



Karl Schwarzschild's Work



































PRSs return to the horizon		
You change to an orbit ar with circumference 10 tir measure distances with 1 very near by, and measu orbits, can you reveal the	round a much more nes that of the BH's l .0% accuracy. By swi ring circumferences. space-warping effec	massive black hole, again horizon, and again you can tching to different orbits and distances between cts of the BH?
A. Yes; the BH warps sp	ace severely here.	B. Yes, but just barely.
C. No; accuracy insuffici	ent. D. No; the w	arp is essentially zero here.















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Reaction to the Schwarzschild singularity

- Schwarzschild's solution to the Einstein field equation was demonstrated to be correct - the singularity is not the result of a math error.
- □ Thus most physicists and astronomers assumed that the singularity would not be physically realizable (just like the singularity in Newton's law of gravitation) or that accounting for other physical effects would remove it.
- □ Einstein (1939) eventually tried to prove this in a generalrelativistic calculation of stable (non-collapsing or exploding) stars of size equal to the Schwarzschild circumference.
- □ He found that this would require **infinite gas pressure**, or **particle speed greater than the speed of light**, both of which are impossible.

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 Reaction to the Schwarzschild singularity (continued)

 □ Einstein's results show that a stable object with a singularity cannot exist.

 □ From this he concluded (incorrectly) that this meant the singularity could not exist in nature.

 □ Einstein's calculation was correct, but the correct inference from the result is that gas pressure cannot support the weight of stars similar in size to the Schwarzschild circumference.

 □ If nothing stronger than gas pressure holds them up, such stars will collapse to form black holes -- the singularity is real. (!!?)

 • Does physics provide us with any such pressure? Find out next week.

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