SPEZIELLE und **ALLGEMEINE RELATIVITÄTSTHEORIE**
für Physiker und Philosophen

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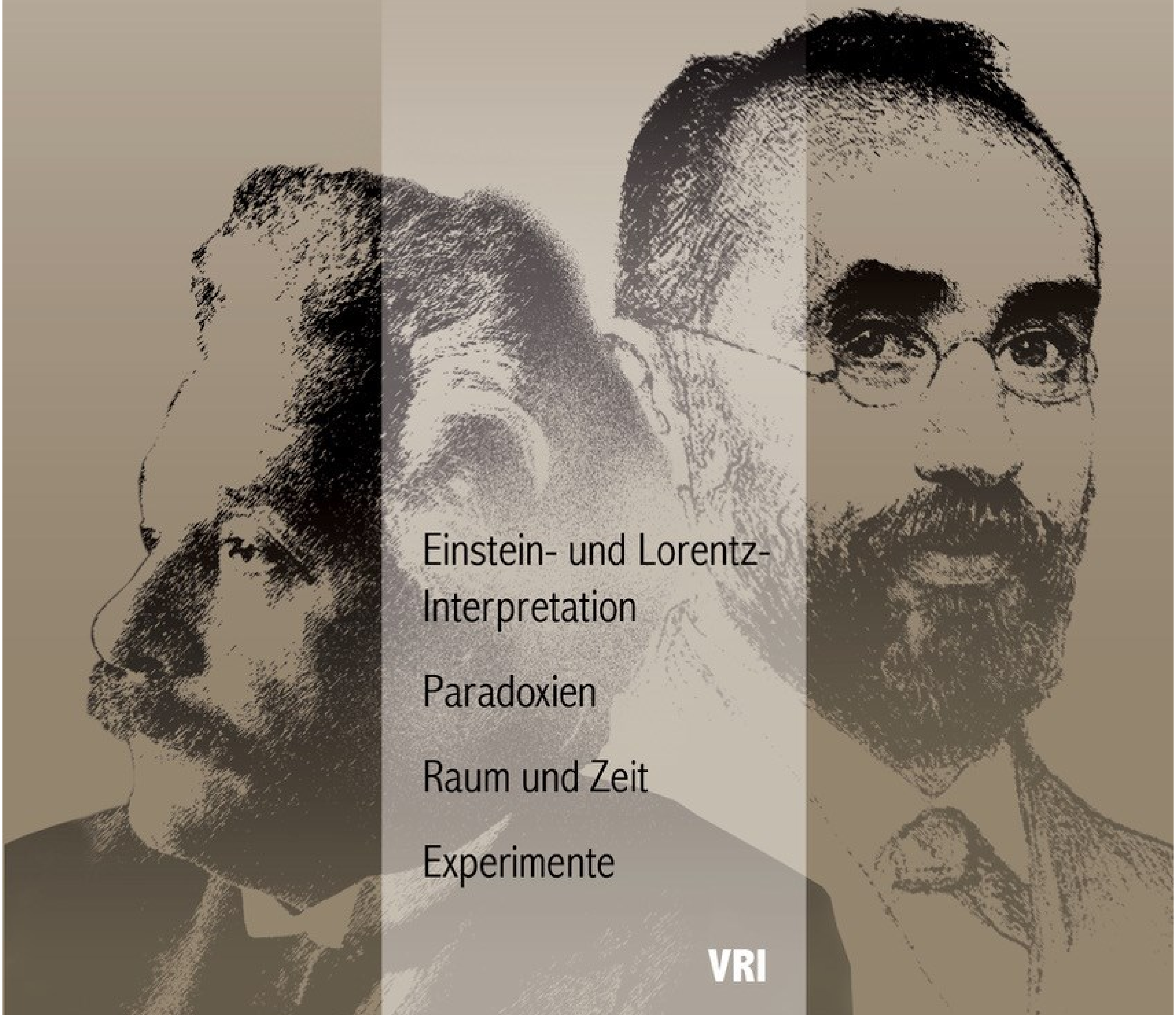
5. erweiterte Auflage



Einstein- und Lorentz-Interpretation

Paradoxien

Raum und Zeit

Experimente

VRI

Deutsche Physikalische Gesellschaft
Virtuelle-Frühjahrstagung März 2022
Fachverband Gravitation und Relativitätstheorie (GR)

Talk DPG 2022

Black holes, classical general relativity, no ether – are there alternatives?

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1 Introduction

The textbook „Brandes, J.; Czerniawski, J. (2022): *Spezielle und Allgemeine Relativitätstheorie für Physiker und Philosophen - Einstein- und Lorentz-Interpretation, Paradoxien, Raum und Zeit, Experimente*" [10] discusses alternatives to black holes, classical general relativity, and to a nonexistence of an ether. Is this rational? Not at the first sight since everybody knows:

1.) Black holes are experimentally proven
2.) There is not alternative to classical general relativity
3.) There is no ether

The textbook and my homepage evaluate scientific counterarguments which challenge points 1.) – 3.). But instead of presenting some of them it is more interesting to present the counterarguments of famous physicists. Especially, four **Nobel prize winners** agree with one of the following three statements:

1.) Black holes are not experimentally proven
2.) There is an alternative to classical general relativity.
3.) Ether and classical special relativity fit together.

2 Nobel prize winner Genzel questions first image of BH

This image everyone will remember:

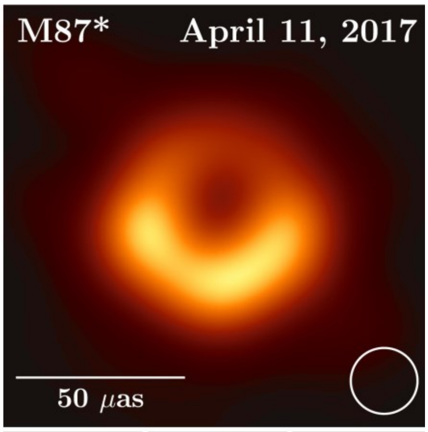

Fig 1. First image of a black hole

It is claimed as the first image of a black hole as well as the absolute proof that there are black holes. This is now questioned openly by **Nobel prize winner Reinhard GENZEL**. Thereto I cite from a discussion within the German newspaper "Der Spiegel" [1]:
Spiegel: „Wo immer über schwarze Löcher berichtet wird, sieht man dieses Bild [Fig. 1]. Und Sie sagen uns jetzt, dass wir gar nicht wissen, was es eigentlich zeigt?"
GENZEL: „So ist es. Es kann sein, dass wir den Schatten des schwarzen Lochs sehen, so wie es gemeinhin dargestellt wird. Aber es könnte auch sein, dass es sich um die Außenwand eines Jets handelt, der sich mit Lichtgeschwindigkeit direkt auf uns zukommt. …"
Translation (not literally):
Spiegel: „Wherever it is reported on black holes you will see this picture [Fig. 1]. And now you tell us that we don't know what it really shows?"
GENZEL: "So it is. It is possible, that we see the shadow of the black hole as it is commonly presented. But also, it could represent the outside of a jet approaching us with the velocity of light. ..."

This means with other words **Nobel prize winner Reinhard GENZEL** takes black holes for not proven until now. Nobody is unscientific if he challenges black holes as long as they are unproven. Some simple consequences: Lorentz interpretation of general relativity (see ch. 4) is not rejected up to now - possibly there are no black holes. Classical general relativity should tolerate this fact till there are better observations. **An update from 25.10.2022 see at end of chapter 13 of "observations questioning …" [9].**

3 Nobel prize winner THORNE about curved spacetime versus flat space and time

At first one should have a look at fig.2. It visualizes the question. Am I running through the curved space and my measuring rods do not change or am I running through the flat space in a gravitational field and my measuring rods become contracted?
To this THORNE [3] says: “Is spacetime *really* curved? Isn´t it conceivable that spacetime is actually flat, but the clocks and rulers with which we measure it … are actually rubbery?” His answer: “Yes.” And later: “What is the real, genuine truth? Is spacetime really flat, as the above paragraphs suggest, or is it really curved? To a physicist like me this is an uninteresting question because it has no physical consequences. Both viewpoints, curved spacetime and flat, give precisely the same predictions for any measurements performed with perfect rulers and clocks. … “Since the two viewpoints agree on the results of all experiments, they are physically equivalent. Which viewpoint tells the “real truth” is irrelevant for experiments, it is a matter for philosophers to debate, not physicists.”
This is convincing, but a minor remark might be necessary. Since both theses make different declarations about ‘reality’ they are different theories.

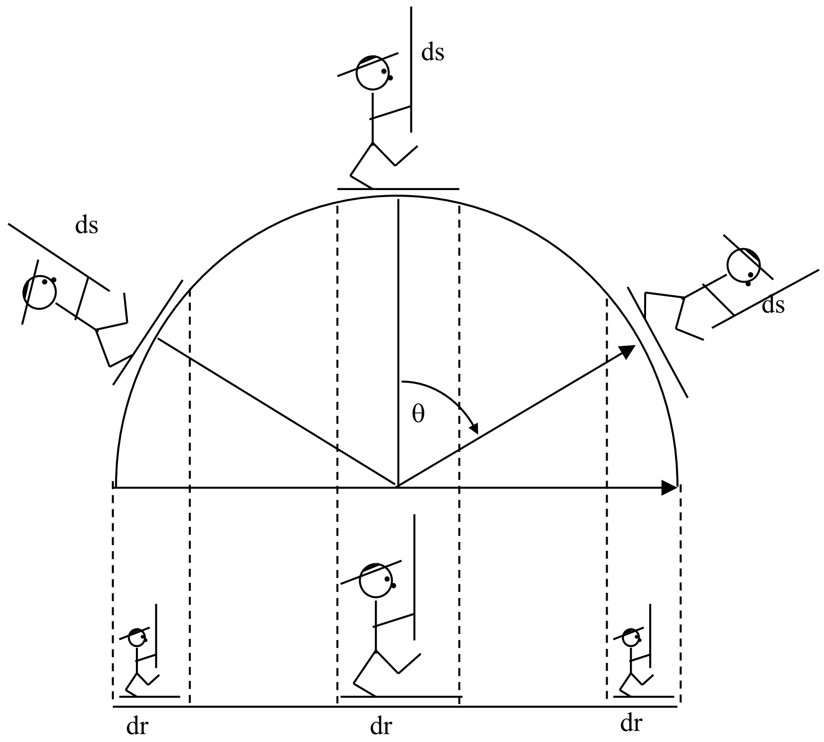

Fig. 2. Curved space versus contraction of measuring rods within a gravitational field.

4 Nobel prize winner EINSTEIN about Euclidean geometry

The following citations prove that EINSTEIN accepts both theses of fig. 2. At least, for him they contain no contradictions. EINSTEIN says about the Schwarzschild-Metrik[4]: “The measuring rod appears contracted relative to the coordinate system with the evaluated value caused by the gravitational field if the rod is radially applied. … If tangentially applied the gravitational field of a mass point has no influence on the rod length”. [Translation (not literally)] For some explanation a citation of HERMANN WEYL (cofounder of gauge theory) [5] “Certainly, it is possible to explain this fact in the following way. In truth, the Euclidean geometry is correct, but the gravitational field reacts on measuring rods in such a manner that a radially applied rod, which is situated at the (real) distance r from the gravitational center, suffers a contraction proportional to

$$\sqrt{1-2m/r}:1$$

while the gravitational field produces no contraction if the rod is applied tangentially e. g. perpendicular to the radius.” [Translation (not literally)] Another well known physicist who agrees is R. U. SEXL [6].

Following the statements of the Nobel prize winners THORNE and EINSTEIN the author distinguishes between classical general relativity (curved spacetime) and Lorentz interpretation of general relativity (rods are contracted in gravitational fields). Lorentz interpretation of general relativity is the alternative to classical general relativity. Accordingly, within classical special relativity there is no ether but within Lorentz interpretation of special relativity there is a relativistic ether. Some of its features are discussed now.

5 Nobel prize winner LAUGHLIN on the debate of an ether

Does an ether exist? **Nobel prize winner LAUGHLIN** agrees with it. This you can read in [7]:"Nobel prize winner LAUGHLIN (theory of the fractional quantum-Hall-effect) says it more pointed" „The word ether has extremely negative connotations in theoretical physics because of its past association with opposition to relativity. This is unfortunate because, stripped of these connotations, it rather nicely captures the way most physicists actually think about the vacuum. [...] The modern concept of the vacuum of space, confirmed every day by experiment, is a relativistic ether. But we do not call it this because it is taboo."
LAUGHLIN agrees with an ether and for distinguishing from former ether concepts he calls it „relativistic ether". Its features - the modern concepts of the vacuum of space – shall not be discussed here, but one feature applies in every case: the ether is the carrier medium of light waves. In this spirit PETER SCHMÜSER (Desy, cofounder of gluons) writes: „Physicists of the 19th century were unable to imagine wave propagation without a carrier medium. … **If physicists of the 21th century seriously think about this problem they are unable too.**" [8].

6 Counterarguments

Counterarguments of this talk you will find on the homepage of the author [9] in **Further counterarguments since 2013,** chapter 6.

7 Summary

Four **Nobel prize winners** contradict classical relativity as it is usually presented in textbooks. Black holes are not experimentally proven up to now. Classical special and general relativity have an alternative called Lorentz interpretation of special and general relativity. The ether is a viable concept. An objective lecture of special and general relativity should tolerate these objections.

8 Literature

[1] Spiegelgespräch mit Nobelpreisträger Genzel vom 10. 10. 2020
[2] Kip S. Thorne (1994): *Black holes and time warps. Einsteins outrageous legacy*, New York, London: Norton, page 397, 400 ff, 402, 403
[3] Kip S. Thorne (1994): *Gekrümmter Raum und verbogene Zeit. Einsteins Vermächtnis.* München Droemer Knaur 4. Auflage 1994, Seite 457, 460, 462, 463
[4] Einstein, A.: Die Grundlage der allgemeinen Relativitätstheorie. Ann. d. Phys. 49, (1916) in: Lorentz, H. A.; Einstein, A.; Minkowski, H.: *Das Relativitätsprinzip. Darmstadt:* Wissenschaftliche Buchgesellschaft 1958. (Seite 122)
[5] Weyl, H., *Raum, Zeit, Materie*. Berlin: Springer-Verlag 1920, (Seite 254f, 257)
[6] Sexl, R.; Sexl, H.: *Weiße Zwerge – Schwarze Löcher.* 2. Aufl. Braunschweig, Wiesbaden: Friedr. Vieweg u. Sohn 1979, 1999. (Seite 28ff)
[7] http://www.physikdidaktik.uni-karlsruhe.de/kpk/Fragen_Kritik/DPG-Aether.pdf: (Quelle z. Zt. nicht erreichbar.)
[8] Schmüser, Peter (2013) *Theoretische Physik für Studierende des Lehramts, Band 2, Elektrodynamik und Spezielle Relativitätstheorie*, Springer Verlag Berlin Heidelberg, Seite 109.
[9] Homepage of the author: http://www.grt-li.de, die fachlichen Argumente siehe vor allem: Observations questioning classical GRT and preferring LI of GRT – EHT image of M87*, Spin, ALMA image of SGR A* and more, der aktuelle Beitrag wird unter ‚Poster-DPG-2021-SL-nicht-bestätigt' in Talks_Brandes_since_2014 eingefügt.
[10] Brandes, J.; Czerniawski, J. (2022): *Spezielle und Allgemeine Relativitätstheorie für Physiker und Philosophen - Einstein- und Lorentz-Interpretation, Paradoxien, Raum und Zeit, Experimente*, Karlsbad: VRI, 5. erweiterte Auflage