Schwarzschild: Über das Gravitationsfeld eines Massenpunktes 189

Über das Gravitationsfeld eines Massenpunktes nach der Einsteinschen Theorie.

Von K. Schwarzschild.

(Vorgelegt am 13. Januar 1916 [s. oben S. 42].)

194 Gesamtsitzung vom 3. Februar 1916. — Mitt. vom 13. Januar

, so ergibt sich das Linienelement, welches die strenge Lösung des Einsteinschen Problems bildet:

$$ds^2 = (1-\alpha/R)dt^2 - \frac{dR^2}{1-\alpha/R} - R^2(d\vartheta^2 + \sin^2\vartheta\, d\phi^2),\ R = (r^3+\alpha^3)^{1/3}. \quad (14)$$

Dasselbe enthält die eine Konstante α, welche von der Größe der im Nullpunkt befindlichen Masse abhängt.

§ 5. Die Eindeutigkeit der Lösung hat sich durch die vorstehende Rechnung von selbst ergeben.

Until YOU  ***flawlessly*** **convert**

$$ds^2 = (1-\alpha/R)dt^2 - \frac{dR^2}{1-\alpha/R} - R^2(d\vartheta^2 + \sin^2\vartheta\, d\phi^2),\ R = (r^3+\alpha^3)^{1/3}$$

to: $$ds^2 = (1-r_S/r)dt^2 - \frac{dr^2}{1-r_S/r} - r^2(d\vartheta^2 + \sin^2\vartheta\, d\phi^2)$$

(you can substitute ct for t and equate $\alpha = r_S = 2GM/c^2$)

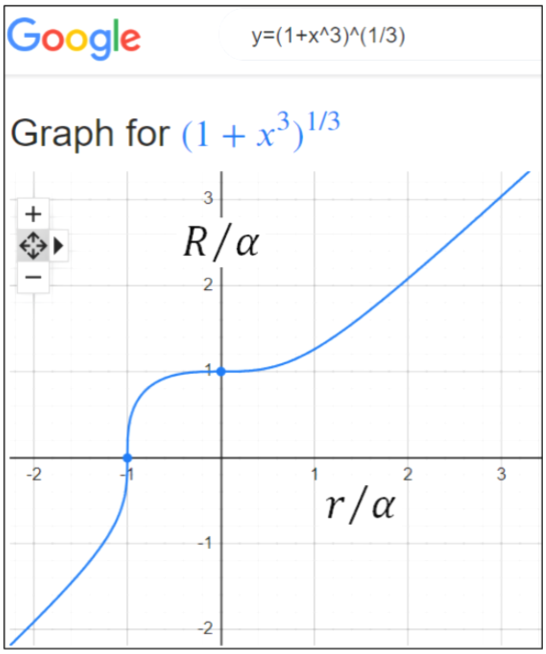
I will **INSIST** that the

common standard black hole equation

IS JUST PLAIN WRONG!

Unless YOU put YOUR finger on an error in Schwarzschild's original derivation, the commonly used BHE *<u>cannot</u>* be correct!

$$\boldsymbol{R = \left(r^3 + \alpha^3\right)^{1/3} \neq r}$$



A negative r is of course meaningless, but doesn't it look like walking around a tree, a heavy mass that's in the way?

Lower case $\boldsymbol{r}$: "true" distance from obj. to point mass as obs'd from ∞;
upper case $\boldsymbol{R}$: merely an auxiliary variable, seemingly simplifying the eqn.

Doesn't this inequality imply that anything & everything derived from the flawed standard BHE is incorrect?

Ex falso sequitur quod libet.

From falsehood follows whatever pleases you.

Quæ non libet (what doesn't please me):

- impact into r_S at the very speed of light (contradicts special relativity);
- infinite time dilation at r_S (we ***<u>do</u>*** observe BH mergers!);
- ISCO $> r_S$;
- photon sphere $> r_S$;
- "swapping of space & time";
- Penrose diagrams etc.;
- wormholes;
- **si**mplistic **si**lly **si**ngularity;
- **co**smologists **co**ntriving **co**ncoctions.

Dutch physicist **Johannes Droste** had independently found the same as Schwarzschild:

KONINKLIJKE AKADEMIE VAN WETENSCHAPPEN TE AMSTERDAM.
VERSLAG VAN DE GEWONE VERGADERING DER WIS- EN NATUURKUNDIGE AFDEELING
VAN ZATERDAG 27 MEI 1916.

Deze r is niet dezelfde als die, welke in (4) voorkomt. Wij verkrijgen

$$ds^2 = \left(1 - \frac{\alpha}{r}\right) dt^2 - \frac{dr^2}{1 - \frac{\alpha}{r}} - r^2 \left(d\vartheta^2 + \sin^2 \vartheta \, d\varphi^2\right) \quad . \quad . \quad (7)$$

This r is not the same as occurs in (4). We obtain

$$ds^2 = \left(1 - \frac{\alpha}{r}\right) dt^2 - \frac{dr^2}{1 - \frac{\alpha}{r}} - r^2 \left(d\vartheta^2 + \sin^2 \vartheta \, d\rho^2\right) \quad . \quad . \quad (7)$$

1) Nadat deze mededeeling was aangeboden bemerkte ik, dat ook K. SCHWARZSCHILD het veld berekend heeft. Zie: Sitzungsberichte der Kön. Preuss. Akad. des Wiss. 1916, blz. 189. Vergelijking (7) stemt volkomen overeen met (14) aldaar, indien men R voor r leest.

1) After the communication to the Academy of my calculations, I discovered that also K. SCHWARZSCHILD has calculated the field. Vid : Sitzungsberichte der der Kön. Preuss. Akad. der Wiss. 1916, page 189. Equation (7) agrees with (14) there, if R is read instead of r.

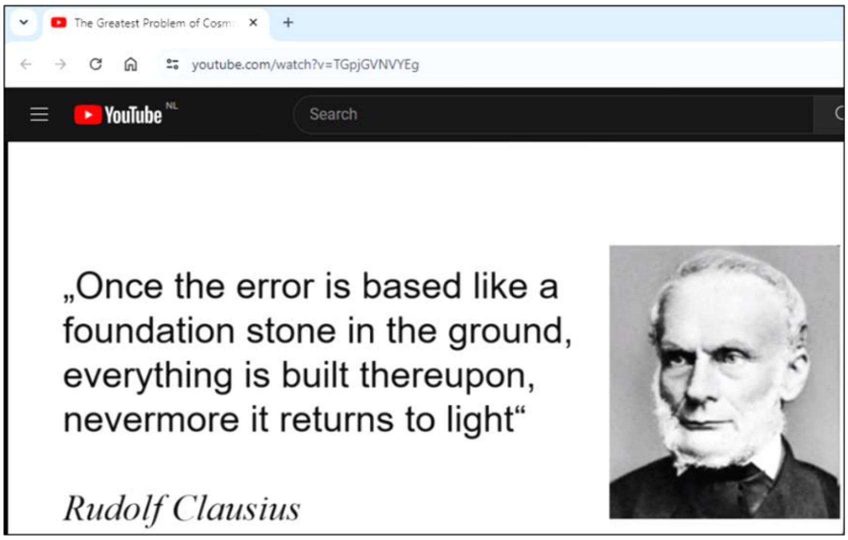
Correct NL-EN translation of last sentence: Equation (7) ***fully*** agrees with (14) there, (...).

But where did he leave Schwarzschild's $R = (r^3 + \alpha^3)^{1/3}$?

He clearly states $\boldsymbol{r}$ is not the same as used before (which I find rather clumsy), but I nowhere see him explicitly say how to derive this different $\boldsymbol{r}$ from the original as obs'd from ∞.

But, in the footnote, he says: $r_{\text{Droste}} = R_{\text{Schwarzschild}}$.

And now, **YOU** and the rest of the world are using $\boldsymbol{R}$ as if it were the observed radius, **whilst it just isn't!**



from: "The Greatest Problem of Cosmology is Solved" (HR: *I think it isn't...*)
by Dr. Alexander Unzicker, https://www.youtube.com/watch?v=TGpjGVNVYEg

Apart from the above, Droste derives:

3. Uit (7) laten zich direct eenige gevolgtrekkingen afleiden. Het punt (r, φ, ϑ) ligt op een afstand

$$\delta = \int_{\alpha}^{r} \frac{dr}{\sqrt{1 - \frac{\alpha}{r}}} = r\sqrt{1 - \frac{\alpha}{r}} + \alpha \log\left(\sqrt{\frac{r}{\alpha} - 1} + \sqrt{\frac{r}{\alpha}}\right) \quad (8)$$

van het punt, waar de straal bol $r = \alpha$ snijdt, ondersteld, dat $r > \alpha$ is en (7) blijft gelden tot $r = \alpha$ toe. Wij zullen deze twee

3. From (7) we can immediately deduce some conclusions. The point (r, ϑ, φ) lies at a distance

$$\delta = \int_{\alpha}^{r} \frac{dr}{\sqrt{1 - \frac{\alpha}{r}}} = r\sqrt{1 - \frac{\alpha}{r}} + \alpha \log\left(\sqrt{\frac{r}{\alpha} - 1} + \sqrt{\frac{r}{\alpha}}\right). \quad (8)$$

With: $\rho \coloneqq r/\alpha$

and: $\varrho \coloneqq \delta/\alpha$

this becomes: $\varrho = \sqrt{\rho - 1}\sqrt{\rho} + \log\left(\sqrt{\rho - 1} + \sqrt{\rho}\right)$

But please note: $\boldsymbol{r}$, hence $\boldsymbol{\rho}$, is *not* the "truly" observed radius!

This solution may be mathematically correct, but in a physical sense, it isn't.

When accelerating, the IRMPD (**I**nter **R**oadside **M**arker **P**ost **D**istance) will become more and more Lorentz contracted with increasing speed. You measure each successive IRMPD at the moment you pass it = it passes you. To you, it is contracted by the reciprocal Lorentz factor of *that* very point in time, in agreement with your velocity at *that* very moment and location. Each IRMPD will have its own individual contracted value and they all differ, since your speed is continually increasing. Integration, i.e. adding them all together, renders a value that you might consider the observed total length of the road. However, it merely is the *passed* length, with each piece measured at the moment of passage. Please note that at *any* single point in time, the ***entire*** road is contracted by the one and only reciprocal Lorentz factor of *that* point in time! On departure, when you're not yet moving, the whole road simply has its rest length. Its full length, all the way to your future point of arrival, is not yet contracted at all. But when you look back on arrival, this ***full*** length is contracted by the ***final*** reciprocal Lorentz factor, corresponding to your ***final*** velocity! The *logarithmic* term in the solution arises from the *faltering integration* that is adding up not yet fully contracted intermediate IRMPD values that will still become further contracted after measurement. With this logarithm, a physically senseless sort of mean value of the initial and final street lengths is obtained. *You integrated over a path that is neither measured at a single point in time, nor at a single point in space, thus adding up a load of infinitesimal malarkey, rendering a grand total of useless gobbledygook, flapdoodle, poppycock, b****cks.*

Would one express the road length in no. of RMPs, it becomes an immutable intrinsic truly physical property of the road. It would not undergo any form of contraction.

Droste also finds something at $r = 3\alpha$: an orbiting object within it
will spiral out towards $r = 3\alpha$, never truly reaching, let alone surpassing it.
He calls it *afstooting* = *repulsion*. Isn't $r = 3\alpha$ the ISCO?

Once upon a time, there were some very sophisticated teachers who taught **YOU** one or more interesting lessons and it seems plausible that **YOU** — like so many others — haphazardly believed it without any form of criticism, so I think **YOU** have until now trusted this flawed BHE, so **YOU** probably agree with its explanation as presented in many sources. But alas, it will not live happily ever after, because this flawed BHE is a fairy tale.

What also follows from it is next.

(https://en.wikipedia.org/wiki/Two-body_problem_in_general_relativity#Effective_radial_potential_energy)

Effective radial potential energy:

$$U(r) = -\frac{GMm}{r} + \frac{L^2}{2\mu r^2} - \frac{G(M+m)L^2}{c^2\mu r^3} = -\frac{G\mathcal{M}\mu}{r} + \frac{L^2}{2\mu r^2}\left(1 - \frac{2G\mathcal{M}}{rc^2}\right)$$

(where: $\mathcal{M} = M + m,\ \mu = Mm/\mathcal{M}$)

Specific angular momentum: $\mathcal{L} = L/\mu$

Einsteinian potential: $\phi_{\mathrm{E}}(r) = \frac{U(r)}{\mu} = -\frac{G\mathcal{M}}{r} + \frac{\mathcal{L}^2}{2r^2}\left(1 - \frac{2G\mathcal{M}}{rc^2}\right)$

Newtonian: $\phi_{\mathrm{N}}(r) = -\frac{G\mathcal{M}}{r} + \frac{\mathcal{L}^2}{2r^2}$

We conclude: $\mathcal{L}_{\mathrm{E}} = \mathcal{L}_{\mathrm{N}} \cdot \sqrt{1 - \frac{2G\mathcal{M}}{rc^2}}$

and if $\mathcal{L} = 0$: $\phi_{\mathrm{E}}(r) = \phi_{\mathrm{N}}(r) = -G\mathcal{M}/r$

For an exactly radial free fall, the *Einsteinian* effective gravitational potential equals the *Newtonian* potential.

We rewrite: $\phi_{\text{effective}} = \phi_{\text{radial}} + \phi_{\text{orbital}}$

where: $\phi_{\text{radial}} = -G\mathcal{M}/r$

and: $\phi_{\text{orbital}} = \frac{\mathcal{L}^2}{2r^2}\left[1 - \frac{2G\mathcal{M}}{rc^2}\right]$

We have: $\mathcal{L} = L/\mu = rp/\mu = rv = r\omega r$

hence: $\phi_{\text{orbital}} = \frac{\omega^2 r^2}{2}\left[1 - \frac{2G\mathcal{M}}{rc^2}\right] = \frac{v_{\text{orb}}^2}{2}\left[1 - \frac{2G\mathcal{M}}{rc^2}\right]$

According to the above, the radial potential would always be Newtonian, even in general relativity. For this reason, and because I think I have no other choice, I stick to the Newtonian potential, provided that only local observations & measurements are considered, i.e. everything is measured on the spot. Have a look at ref. 1.

Minkowski's (error free) geometrical formulation of special relativity caused Einstein to start thinking the geometrical way as well. After the genius got stuck & panicked, Marcel Grossmann taught him the behemoth of tensor calculus, resulting in General Relativity, being a mathematically flawless geometrical *description* of gravitation. But a description is not yet an explanation. How does Jupiter know it should orbit the sun? Well, it doesn't need that knowledge at all, it just obeys Newton's law of inertia, but along a geodesic in curved spacetime. This does not *explain* anything. I know not a single layman who truly understands it. He knows and understands that Earth's surface is

[1] http://henk-reints.nl/astro/HR-general-relativity-and-black-holes.pdf (@pp.68–71 as of 2024-04-12)

curved (well, most people do), as well as that "rubber sheet" in videos about spacetime curvature. But empty space itself? Or time? Curved? Huh? He certainly thinks it is **YOU** who's totally bonkers and he may ask practically the same question once again. How does spacetime know it must curve such that this *cheerio dentist or how did you call it?* becomes Jupiter's orbit around the sun? Can **YOU** *explain* it in such a way that he truly understands it? Can **YOU** yourself *honestly* say you *truly understand* it? Please note: *understanding is not the same as grasping an abstract mathematical derivation*!

Gravity is not a force? Moron! Please put a 1000 kg object on **YOUR** foot and describe your experience. Would you feel *curvature of spacetime*? Or would you scream at the top of your voice, *curve* your whole body and urgently need to visit a hospital where — if you're lucky — they may be able to fix your *curved* and fractured foot bones?

I have a very strong desire to avoid any form of very complicated and nearly unfathomable (at least to laymen & other "normal" people) abstract mathematics. I especially dislike the behemoth of tensor calculus, no matter how powerful & beautyful it actually is. Mathematics can merely *describe* natural phenomena, but not *explain* them. I strive for understanding and explanations in a physical and/or tangible way, such that a layman can honestly say he's got it.

If you cannot explain it to a barmaid,
it is probably not very good physics.
— Ernest Rutherford —

Indiscrepancies.

Implicit basic premise of Special Relativity: your velocity relative to me (as measured by me) equals my velocity relative you (as measured by you), at least by absolute value:

$$v_{\text{YM}} = v_{\text{MY}} \qquad \text{[A]}$$

Your velocity w.r.t. an object that is stationary to me equals your velocity relative to me myself, and this object's velocity w.r.t. you equals my velocity w.r.t. you:

$$v_{\text{YO}} = v_{\text{YM}}$$
$$v_{\text{OY}} = v_{\text{MY}}$$

and, together with [A]: $$v_{\text{YO}} = v_{\text{OY}} = v_{\text{YM}} = v_{\text{MY}} \qquad \text{[B]}$$

Now this object is a BH & I am inert and infinitely far away from it. You are so unlucky to fall into it hahahahah! According to the conventional "explanation", your speed w.r.t. the BH would increase to exactly precisely the very speed of light at the event horizon, whilst I see your velocity drop all the way to zero.

We then obtain: $v_{\text{YO}} \rightarrow= c$

as well as: $v_{\text{YM}} \rightarrow= 0$

together with [B], this yields: $\boldsymbol{c = 0}$ Congratulations! 𝄞 🍰 🍷

According to: $E_{\text{kin}} = (\gamma - 1)mc^2$

and: $(v \rightarrow c) \Rightarrow \gamma \rightarrow \infty \therefore E_{\text{kin}} \rightarrow \infty$

this requires an infinite amount of energy, but at the Schwarzschild radius, the gravitational potential merely equals:

$$|\varphi_{\text{radial}}| = c^2/2 < \infty$$

Altogether, this implies: ***infinity is finite!*** Congrats one again! 🍷 🍷 🍷 🍷

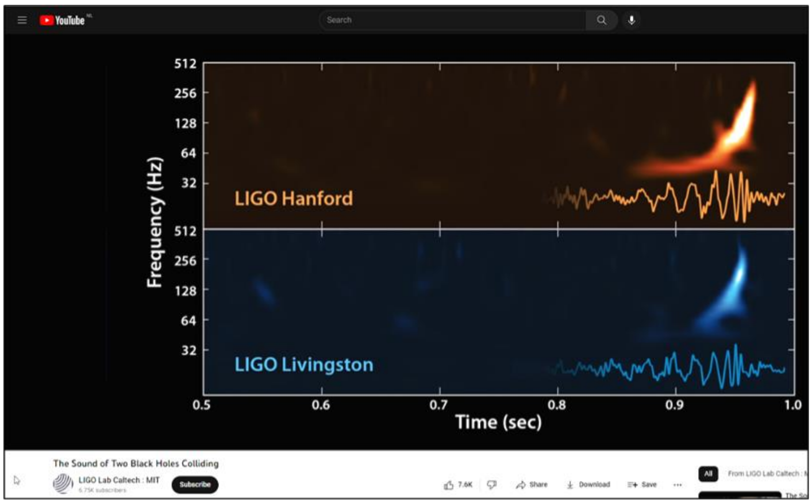
According to the conventional "explanation", I'll *never ever see you fall into the black hole*, due to infinite time dilation & redshift. After all, I see your speed drop to zero, don't I?

Now thou should proudly shout out loudly:

BUT WE *DO OBSERVE* BLACK HOLE MERGERS!

https://www.youtube.com/watch?v=QyDcTbR-kEA

The Sound of Two Black Holes Colliding:



*Isn't it **very** clear that it lasts merely a fraction of a second?*

Conclusion:

"never ever" occurs within a second!

One shouldn't drink and derive!

The standard BHE is just plain wrong!

The "Schwarzschild root" $\sqrt{1-\frac{2GM}{rc^2}}$ *incorrectly* is fully Newtonian!

Redshift to infinity at r_S? Dunce! The *observed* frequency *in*creases!

Please read:

1. http://henk-reints.nl/astro/HR-Deflection-of-light-passing-a-mass.pdf ;
2. http://henk-reints.nl/astro/HR-Deflected-light-stuff.pdf ;
3. http://henk-reints.nl/astro/HR-truly-black-Black-Hole.pdf ;
4. http://henk-reints.nl/astro/HR-BH-internals.pdf ;
5. http://henk-reints.nl/astro/HR-BH-temperature.pdf ;
6. http://henk-reints.nl/astro/HR-fall-into-black-hole-slides.pdf ;
7. http://henk-reints.nl/astro/HR-general-relativity-and-black-holes.pdf ;
8. http://henk-reints.nl/astro/HR-Schwarzschild-strict-grav-contr.pdf ;
9. http://henk-reints.nl/astro/HR-Schwarzschild-interior.pdf ;
10. http://henk-reints.nl/astro/HR-original-Schwarzschild-interior.pdf ;

as well as:

11. http://henk-reints.nl/astro/HR-Mercury-perihelion-precession-by-SR-only.pdf ;
12. http://henk-reints.nl/astro/HR-Equivalence-principle.pdf .

It is dangerous to be right in matters on which established authorities are wrong.

— Voltaire —

Vide Galileo Galilei.

— Edsger W. Dijkstra, EWD498 —