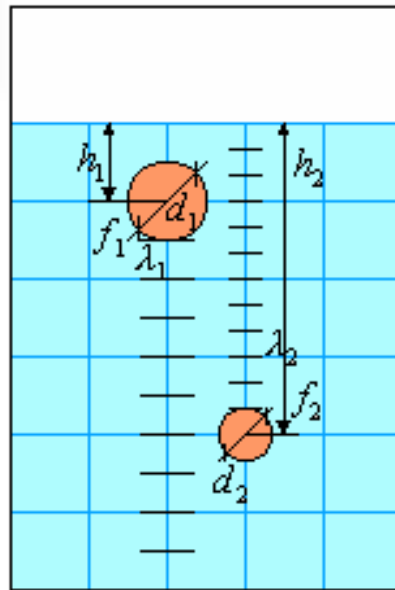
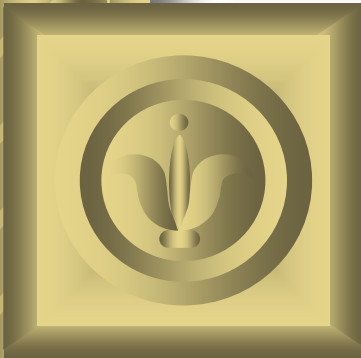


How to overcome problems of General Relativity (GR) using alternative approaches

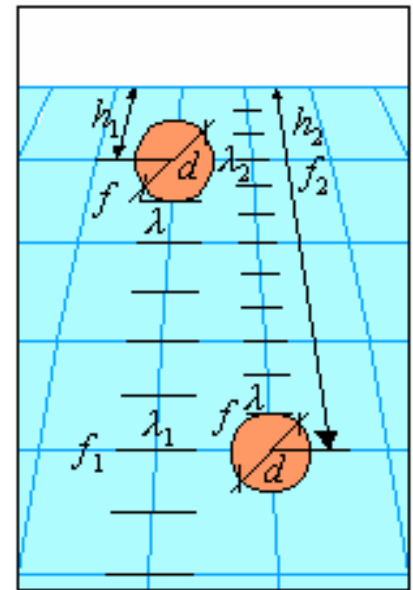
György SZONDY

Member of Roland Eötvös Physical Society



GPS

?

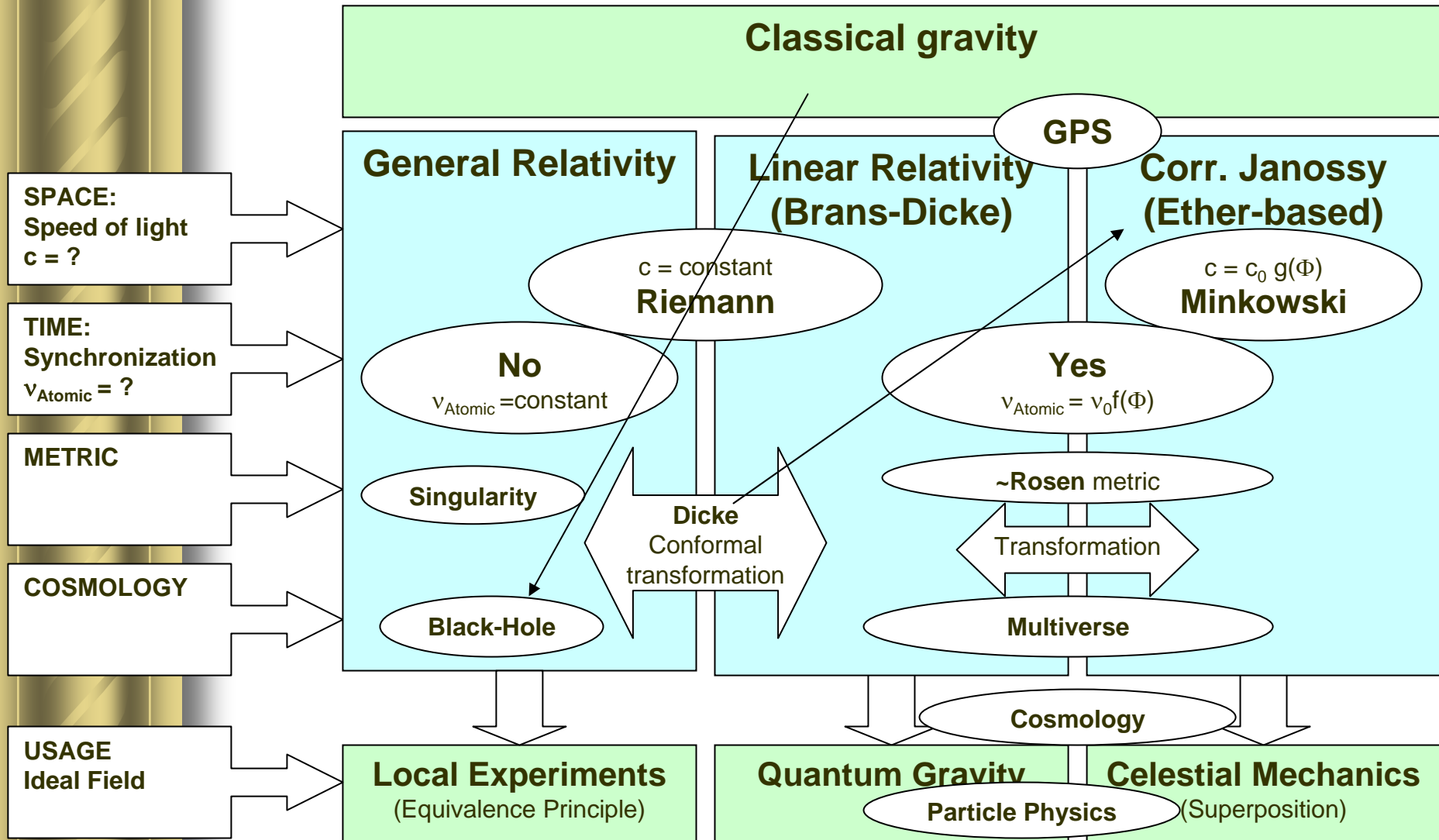


GR

ELFT Fizikus Vándorgyűlés

Szombathely, 2004. Augusztus 24.-27.

Different descriptions of GRAVITATION



Space-time measurements

- **Measurement of physical reality is key part of experiments**
- **Measuring**
 - compare **SUBJECT** to an **ETALON** using an **INSTRUMENT**
 - Measure **SPACE-TIME** using **CLOCK** and **LIGHT-BEAMS** (Supported by the definition of c)
- **Correction of possible errors**
 - etalon – **YES: calibration**
 - Instrument – **ACCIDENTAL** (e.g. change direction)
- **Corrections in GENERAL RELATIVITY**
 - Etalon – Atomic clock: **NO CALIBRATION** needed
 - Instrument – Light Beam: **Gravitational red-shift** (integration of correction along the path - **APPROXIMATION**)

General Relativity is NOT IDEAL for measurements!

GPS measurements

- **Global Positioning System (GPS) is the most widely used application of relativistic measurements**
- **Corrections in GPS**
 - Etalon – Atomic clock: **CALIBRATION** needed (corrections are applied depending on the gravitation potential too)
 - Instrument – Light Beam: **IDEAL** – No gravitational red-shift
- **Limitations - theoretical**
 - Space-time considered being flat
 - Saphiro effect is not considered
- **Usage**
 - Practically used on the same gravitation potential = practically on flat space
 - Mathematical **COMPLEXITY** is just a fragment compared to GR

GPS is IDEAL for measuremets!

GR alternatives - 1

Linear (Brans-Dicke) Relativity

- **Measurement in the original Brans-Dicke theory**
 - Etalon – Atomic clock: Not ideal, changed by a position dependent scalar $f(x)$ - CALIBRATION needed
 - Instrument – Light Beam: NOT IDEAL, BUT gravitational red-shift changed by a position dependent scalar $f(x)$
- **Special definition of $f(x)$ to INHIBIT gravitational red-shift**
 - Instrument – Light Beam: IDEAL – No gravitational red-shift
- **Gains**
 - Linear Relativity is a Riemann extension of GPS!
 - Conformal transformation between Linear Relativity and General Relativity (as defined by Dicke)
 - Gravitation field has no energy
 - Addition of mass and energy is Linear

Usable for Quantum Gravity

GR alternatives – 2a

Corrected Janossy approach

- **Janossy: Relativistic Description of Gravitation on Flat (Minkowskian) space – Ether**
 - Qualitatively: good
 - Quantitatively: half of the proper values for
 - Light deflection
 - Mercury perihelion shift
 - (Dicke also mentioned this possibility)
- **Cause of the problem**
 - Heuristic assumption: size of the particle is constant
- **Corrected Janossy approach**
 - **SIZE of the PARTICLE also DEPENDS on the gravitation POTENTIAL**
 - Proper values for
 - Light deflection
 - Mercury perihelion shift

Alternative for General Relativity on flat space!

GR alternatives – 2b

Superposition and n-body solution

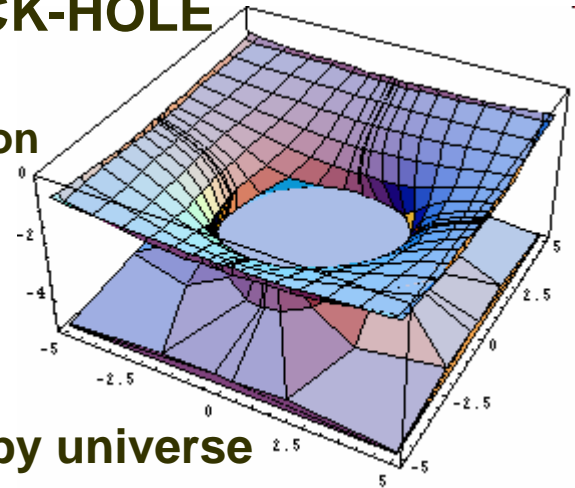
- **Requirements for additional corrections**
 - No singularity
 - Superposition
 - Calculate metric from mass distribution
 - Zero Ricci scalar is not required
- **Result**
 - Metric: Transformed form of well-know ROSEN metric

Ideal for Celestial Mechanics and COSMOLOGY!

- **Addition**
 - Metric can be transformed to the form of Linear Relativity

Cosmological aspects of alternatives

- **Inside of the (Schwarzschild) BLACK-HOLE**
 - **General Relativity:**
 - instable orbits near the event horizon
 - **Alternatives:**
 - Expansion of space
 - Switch of in-out directions
- **Multiverse model (Lee Smolin)**
 - Internal region of a black hole = baby universe
 - Universes with different cosmological constant
 - Only WORM-HOLES exists (between parent and baby universes)
 - BIG-BANG = born of the new universe inside a black-hole
 - ...



Alternative cosmological answers!

Geometric Quantum Gravity

- **Classical Relativistic Gravity**
 - Assumptions for “weak” fields
 - Gravitation potential \Rightarrow particle
- **Geometric Quantum Gravity**
 - Exact solution
 - gravitation potential = (Geometry \Rightarrow particle)
 - Requires Bohr-like particle model
 - Particle rest-mass depends on space curvature

- **Candidates**
 - String theory
 - Loop Quantum Gravity
 - ...

References

- [1] Landau, Lifsic, *Elméleti Fizika II*, 405, 293-, Tankönyvkiadó (1976)
- [2] C. Brans and R. H. Dicke, *Mach's Principle and a Relativistic Theory of Gravitation*, Phys. Rev. D 124-925 (1961)
- [3] R. H. Dicke, *Mach's Principle and Invariance under Transformation of Units*, Phys. Rev. D 125-2163 (1962)
- [4] Lajos Jánosy, *Relativitás Elmélet a fizikai valóság alapján*, 237-251, (Akadémia 1973).
- [5] S. Kaniel and Y. Itin, *Gravity on parallelizable manifold*, [gr-qc/9707008](http://www.mira.org/bonestell/kai/multi.htm), (1997)
- [6] Dr. Kai Woehler, *Multiverse*, <http://www.mira.org/bonestell/kai/multi.htm>
- [7] Gy. Szondy, *Korrekt mérések a téridoben*, <http://www.kfki.hu/~elftterm/TerMer.pdf>, (2001)
- [8] Gy. Szondy, *Linear Relativity as a Result of Unit Transformation* [physics/0109038](http://www.kfki.hu/~elftterm/physics/0109038), (2001)
- [9] Gy. Szondy, *Mathematical Equivalency of the ether based gravitation theory of Janosy and General Relativity*, [gr-qc/0310108](http://www.kfki.hu/~elftterm/gr-qc/0310108), (2003)
- [10] Gy. Szondy, *Allowing superposition in classical Relativistic gravitation*, http://www.geocities.com/gyorgy_szondy/GRRRefining14.pdf, (2003).
- [11] Gy. Szondy, *Léggömb Relativitás (ismeretterjesztő)*, http://www.geocities.com/gyorgy_szondy/LeggombRelativitas.html (2001)

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