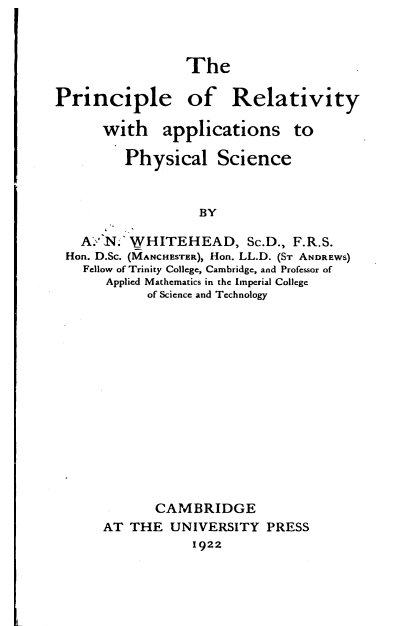
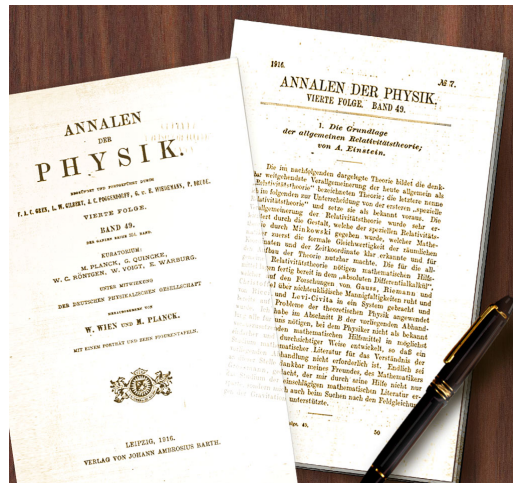


Aesthetic Comparison of Einstein's and Whitehead's Theories of Gravitation

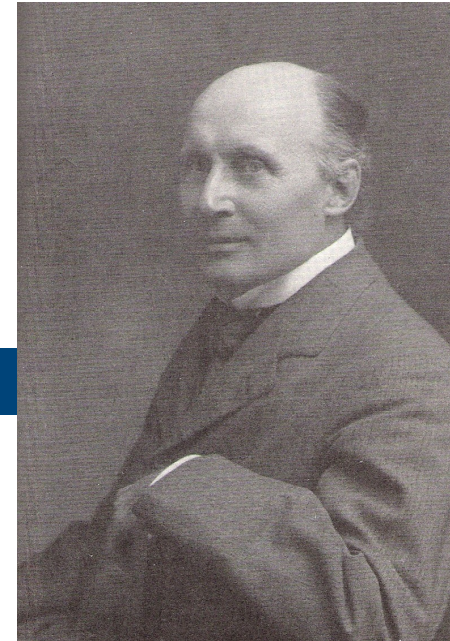
Ronny Desmet

Two theories of gravitation

- Einstein's general theory of relativity (GTR): 1916
- Whitehead's alternative theory of gravitation (ATG): 1922



Whitehead's ATG



- Replaced Einstein's geometric explanation with an **electrodynamics-like** explanation of the gravitational motion of a free mass-particle as due to a **field action** determined by **retarded wave-potentials** propagating in a **uniform space-time** from the source masses to the free mass-particle
- Not empirically equivalent with Einstein's GTR, but **"experimentally indistinguishable"**

“experimentally indistinguishable”

- Approximates Newton’s theory of gravity
- Shares with Einstein’s GTR the Schwarzschild solution
 - same predictions for the precession of perihelion of Mercury & the bending of starlight by the sun & the redshift of light emitted by atoms in the field of the sun
- Shares with Einstein’s GTR the Kerr solution
- **Predictive divergence** in the two-body case **is quite small**
 - example: double stars
 - **experimental techniques not sufficiently refined to measure it**
 - until 2008: GTR’s predictions confirmed, ATG’s falsified

Philosophy of science

Hilary Putnam

- For a long time: ATG experimentally indistinguishable from GTR
- Nonetheless: acceptance GTR & rejection ATG
- Hence: theory selection based not only on **empirical** facts but also on **aesthetic** values
- However: my aesthetic comparison does not favor GTR over ATG



Aesthetic comparison: Whitehead >< Einstein

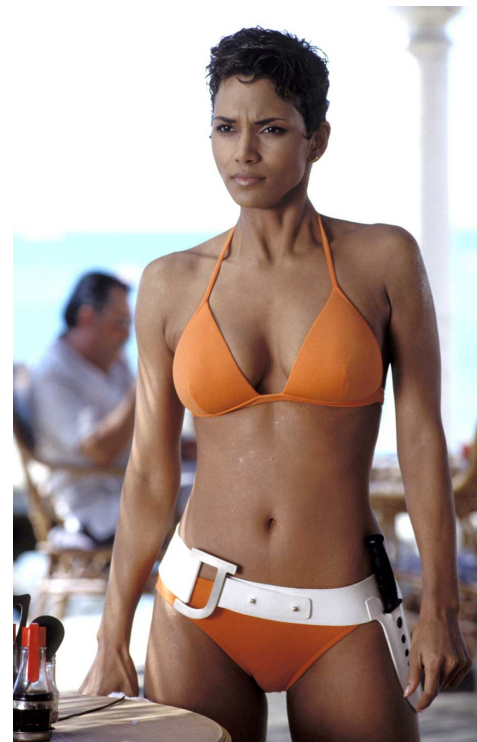


- Mathematical simplicity: ATG equations linear and easy to solve >< GTR equations inevitably unique
- Unifying power: ATG unifies gravitation and electromagnetism >< GTR unifies space-time and gravitational field
- Uniformity: ATG's spatio-temporal uniformity >< GTR's natural-law uniformity
- Intelligibility: ATG's experiential intelligibility >< GTR's logical intelligibility
- Visualization: ATG's wave metaphor >< GTR's curved surface metaphor
- Harmony with ontology: ATG's ether of events >< GTR's ether of space-time substance

Same theory, different evaluation?

- Wrong answer = Beauty is in the eye of the beholder (different subject → different aesthetic judgment)
- Correct answer = Beauty is background dependent (different background/context → different aesthetic judgment)
- Which background-factor explains the aesthetic consensus of British physicists in the 1920s to accept GTR and reject ATG?

Analogy with female beauty (1)

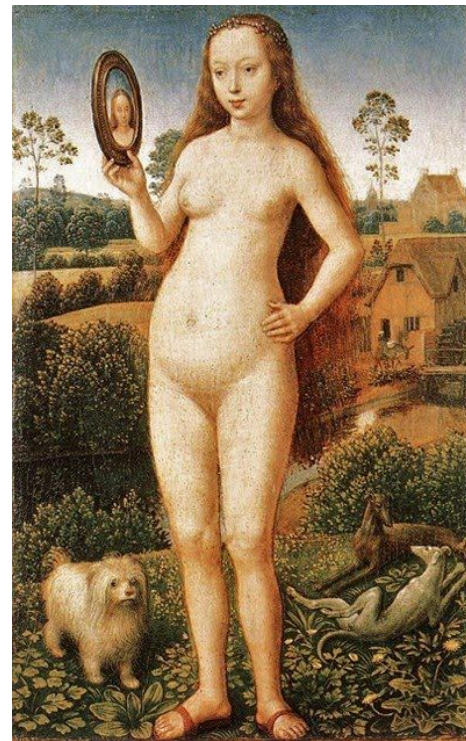


Analogy with female beauty (2)



AllPosters

Analogy with female beauty (3)



Analogy with female beauty (4)



Analogy with female beauty (5)

- Einstein's **GTR** in the 1920s analogous to Twiggy in the 1960s (the **aesthetic yardstick**)
- Whitehead's **ATG** in the 1920s analogous to Marilyn Monroe look-alike in the 1960s (**out of season**)
- Electrodynamics-like ATG might have been highly valued early 1910s, when physicists were enchanted by the beauty of electrodynamics, but not in the early 1920s

Background-factor determining aesthetic consensus

- Social status (media success) determines ideal of female beauty
- **Empirical success determines** (induces) **aesthetic canon of theory evaluation and selection** (according to James McAllister);
- In particular: empirical success of GTR in 1919 determined British physicists in the 1920s to favor GTR over ATG (according to me)

Aesthetic consensus

- Russell, Lorentz, ... : “Einstein’s theory has the highest degree of aesthetic merit: every lover of the beautiful must wish it to be true”
 - Consequently: Whitehead’s theory was not perceived as beautiful, but as less simple, less unifying, less intelligible, etc.
- Physicists aesthetically favored Einstein’s theory over Whitehead’s

Conclusion (more on vub.academia.edu/RonaldDesmet)

- In the 1920s Whitehead's ATG was empirically indistinguishable from Einstein's GTR,
- but the aesthetic properties of the two theories diverged significantly.
- As Einstein's GTR, due to its empirical success, had become the aesthetic standard,
- physicist aesthetically favored Einstein's GTR over Whitehead's ATG.