Dear Mr. Rhys Davies,
University of Melbourne
School of Physics

Thankyou for your submission in relation to the protest of Government funding of the AIGO. Your submission, and this reply which you requested of me, will be posted to the Challenge/AIGO funding protest website, and subsequently forwarded to the international panel of relevant specialist mathematicians and scientists who have agreed to assess the merit of all submissions in preparation of final report to Government.

In your covering email you accuse me of misconceptions, but you have merely reasserted the usual demonstrably false arguments.

You adduce the line element

$$ds^2 = \frac{dr^2}{1 - \frac{r^2}{R^2}} + r^2 d\varphi^2, \tag{1}$$

wherein R is a constant. You then assert, by your own admission, that by "inspection" of (1), $0 < r < R$ therein. Already, by this assertion, you have committed a potentially fatal error in general procedure. You have simply assumed that $0 < r < R$ is admissible on (1). You have not demonstrated by any geometrical means that this range is valid. Nonetheless, you then propose the transformation

$$r = R\sin(\theta),$$

where $0 < \theta < \frac{\pi}{2}$, corresponding to your $0 < r < R$ on (1). You have maintained the correct correspondence on the variables, but that correspondence is dependent upon the validity of your initial claim. Thus, all you have actually said is that *if* $0 < r < R$ on (1), *then* by your transformation, $0 < \theta < \frac{\pi}{2}$, and your alleged singularity at $r = R$ is removed. Nowhere have you proved the upper and lower bounds on r in (1) that you have claimed. You have ignored the remarks in my relevant papers as to the unproven assumptions made by the relativists in relation to the usual line element for the gravitational field for $R_{\mu\nu} = 0$, and thereby have fallen directly, from the outset, into the same procedural mistakes that they have committed. Instead of directly addressing the unproven assumptions in the claims of the black hole/big bang relativists, you instead opt for obfuscation by ignoring proof of the unproved assumptions and introduce spurious arguments that avoid analysis of the unproved assumptions completely. That is neither scientific nor honest, but typical of the attitude and disposition of the relativists. You have taken no account of the mathematical fact that *a geometry is entirely determined by the form of its line element*, and instead foist upon it your assumptions by "inspection" of (1). Not only that, strictly speaking, you have not even stated the full range of values apparently admissible by "inspection", since $r = 0$ does not result in singularity and is therefore allowable, although the line element is degenerate there, and owing to the presence of the squared terms, negative values are also permitted. Thus

$$-R < r < R$$

is admissible without singularity, according to your method of “inspection”. So your assertion that $0 < r < R$ is less than half of what your method of mere “inspection” permits. Nevertheless, I shall, like you, treat only of non-negative values in what follows, since there is no great loss of generality in doing so. In my published papers I have included negative values on the parameter r, and I have also done so in the papers on my Challenge/AIGO protest website.

Since a geometry is entirely determined by the *form* of its line element, everything must be determined from it. One cannot, as you have done in the usual fashion, merely foist your assumptions upon it, either consciously or unconsciously. The *intrinsic* geometry of the line element and the consequent geometrical relations between the components of the metric tensor determine all. With this in mind, ask yourself how you came to the conclusion that $0 < r < R$ on (1). You will then see that you have offered no geometrical arguments at all for the bounds on r. You have disregarded the intrinsic geometry of the line element entirely. The line element must itself be used to determine the bounds on the variable r. You have not done this, and so your assertion is arbitrary, which I will now demonstrate.

Your expression (1) arises in the Robertson-Walker cosmological line element, which I have dealt with in detail in my published papers and in those on the Challenge/AIGO protest website. However, as you have stated in your covering email, you did not read them. They are contained in the **List of Respondents** section of the Challenge/AGIO protest website. Perhaps if you had read them you would have understood why your motivations in relation to (1) are false. Nonetheless, I shall reiterate. Your expression (1) appears in the Robertson-Walker equatorial plane of spatial coordinates (i.e. where constant $\theta = \frac{\pi}{2}$ in the Robertson-Walker line element)

$$ds^2 = dt^2 - e^{g(t)}\left[\frac{dr^2}{1-\frac{r^2}{R^2}} + r^2(d\theta^2 + \sin^2\theta d\varphi^2)\right]. \tag{2}$$

The quantity r appearing in (2) (and also in (1)) is *not* a radial distance. It is in fact only a factor in a radius of curvature in that it determines the Gaussian curvature $G = \frac{1}{e^{g(t)}r^2}$. The radial quantity associated with (1) is the geodesic length R_p, the proper radius, given by

$$R_p = \int \frac{dr}{\sqrt{1-\frac{r^2}{R^2}}} = R \arcsin\left(\frac{r}{R}\right) + K, \tag{3}$$

where K is a constant of integration. Now distance is defined to be a non-negative quantity (it has magnitude but no direction). The minimum value of a distance in general is zero. According to (3), $R_p = 0$ is satisfied for $r = 0 = K$, and so $r = 0$ is the determined lower bound on the quantity r appearing in (1), and R_p is given by

$$R_p = R\left[\arcsin\left(\frac{r}{R}\right) + 2n\pi\right], \quad n = 0, 1, 2, ...$$

having set $K = 2Rn\pi$. Can $r \to R^-$ as you assert? One cannot yet say what the upper bound on the variable r is since there is no clear boundary condition by which it can be ascertained from (1), other than the possibility of singularity.

Now as you have actually noted, when one properly transforms coordinates, one must correctly transform the boundary values to the transformed variables. You did this in your transformation of $0 < r < R$ into $0 < \theta < \frac{\pi}{2}$. Your procedural error is assuming the upper and lower bounds on r instead of using the intrinsic geometry of the line element to determine them, which is what *must* actually be done. To determine the upper bound on r in (1), seek a geometric boundary condition by judicious transformation of the line element, bearing in mind that any transformation must be entirely consistent with the form of (1) and the true range of its variables.

Consider the line element

$$ds^2 = \frac{1}{\left(1 + \frac{\bar{r}^2}{4R^2}\right)^2}\left[d\bar{r}^2 + \bar{r}^2 d\varphi^2\right]. \tag{4}$$

Set

$$r = \frac{\bar{r}}{1 + \frac{\bar{r}^2}{4R^2}}, \tag{5}$$

where R is a constant. Expression (5) carries (4) into (1). This shows that (1) can be conformally represented in Efcleethean space. Since $r = 0$ is the geometrically determined lower bound on r in (1), it follows from (5) that the lower bound on the transformed variable $\bar{r}$ is also zero. Once again note that in (4) the quantity $\bar{r}$ is not a radial distance. In fact, it is not even a radius of curvature on (4). It is merely a parameter for the radius of curvature and the proper radius, both of which are well-defined by the *form* of the line element (describing a spherically symmetric metric manifold). Denoting the radius of curvature by R_c, for (4)

$$R_c = \frac{\bar{r}}{1 + \frac{\bar{r}^2}{4R^2}}. \tag{6}$$

The geodesic radial distance (the proper radius) for (4) is

$$R_p = \int \frac{d\bar{r}}{1 + \frac{\bar{r}^2}{4R^2}} = 2R\arctan\left(\frac{\bar{r}}{2R}\right) + K,$$

where K is a constant of integration. Now $R_p = 0$ is satisfied for $\bar{r} = 0 = K$, so

$$R_p = 2R\left[\arctan\left(\frac{\bar{r}}{2R}\right) + n\pi\right], \quad n = 0, 1, 2, ...$$

having set $K = 2Rn\pi$. But on (4), according to (6), the radius of curvature is maximum when $\bar{r} = 2R$, so that the maximum radius of curvature for (4) is $R_{c_{max}} = R$. Also,

$$\lim_{\bar{r}\to\infty} \frac{\bar{r}}{1 + \frac{\bar{r}^2}{4R^2}} = 0.$$

So according to (6), $0 \leq R_c \leq R$ on (4). But (6) is precisely (5), so $0 \leq r \leq R$ on (2) and (1) (with singularity at $r = R$). Thus your unproven assertion by "inspection" that $0 < r < R$ for (1), is true, and consequently your transformation for $0 < \theta < \frac{\pi}{2}$ is also true. Your transformation of (1) by setting $r = R \sin\theta$ is valid for $2n\pi \leq \theta \leq \frac{\pi}{2} + 2n\pi$, $n = 0, 1, 2, ...$

You have also claimed that the so-called Schwarzschild solution is in exactly the same situation as for your claims on (1). Your assertion is standard fare, but is false nonetheless. First, what you call the "Schwarzschild" solution is *not* Schwarzschild's solution. This is Schwarzschild's solution,

$$ds^2 = \left(1 - \frac{\alpha}{R}\right) dt^2 - \left(1 - \frac{\alpha}{R}\right)^{-1} dR^2 - R^2(d\theta^2 + \sin^2\theta d\varphi^2), \tag{7a}$$

$$R = R(r) = \left(r^3 + \alpha^3\right)^{\frac{1}{3}}, \quad 0 < r < \infty, \tag{7b}$$

where α is a function of the mass of the source of the gravitational field. Schwarzschild did not identify α with the alleged Newtonian limit potential to get $\alpha = \frac{2GM}{c^2}$. I refer you to *www.geocities.com/theometria/schwarzschild.pdf* for Schwarzschild's actual paper (in English translation). You will also see in that paper that he did not breathe a single word about "black holes". His solution does not permit such an object. Expression (7a) is defined on $\alpha < R < \infty$, corresponding to $0 < r < \infty$. However, the black holers and big bangers would have us all believe that one can take R in (7a) down to $R = 0$ to produce a second singularity (there is really only one, at $R = \alpha$, i.e. at $r = 0$ in Schwarzschild's true solution). But they *always* write Schwarzschild's solution thus,

$$ds^2 = \left(1 - \frac{\alpha}{r}\right) dt^2 - \left(1 - \frac{\alpha}{r}\right)^{-1} dr^2 - r^2(d\theta^2 + \sin^2\theta d\varphi^2), \tag{8}$$

and *always* claim that there are two singularities, one at $r = \alpha$ and one at $r = 0$. They make this claim my mere "inspection" of (8), in the same fashion you make your claim of $0 < r < R$ for (1), thereby corrupting Schwarzschild's true solution, and with it attribute to Schwarzschild conclusions which he did not in fact draw, and which are inconsistent with his solution. They have never provided or attempted to provide any proof of their results of "inspection" of (8). However, it is easily seen from expressions (7a) and (7b) that (8) is precisely the same as (7a), except that Schwarzschild's range on r is applied to his R. That is nonsense. One cannot transform Schwarzschild's solution to (8) and retain his $0 < r < \infty$. Considering expressions (7a) and (7b) together, as they must be, clearly shows that for (8), $\alpha < r < \infty$, and so there is no singularity at $r = 0$ on (8). To maintain such a claim means that Schwarzschild's true solution must be defined on $-\alpha < r < \infty$, which is again nonsense, as his paper testifies.

I have deduced and provided the generalisation of Schwarzschild's solution, and shown that there is no singularity obtainable from the alleged condition $g_{11} = 0$, because there is only one singularity, when $g_{00} = 0$, consistent with Schwarzschild's particular solution. That generalisation is defined on $-\infty <$

$r < \infty$, $r \neq r_0$, where r_0 is completely arbitrary, and that $R_p(r_0) = 0 \; \forall \; r_0$ and that $R_c(r_0) = \alpha \; \forall \; r_0$. However, you have also conveniently ignored this.

The fundamental error of the relativists is exceedingly simple, yet evidently beyond their powers of comprehension. It is this — they confuse the location of a centre of spherical symmetry of the gravitational field with the origin of a coordinate system associated with the parameter r whose corresponding centre of spherical symmetry is not at its origin of coordinates. For example, in the Efcleethean plane the equation of a circle of radius ρ and centre C located at the extremity of the fixed vector $\vec{\mathbf{c}}$, may be written

$$(\vec{\mathbf{r}}(u) - \vec{\mathbf{c}}) \bullet (\vec{\mathbf{r}}(u) - \vec{\mathbf{c}}) = \rho^2. \tag{9}$$

where u is some parameter upon which $\vec{\mathbf{r}}$ depends. The centre of the circle is not at the origin of the coordinate system unless $\vec{\mathbf{c}} = \vec{\mathbf{0}}$. The black holers and big bangers treat the origin of the parametric coordinate system as the centre of a non-Efcleethean sphere when the centre of the said sphere is not located at the origin of the parametric coordinate system at all. They think that the origin of the parametric coordinate system is the location of the centre of mass of the source of the gravitational field. That is not true. But under that delusion, they construct a means to get down to that origin of parametric coordinates, by means of the Kruskal-Szekeres "coordinates". They unwittingly construct a completely different and irrelevant manifold, claim that the singularity at $r = \alpha$ on (8) is a "coordinate" singularity, and that the origin of the parametric coordinate system at $r = 0$ is the "true" singularity on (8), ignorant of the parametric nature of the variable r in (8), all in the mistaken belief that the origin of the parametric coordinate system is the location of the centre of spherical symmetry for Einstein's gravitational field. This is a result of the invalid transformation of Schwarzschild's (7a) and (7b) into (8), shown above. And so they do indeed leap between different pseudo-Riemannian manifolds, as I have previously stated in my papers. You can reproduce the error of the relativists by attempting to claim that the "true" centre of the circle described by (9) is not at the extremity of the fixed non-zero vector $\vec{\mathbf{c}}$, but at the origin of the coordinate system to which the vectors are referred, and then try to construct a "transformation of coordinates" that leaves the circle just where it is, but its "centre" at the origin of coordinates, so that its actual centre is a "removable" coordinate artifact. That however, is preposterous, at least to anybody who has taken high school analytic geometry.

Here is the recipe for refutation of my analysis – I have offered it before, on many occasions, but it too has of course been conveniently ignored by the disingenuous proponents of black holes and big bangs. Prove that Einstein's field equations require of necessity that a singularity must occur where the Riemann tensor scalar curvature invariant is unbounded. That this condition is required is frequently claimed by the relativists, *a posteriori* to justify their Kruskal-Szekeres phantasmagoria, yet **none** of them have ever proved it. Alternatively, which is equivalent for the purpose, prove that the radius of curvature and the proper radius are not the salient geometric quantities on a spherically symmetric

metric manifold with boundary. In this regard I suggest that you study submissions 3 and 4 in the **List of Respondents** section of the Challenge/AIGO funding protest webpage.

Contrary to your remarks, I am not attempting to hinder invaluable research; I am in fact exposing a gross scientific fraud that makes Piltdown Man pale into insignificance. I remark that other mathematicians and scientists have published similar objections to the false claims of the relativists, so I am not alone in the exposure of this fraud. I am putting Government on notice as to this scientific fraud, and argue that funding of the AIGO should therefore cease because it is at best a misdirection of public money, or at worst possible public sector fraud and misappropriation of public money that requires investigation by Government law enforcement agencies to uncover the facts and determine wrongdoing, if any. As a taxpayer I, and others, are concerned that large sums of public money are being wasted on spurious "scientific" research projects. I am exercising my right to bring this to the attention of Government, much to the consternation of those who might suppress legitimate disputation of claims made by the scientists. That scientists have manoeuvred themselves into a position and standing in modern society by which they can thumb their noses at the broader community with impunity, at the expense of the public purse, is scandalous. The scientists have no lawful or moral right to tell us "mere mortals" what is good for us and what we should do with public money, and especially if that public money feeds them into the bargain. It is time for accounts to be examined for a change, with the scientists being brought back to reality in more ways than one.

Yours faithfully,
Stephen J. Crothers
10 March 2007.