Re: Bending of light not well authenticated

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2005−05/msg01033.html

- *From*: "Randy M. Dumse" <rmd@xxxxxxxxxxxxx>

- *Date*: Sat, 14 May 2005 17:12:51 −0500

"Koobee Wublee" <kublai@xxxxxxx> wrote in message
news:hiehe.32316$fI.18194@xxxxxxxxxxxxx
> Since the curvature is in spacetime and not just in space, why do
> you expect the photon to be deflected permanently with an angle
> of displacement in space?

I'd say that's missing the point I was making slightly. The curvature is in spacetime, and the curvature factor effects both space and time, and both have a deflection effect on the path of a photon. Or put another way the curvature factor (1−2M/r) appears in the Schwarzschild equation both in the time component and in the radial distant component.

>Since you model the curvature of spacetime as a prism, why do you
> not expect the light to follow what a prism would bend the light that
> is unbending or correcting the deflection as the photon leaves the
> sun which ends up with no deflection at all?

In every analogy, there is a part that is analogous and the part that is not at all analogous. The difference is when something is like something vs. actually is something. The prism was an analogy. The analogous part was Fermat's principle applies to both. The light passing the sun would be deflected toward the sun from passing through a denser optical medium, just as light arriving at an angle to a slower medium would be bent toward a smaller angle. That's the analogous part. The unanalogous part would be the shap of the prism and the shape of space near the gravitating body. Now we could probably further define this shape with effort, but it's not worth bothering.

> GR math actually shows gravitational lens behaves very much like a
> true lens where the index of refraction is a gradient highest at the
> center. However, whoever first derrived this after 1915 incorrectly
> simplifed the integration limit of the integral.

Well, I'm reasonably certain the first to derive the deflection after 1915 was Einstein himself. So I don't really understand the references that follow.

> That depends on dr which is related to an integration constant
> associated with the conservation of angular momentum.

The derivation indeed is based on the ratio of angular momentum and energy, which turns out in the no mass limit to be simply b, the impact parameter.

Far away from the gravitating body, where r is large the path of the ray will have a parallel ray which can go straight along a single radial to infall to the gravitating body. The distance between these two parallel rays in flat space is called the impact parameter.

So the geodesic motion of a massless particle depends on only two things, its effective potential defined by the Schwarzschild metric, and it's inital displacement from a straight in radial, the impact parameter.
(MTW 673)

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Randy M. Dumse

Caution: Objects in mirror are more confused than they appear.

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