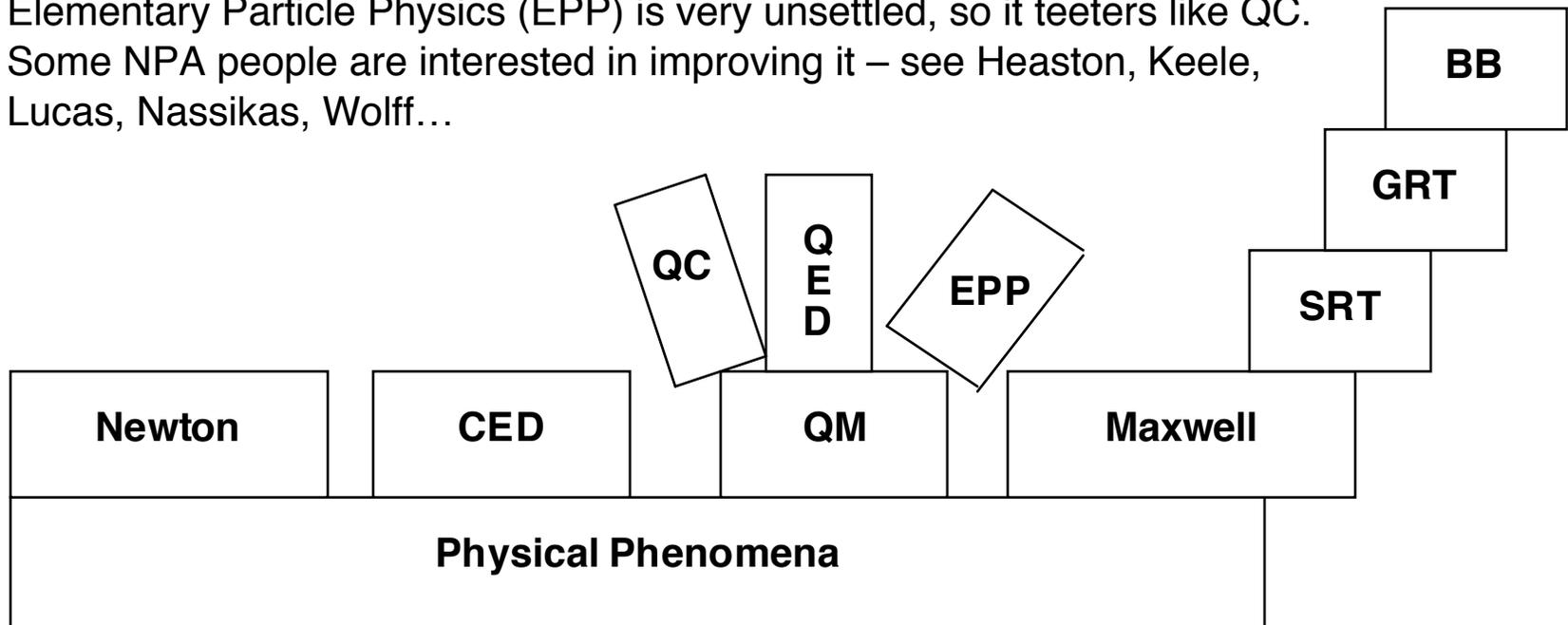
A Tower Starts on the Maxwell Side

- Einstein built Special Relativity Theory (SRT) on Maxwell's foundation. It too has a bit of overhang, representing mismatch with known physical phenomena. SRT removed 'aether' but inserted '**length contraction**', which like 'aether' is not detected.
- Einstein's built General Relativity Theory (GRT) on SRT. It has even more overhang, representing **space-time curvature**. GRT has just four tests: clock slowing, light bending, frequency shift, and perihelion advance.
- Modern cosmology is based on GRT. It has still more overhang, representing the '**Big Bang**'. See Borchardt, Marmet, Mitchell, ... This tower is getting a little bit unstable!



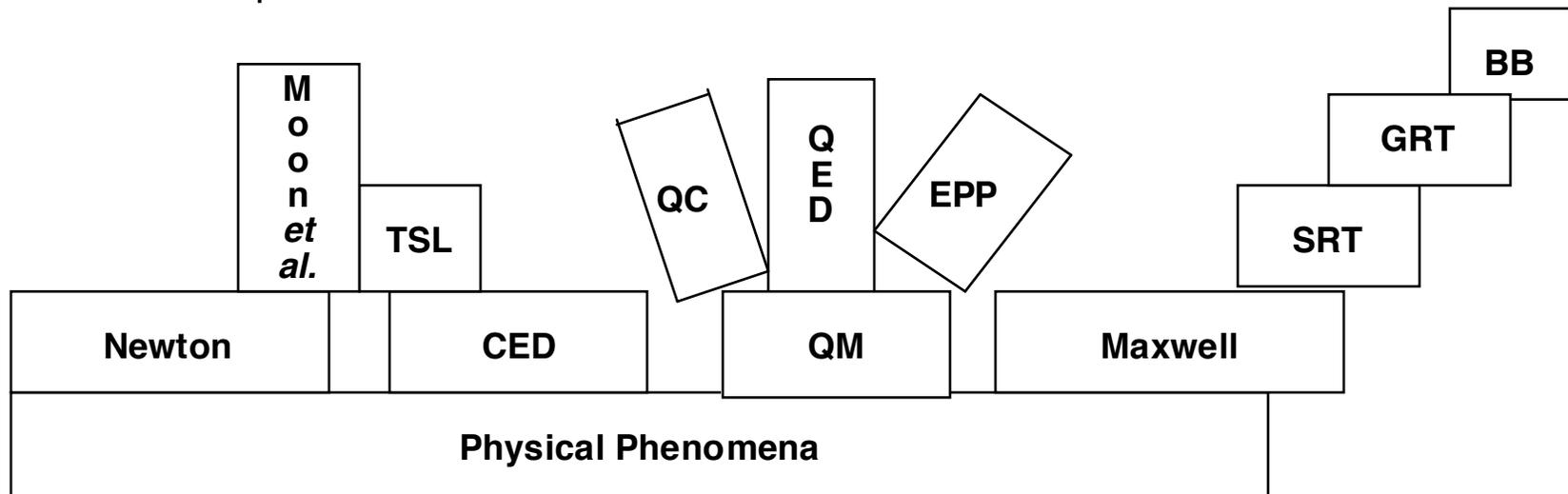
Several Towers Start Above the QM Block

- Quantum Electrodynamics (QED) treats relationships between photons, electrons and positrons. It is very good at what it does, so is drawn solidly planted.
- Quantum Chemistry (QC) is difficult and sometimes inaccurate; recall my earlier NPA papers about ionization potentials (IP's). QC is ill-planted and teetering.
- Elementary Particle Physics (EPP) is very unsettled, so it teeters like QC. Some NPA people are interested in improving it – see Heaston, Keele, Lucas, Nassikas, Wolff...



Some Towers Start Above Newton and CED Blocks

- Key idea: we should examine, and question, and consider alternatives to, the light speed postulate at the foundation of SRT. In particular, we should try to recover Newton's Universal Time.
- One tower represents the work of Moon, Spencer, *et al.* It does a better job on mysterious aspects of metallurgy (Herring furnace (HF), arc welding (AW),...). It explains confounding optical experiments (OE) (Sagnac, Michelson-Gale,...). It does extremely well for anything **macroscopic**.)
- Another tower represents my own Two-Step Light: expanded SRT de-conflates ideas, removes paradoxes, handles OE's (Infinite Energy Magazine), and variant QM does better than QC (Foundations of Physics). It aims to treat the **microscopic**.



Why Two Separate Towers?

- Instead of further applying the current best of the Moon, Spencer *et al.* Postulates, I have considered adding another variation to it.
- I believe their success has come from asserting continuing attachment to the source of light as a reference for light speed.
- I have matched that with a second part of any energy transfer scenario: a period of attachment to the receiver of light as a reference for light speed.
- That makes **Two-Step-Light**. It is very controversial. Here I must try again to explain it.

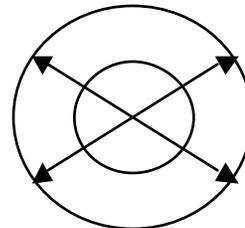
What Can be Said About ‘Light in Flight’?

- Absolutely **nothing** directly verifiable, because ‘verifying’ anything means ‘capturing’ the light, and ‘captured’ means ‘no longer in flight’. (Probably Moon)
- Absolutely **anything** that does not imply an end result that contradicts experiment.

e.g. “Phase velocity is c in any inertial coordinate frame.” (From Maxwell via Einstein. Absolute phase isn’t measurable, so anyone can say anything at all about it.)

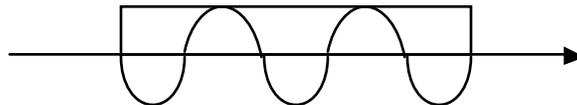
e.g. “Light is a limited wave packet with finite total energy arising from a single atomic source – a ‘photon’.” (From Einstein. Photons always come in bunches, so who knows if just one atom can produce just one photon?)

e.g. “Light is a continuing wave, with each phase front expanding spherically at speed c from a point source, however that point source may move.” (Moon, Spencer, *et al.* But who knows if it is spherical.)



Some Additional Statements Seem Allowable

- e.g.** “Light is a limited wave packet with finite total energy, arising from a finite number of atomic sources by laser-like action.” (Marquardt / Wesley)
- e.g.** “If coming from laser-like action, a light wave packet must favor a particular propagation direction. Don’t think ‘sphere’, think ‘**cylinder**’.” (Marquardt / Whitney)
- e.g.** “This propagation direction is determined by the arrangement of atoms in the laser-like source, and **NOT** by any **pre-determined receiver**.” (Whitney. This idea is controversial, and I don’t know why.)
- e.g.** “If the wave packet is ‘limited’, it must have a ‘beginning’ and an ‘end’, and hence some amplitude profile along its propagation direction.” (Whitney)
- e.g.** “An amplitude profile has ‘height’ and a ‘length’, and both can vary over time, so long as its ‘area’ remains the same.” (Whitney. This idea does contradict the linear, non-dispersive Maxwell theory, but not any experiment.)



Some More Controversial Whitney Statements

- e.g.** “Between the ‘beginning’ and the ‘end’ of an amplitude profile, there has to be a ‘middle’. The amplitude profile may be flat, or symmetric about this ‘middle’.”
- e.g.** “Then the ‘middle’ is the **centroid** of the energy distribution. And *it* must be what travels at speed c .” (This means the ‘beginning’ could stay with the source, and the ‘end’ would then have to go off at $2c$.)
- e.g.** “If phase fronts travel at c , then the ones beyond the ‘middle’ of the amplitude profile have not gotten there by travel from the source; they have ‘arisen’ there by **induction**, and only then begun to travel.”
- e.g.** “The fast-moving ‘end’ of the amplitude profile will eventually encounter some bit of matter.” (This ‘encounter’ is a **RANDOM** event, and it selects a **RANDOM** ‘receiver’. **The receiver is NOT pre-determined.**)
- e.g.** “After the encounter, the process **reverses**: the ‘end’ of the amplitude profile stays with the randomly chosen receiver, however it may move, while the ‘middle’ moves at speed c toward the receiver, and the ‘beginning’ therefore has to move at $2c$ toward the receiver.”
- e.g.** “The scenario isn’t ‘over’ until the ‘beginning’ of the amplitude profile completes its journey to the receiver.”

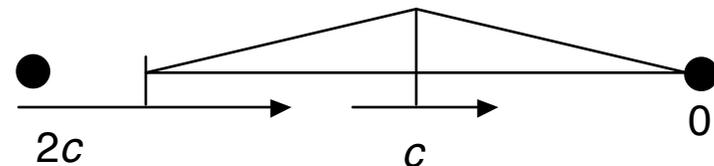
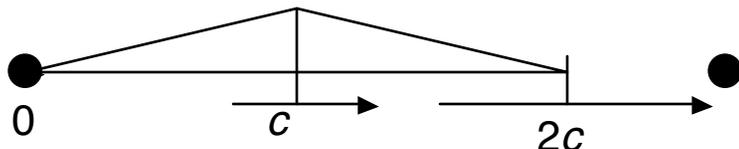
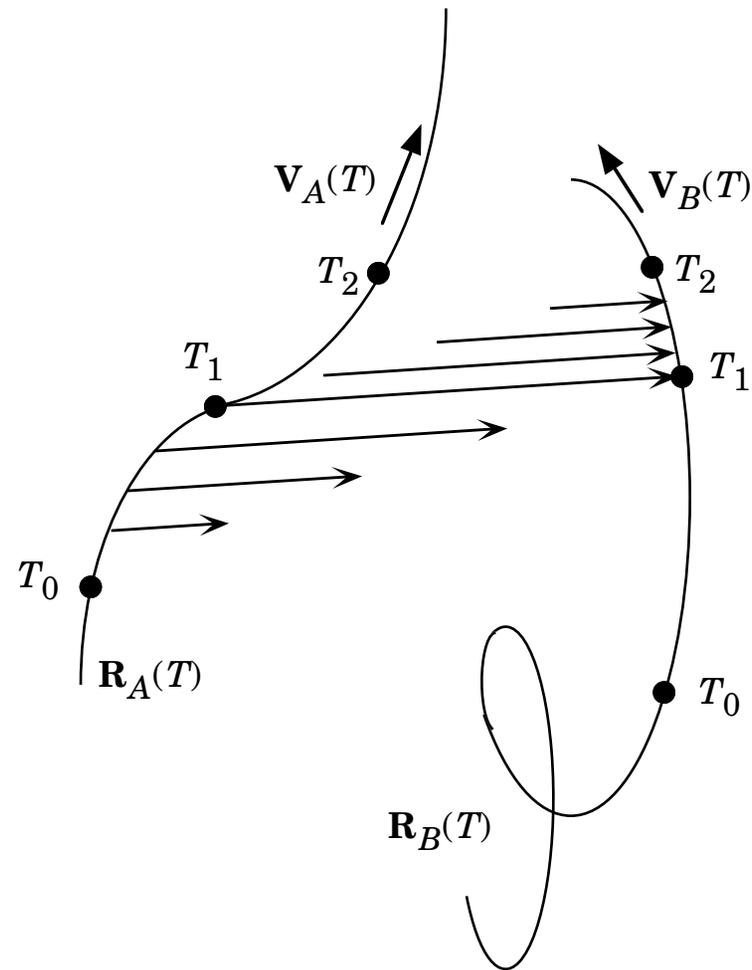


Illustration of Two-Step Light Propagation



A Mission for All of Us in the Future

- Re-do what is unstable: the whole tower on the right side, through SRT, GRT, and culminating with Big Bang cosmology.
- Re-do what is teetering: the towers for elementary particles and quantum chemistry, and maybe even the quantum mechanics below those.
- Unify what is presently fractious: the two towers representing efforts by NPA people investigating alternative postulates.
- And why do we have separate towers at all? Will there one day exist an accepted 'Theory of Everything'?

Mainstreaming – A Personal Progress Report

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A Few Papers Invited by Mainstream Journals

- “Relativistic Dynamics in Basic Chemistry”, *Foundations of Physics* **37** (4/5) 788-812 (2007).
- “Closing in on Chemical Bonds by Opening up Relativity Theory”, *International Journal of Molecular Sciences* **9**, 272-298 (2008).
- * “Single-Electron State Filling Order Across the Elements”, *International Journal of Chemical Modeling* **1**, forthcoming.
- “Visualizing Electron Populations”, *International Journal of Chemical Modeling*, in preparation.

How Did That Happen?

- It was a good thing to seek out **experimental** problems as the context within in which to introduce any new theoretical notions. Only experiments can force people open up to new ideas!
- It was a good thing to look beyond pure physics experiments, which are always designed to 'prove' existing physics theory, and look into experiments by **chemists**, who have no loyalty to physics dogma.
- It was a good thing to seek out a problem where there was a lot of data, but no satisfactory sense of understanding: **ionization potentials**.
- It was probably a good thing to be able to **recover**, rather than replace, the existing SRT and the existing QM.
- * Never mind being stridently **confrontational** with the physics establishment. Being quietly **subversive** works so much better!