3

A Critical Evaluation of Standard Model Cosmology with Einstein Cartan Evans (ECE) Field Theory

by

Myron W. Evans,
Alpha Institute for Advanced Study, Civil List Scientist.
(emyrone@aol.com and www.aias.us)

and

H. Eckardt and S. J. Crothers,
Alpha Institute for Advanced Study.
(www.aias.us)

Abstract

Some claims of standard model cosmology are tested with the inhomogeneous field equation of ECE field theory. The only rigorously correct line elements available at present are those given by Crothers, because they are the only line elements that are geometrically correct as well as being exact solutions of the Einstein Hilbert (EH) field equation. A small sample of rigorously correct line elements is used to produce charge/current densities of the inhomogeneous ECE field equation and it is found that at present there is no rigorously correct metric available that produces electromagnetic radiation in ECE theory. The reason is that the standard model of cosmology is based on an incorrect appreciation of differential geometry and must be disregarded for this reason.

Keywords: ECE theory, Einstein Hilbert field equation, charge/current density, Crothers lien elements, criticisms of standard model cosmology.

3.1 Introduction

Recently a generally covariant unified field theory has been developed [1–10] that is based rigorously on the philosophy of general relativity [11]. This is known as Einstein Cartan Evans (ECE) field theory because it is based on the well known differential geometry of Cartan. The latter geometry extends Riemann geometry by use of the Cartan torsion. ECE theory has been tested extensively (www.aias.us) against experimental data and is based directly on Cartan geometry. The mathematical correctness of ECE theory is obvious, because Cartan geometry is a valid geometry, but nevertheless ECE theory has also been tested exhaustively and the results accepted by the international community of scientists (feedback to www.aias.us over three and a half years). Recently the theory has been applied using line elements [12] which are exact solutions of the Einstein Hilbert (EH) field equation. The basic equation used for this test of standard model cosmology is the inhomogeneous ECE field equation given in Section 3.2. This has a simple structure when written in differential geometry. It becomes a little more complicated in other notations, but at the same time can be reduced to the familiar vector notation of the Maxwell Heaviside (MH) field theory. The familiar laws of electrodynamics in ECE theory take the same form as in MH theory, but are written in ECE in a space-time that has both curvature and torsion. In MH theory the equations are written in a space-time that has no curvature and no torsion - the Minkowski space-time of special relativity. Thus ECE unifies electrodynamics and gravitation in a natural way - based directly on geometry. MH cannot unify the two fundamental fields because it is developed in a space-time that is flat and not generally covariant. The Minkowski space-time supports only Lorentz covariance as is well known.

In order to apply ECE theory, line elements must be found that are suitable for the gravitational sector of ECE. Charge/current densities are calculated from these line elements [1–10] in various approximations. In the first approximation used in this paper and previous papers on this topic, the gravitational torsion is assumed to be negligible compared with the gravitational curvature. This is a situation that exists for example in the solar system. In this approximation line elements can be used which are solutions to the EH field equation, in which gravitational torsion is absent. Crothers [13–15] has shown that such line elements must also be well behaved geometrically as well as being exact solutions to the EH field equation. At present the Crothers metrics are the only ones that are acceptable, because they are the only ones that are rigorously correct geometrically. In Section two, a small sample of Crothers metrics is used to compute charge and current densities of the ECE Coulomb and Ampère Maxwell laws. The well known line elements of the standard model are incorrect fundamentally because they violate differential geometry at a fundamental level. This incorrectness has led to the crude fallacies of Big Bang, Black Holes, and dark matter. All inferences based on this pseudo-science are false because they are based on incorrect mathematics. In

Sections 2 and 3 the obvious errors in the standard model are illustrated with a few examples. Because of these errors it is concluded that at present there exists no rigorously correct line element that is able to produce electromagnetic radiation in a generally covariant unified field theory, i.e. a theory that is demanded by the philosophy of relativity.

3.2 Testing with the Inhomogeneous Field Equation of ECE

In the simplest type of notation [1–10] the inhomogeneous ECE field equation in the approximation of vanishing gravitational torsion is:

$$d \wedge \widetilde{F} = A^{(0)}(\widetilde{R} \wedge q)_{\text{grav}} \tag{3.1}$$

where $\widetilde{F}$ is the Hodge dual of the electromagnetic field form F and $\widetilde{R}$ is the Hodge dual of the curvature or Riemann form of ECE theory. The subscript in Eq. (3.1) means that the gravitational sector is described by the wedge product $\widetilde{R} \wedge q$, where q is the tetrad form. In vector notation Eq. (3.1) becomes two laws of ECE theory, the Coulomb and Ampère Maxwell laws:

$$\boldsymbol{\nabla} \cdot \boldsymbol{E} = \frac{\rho}{\epsilon_0} \tag{3.2}$$

and

$$\boldsymbol{\nabla} \times \boldsymbol{B} - \frac{1}{c^2}\frac{\partial \boldsymbol{E}}{\partial t} = \mu_0 \boldsymbol{J}. \tag{3.3}$$

Here $\boldsymbol{E}$ is the electric field strength in volts per meter, ρ is the charge density in Cm^{-3}, ϵ_0 is the S.I. vacuum permittivity, $\boldsymbol{B}$ is the magnetic flux density in tesla, $\boldsymbol{J}$ is the current density in Cs^{-1} meter^{-2}, and μ_0 is the S.I. vacuum permeability. These are the same laws as in MH theory, but ECE derives them from geometric first principles, and is able to compute the charge density and components of the current density from line elements used in the theory of gravitation. The choice of line elements is important, because not only must they be exact solutions of the EH equation, but must also be geometrically correct [13–15]. These requirements are described in more detail by Crothers in Section 23.3 of Chapter 23 of www.aias.us. Here we base our discussion on that Section 23.3, using the same notation. The results are further discussed in Section 23.3 of this paper.

The first example discussed in this paper is the Schwarzschild class of static vacuum solutions. As shown by Eddington [16] and Crothers [13–15], there is an infinite number of possible solutions of the EH equation for this class of metrics. The most general form of the line element for this class of metrics has been given by Crothers [13–15] and is:

$$ds^2 = A(C(r))^{1/2}dt^2c^2 - B(C(r))^{1/2}d(C(r))^{1/2} \\ - C(r)(d\theta^2 + \sin^2\theta d\phi^2) \tag{3.4}$$

where:

$$C(r) := C(|r - r_0|). \tag{3.5}$$

Here $A(C(r))^{1/2}$, $B(C(r))^{1/2}$ and $C(r)$ are a priori unknown positive valued analytic functions that must be determined by the intrinsic geometry of the line element and associated boundary conditions. In the class of vacuum solutions the Einstein tensor vanishes:

$$G_{\mu\nu} = 0. \tag{3.6}$$

The radius of curvature [13–15] is defined by:

$$R_c(r) = (C(r))^{1/2}. \tag{3.7}$$

Using (3.4) in the EH field equation gives:

$$ds^2 = \left(1 - \frac{\alpha}{(C(r))^{1/2}}\right)c^2t^2 - \left(1 - \frac{\alpha}{(C(r))^{1/2}}\right)^{-1} d(C(r))^{1/2} \\ - C(r)(d\theta^2 + \sin^2\theta d\phi^2). \tag{3.8}$$

Crothers has shown furthermore [17] that the admissible form of $C(r)$ that satisfies the intrinsic geometry of the line element and also the required boundary conditions must be

$$(C(r))^{1/2} = R_c(r) = (|r - r_0|^n + \alpha^n)^{1/n}, \quad r \in R, n \in R^+, r \neq r_0, \tag{3.9}$$

where r_0 and n are entirely arbitrary constants and α is a constant that depends on the mass of the gravitational field, but which cannot be identified with a point mass M. The line element (3.8) is well defined on

$$-\infty < r < r_0 < r < \infty \tag{3.10}$$

and has a singularity if and only if:

$$r = r_0. \tag{3.11}$$

Since r is never equal to r_0 in Eq. (3.9), no such singularity occurs. There is no black hole singularity. Numerous other errors of the standard model have also been pointed out by Crothers [13–15]. These are irretrievable errors and so standard model cosmology must be discarded and replaced by Crothers metrics. The solution of the EH equation obtained originally by Karl Schwarzschild [18] is the special case:

$$n = 3, r_0 = 0, r > r_0. \tag{3.12}$$

Using this line element it was found by computer algebra that the charge and current densities vanish. The reason for this is that the line element (8) is Ricci flat, i.e. all components of the Ricci tensor vanish, and consequently the Ricci scalar curvature. All the line elements of the spherically symmetric and static Schwarzschild class will give this result, because they are vacuum line elements. The vacuum is defined as Ricci flat. There is an infinite number of such line elements that are exact solutions of the Einstein Hilbert equation, but only the Crothers class is acceptable as also being rigorously correct in differential geometry. In this case the inhomogeneous ECE field equations have the same vector form precisely as the Maxwell Heaviside inhomogeneous field equations. They are the vacuum Coulomb law:

$$\boldsymbol{\nabla} \cdot \boldsymbol{E} = 0 \tag{3.13}$$

and the vacuum Ampère Maxwell law:

$$\boldsymbol{\nabla} \times \boldsymbol{B} - \frac{1}{c^2}\frac{\partial \boldsymbol{E}}{\partial t} = \mathbf{0}. \tag{3.14}$$

For any line element that is not Ricci flat a finite charge/current density is obtained, as in Chapter 93 of www.aias.us. The correct way of computing the ECE charge current density from the original line element of Schwarzschild is from eq. (3.8) of this paper. In the generalization (3.4) of the Minkowski element, the a priori unknown A and B must be functions of $C^{1/2}$. The line element (8) is obtained from the line element (4) using the Einstein Hilbert field equation, so the line element (8) must be used to compute ECE charge and current densities, as in this paper. A Lehnert type [19] vacuum current charge density may conceivably be obtained from a line element that is not Ricci flat in the absence of canonical energy-momentum density. In that case, the "vacuum" is a different one from that of the Schwarzschild class, all of whose members are Ricci flat. The usual definition of "vacuum" in general relativity is therefore that the Ricci tensor vanishes and the canonical energy momentum density tensor vanishes. In the Schwarzschild vacuum the ECE charge current density vanishes for all $A^{(0)}$ as we have seen. So ECE is rigorously self-consistent conceptually and mathematically. It is the first successful generally covariant unified field theory that can be used in electrical engineering with the inclusion of the spin connection.

The second example given in this section is Crothers' generalization of the line element for the incompressible sphere of fluid obtained in 1916 by Schwarzschild [20]. In the notation used by Crothers in Section 23.3 of paper 23 his generalization is:

$$
\begin{aligned}
ds^2 = \Bigg(& \frac{3}{2}\left(\cos|\chi_a - \chi_0| - \cos|\chi - \chi_0|\right)^2 c^2 dt^2 \\
& - \frac{3}{\kappa\rho_0} d\chi^2 - \frac{3}{\kappa\rho_0}\sin^2|\chi - \chi_0|\left(d\theta^2 + \sin^2\theta d\phi^2\right)\Bigg) .
\end{aligned}
\tag{3.15}
$$

It was found by computer algebra (using a program written by HE) that this line element obeys the fundamental equation:

$$
R \wedge q = 0 \tag{3.16}
$$

usually known as the first Bianchi identity. (In fact it was discovered by Ricci and Levi-Civita.) Having checked the line element in this way the computer algebra was used to find that the charge density is proportional to:

$$
J^0 = \phi\left(\frac{4\cos(\mid\chi - \chi_0\mid)\kappa\rho_0}{(\cos(\mid\chi-\chi_0\mid) - 3\cos(\mid\chi_a - \chi_0\mid))^3}\right) \tag{3.17}
$$

and the current densities to:

$$
J_r = \frac{A^{(0)}}{\mu_0}\left(\frac{\cos(|\chi-\chi_0|)\kappa^2\rho_0^2}{9(\cos(|\chi-\chi_0|) - 3\cos(|\chi_a-\chi_0|))} + \frac{2}{9}\kappa^2\rho_0^2\right) \tag{3.18}
$$

$$
\begin{aligned}
J_\theta = J_\phi \sin^2\theta = \frac{A^{(0)}}{\mu_0} \Bigg(& \frac{\cos(|\chi-\chi_0|)\kappa^2\rho_0^2}{9(\cos(|\chi-\chi_0|) - 3\cos(|\chi_a-\chi_0|))} \\
& + \frac{\kappa^2\rho_0^2}{9\sin(|\chi-\chi_0|)^2} - \frac{(\cos(|\chi-\chi_0|)-1)(\cos(|\chi-\chi_0|)+1)\kappa^2\rho_0^2}{9\sin(|\chi-\chi_0|)^4}\Bigg) .
\end{aligned}
\tag{3.19}
$$

These are graphed in Figs. (3.1) to (3.3). These results pertain to the interior of the sphere only and depend on a non-zero primordial voltage $cA^{(0)}$ being present, proportional to the electronic charge -e regarded as a fundamental constant. Outside the sphere of incompressible fluid the charge and current densities vanish even for non-zero $cA^{(0)}$. As pointed out by Crothers, two line elements are needed for a source of the gravitational field, one for the interior of the source, another for the exterior, where the gravitational

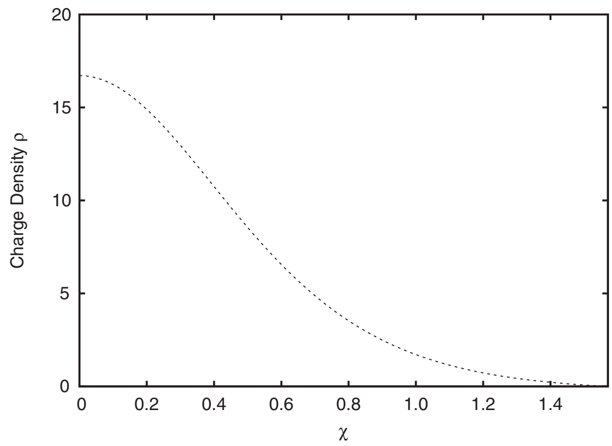

Fig. 3.1. Homogeneous Fluid Sphere, charge density ρ for $\rho_0 = 1, \kappa = 1$, $\chi_a = 1, \chi_0 = 0$.

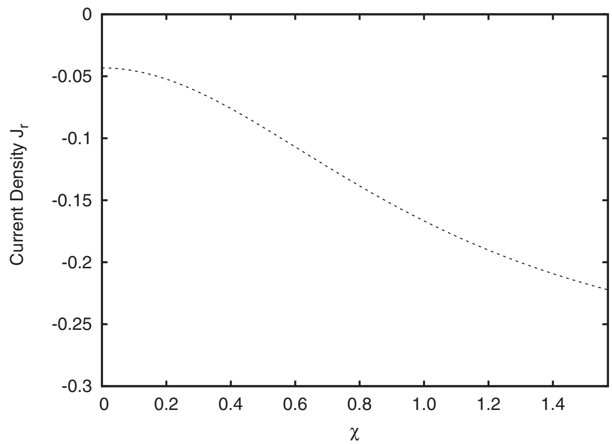

Fig. 3.2. Homogeneous Fluid Sphere, current density J_r for $\rho_0 = 1, \kappa = 1$, $\chi_a = 1, \chi_0 = 0$.

field is modeled mathematically by the center of mass, a purely mathematical concept. This is explained further in Section 3 of this paper. So if a classical electron is modeled like this, it has charge and current density in its interior, but not around it. Obviously this conflicts with the laws of classical electrodynamics, which show that an electron is a source for an electric field, and if it moves with time, radiates. To describe this correctly, a rigorous Crothers type line element is needed that gives a charge current density both in the

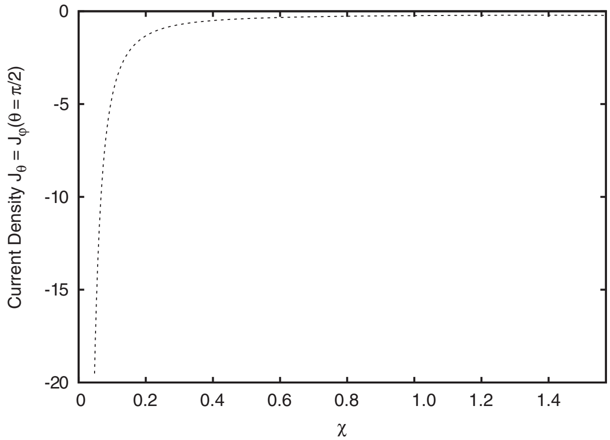

Fig. 3.3. Homogeneous Fluid Sphere, current density J_ϑ, J_φ for $\rho_0 = 1$, $\kappa = 1, \chi_a = 1, \chi_0 = 0$.

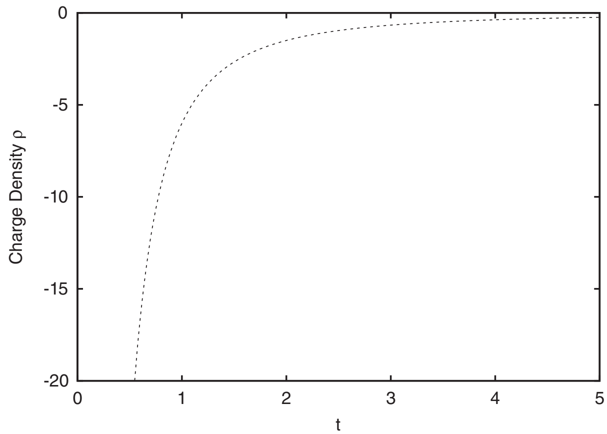

Fig. 3.4. FLRW metric, charge density ρ for $R(t) = t^2, k = .5, r = 1$.

interior and exterior of a source. None of the line elements of the standard model can be accepted because they are geometrically incorrect.

In anticipation of the next section we present the results of the cosmological charge and current densities of the FLRW metric, Eq. (3.20). Figs. (3.4) to (3.6) show the time dependence of these quantities for a fixed radius where the time-dependent curvature radius increases quadratically. All quantities tend to zero over time for an expanding universe. If the universe is contracting (Figs. (3.7) to (3.8)), the cosmological quantities tend to explode. This would only be meaningful if it would appear in a restricted volume. However

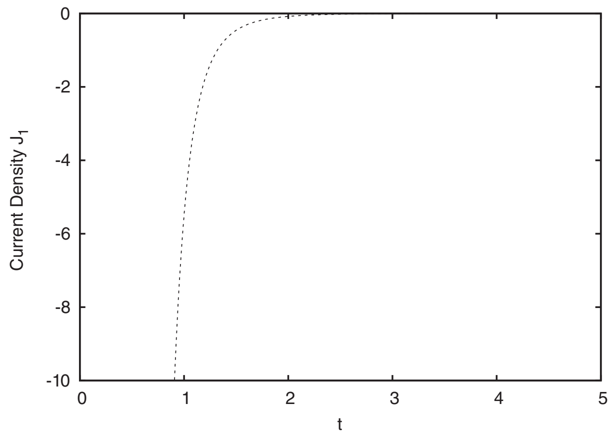

Fig. 3.5. FLRW metric, current density J_r for $R(t) = t^2, k = .5, r = 1$.

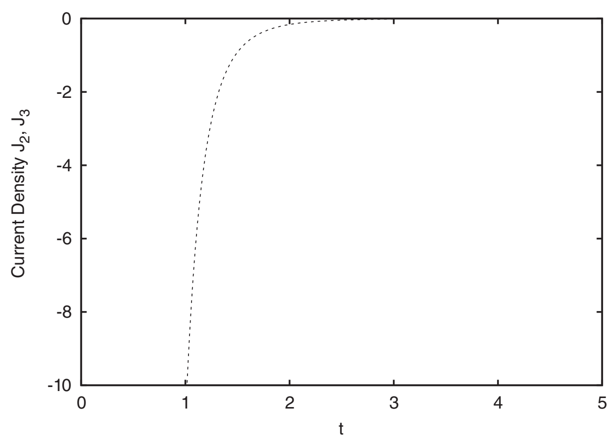

Fig. 3.6. FLRW metric, current density J_ϑ, J_φ for $R(t) = t^2, k = .5, r = 1$.

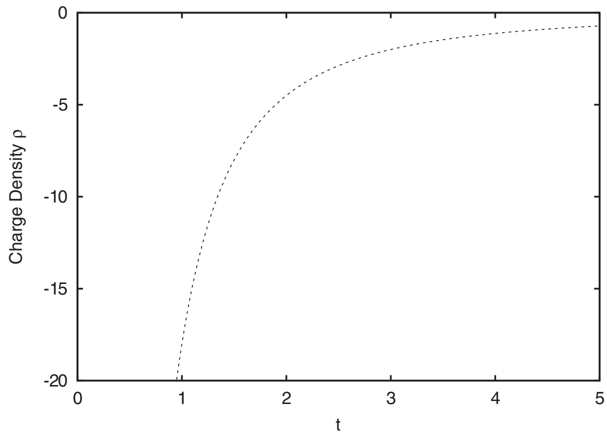

Fig. 3.7. FLRW metric, charge density ρ for $R(t) = t^{-2}, k = .5, r = 1$.

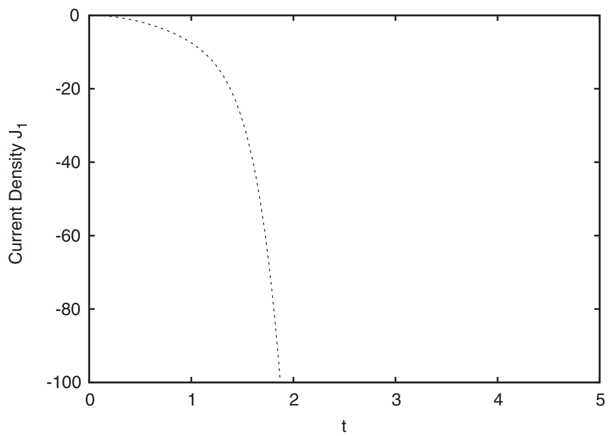

Fig. 3.8. FLRW metric, current density J_r for $R(t) = t^{-2}, k = .5, r = 1$.

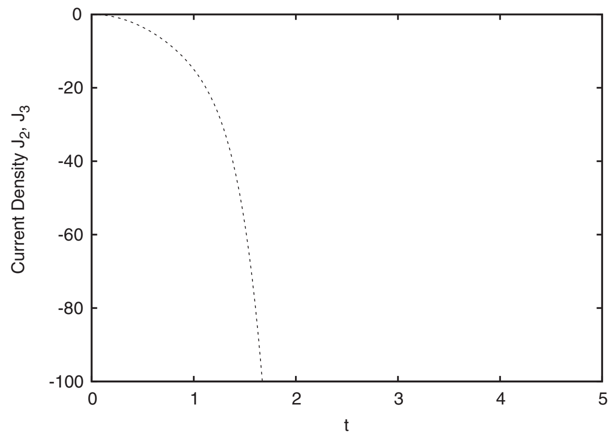

Fig. 3.9. FLRW metric, current density J_ϑ, J_φ for $R(t) = t^{-2}, k = .5, r = 1$.

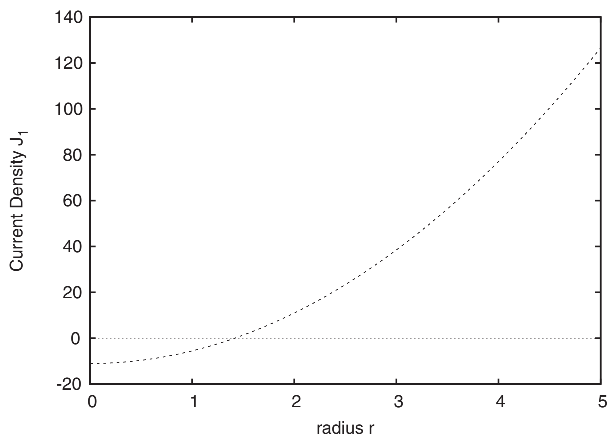

Fig. 3.10. FLRW metric, current density, r dependence of J_r for $R(t) = t^2, t = 1, k = .5$.

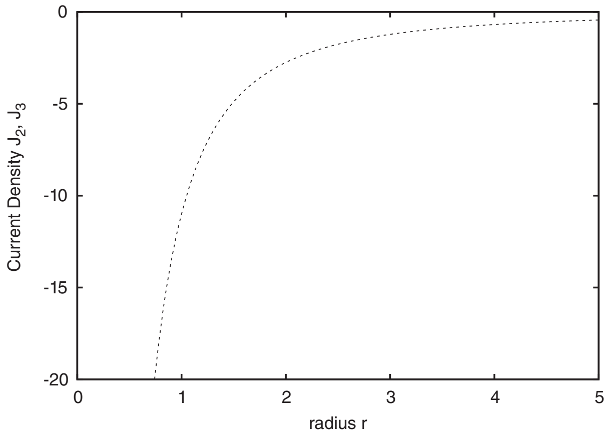

Fig. 3.11. FLRW metric, current density, r dependence of J_ϑ, J_φ for $R(t) = t^2, t = 1, k = .5$.

Fig. (3.10) shows that the radial part of the current density grows indefinitely with radius while the angular dependence (Fig. (3.11)) disappears. This is no meaningful physical behaviour and the significance of the FLRW metric is indeed strongly relativated in the next section.

3.3 Concerning the Standard (Big Bang) Cosmological Model

3.3.1 Non-Static Spherically Symmetric Metric Manifolds

It has been frequently claimed by the proponents of the Standard (Big Bang) Cosmological Model that cosmology truly became a science with the advent of Einstein's General Theory of Relativity and the subsequent works of Friedmann, Lemaître, Robertson, and Walker. The essential theoretical elements underlying the alleged Big Bang cosmology are codified in what has become known as the Friedmann-Lemaître-Robertson-Walker (FLRW) line-element.This line-element has three standard forms:

$$ds^2 = dt^2 - \frac{R^2(t)}{\left(1 + \frac{k}{4}r^2\right)^2}[dr^2 + r^2(d\theta^2 + \sin^2\theta d\varphi^2)], \tag{3.20}$$

$$ds^2 = dt^2 - R^2(t)\left[\frac{d\bar{r}^2}{1 - k\bar{r}^2} + \bar{r}^2(d\theta^2 + \sin^2\theta d\varphi^2)\right], \tag{3.21}$$

$$ds^2 = dt^2 - \frac{R^2(t)}{k}[d\chi^2 + \sin^2\chi(d\theta^2 + \sin^2\theta d\varphi^2)]. \tag{3.22}$$

The path to these line-elements is through a tortuous series of transformations of coordinates and assumptions. The starting point is to assume that:

(a) the desired line-element can be written in the form $ds^2 = dt^2 + g_{ij}dx^i dx^j, (i, j = 1, 2, 3)$;

(b) spacetime is spatially homogeneous and isotropic for any observer, located anywhere in the Universe and at rest with respect to the mean motion of matter in the observer's neighbourhood.

In accordance with these assumptions it is next supposed that the sought for line-element can be expressed in the spherically symmetric general form

$$ds^2 = e^{\nu} dt^2 - e^{\lambda} dr^2 - e^{\mu}(r^2 d\theta^2 + r^2 \sin^2\theta d\varphi^2) + 2adrdt, \tag{3.23}$$

here ν, λ, μ are functions of r and t. By a series of coordinate transformations this line-element is reduced to the the form,

$$ds^2 = dt^2 - e^{\mu}(dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta d\varphi^2), \tag{3.24}$$

wherein $\mu = \mu(r,\ t) = f(r) + h(t)$.

Now comes a crucial step: to find, in terms of (3.24), a solution to Einstein's field equations $R_{\rho\sigma} - \frac{1}{2}g_{\rho\sigma}R = \kappa T_{\rho\sigma} \neq 0$, without specific knowledge of $T_{\rho\sigma}$. By spatial isotropy it is asserted that $T_{11} = T_{22} = T_{33}$, by which a 2nd-order differential equation is obtained for $f(r)$. Note however that one cannot obtain an expression leading to an explicit expression for $h(t)$, which remains a priori unknown. Solving the differential equation for $f(r)$, the line-element (3.20) is obtained, and by implicit coordinate transformations, line-elements (3.21) and (3.22) are obtained. To obtain (3.21) from (3.20), set

$$\bar{r} = \frac{r}{1 + \frac{k}{4}r^2}, \tag{3.25}$$

and to obtain (3.22) from (3.21), set

$$\bar{r} = \frac{1}{\sqrt{k}} \sin\chi. \tag{3.26}$$

It must be noted that in the line-elements (3.20), (3.21) and (3.22), the quantities r, $\bar{r}$, and χ do not denote distances, radial or otherwise, in the spacetime they equivalently describe. Line-elements (3.20), (3.21) and (3.22) share the same intrinsic geometrical structure as the usual line-element, in spherical coordinates, for Minkowski space, upon which they are fundamentally based. This is so because a geometry is completely determined by the form of its line-element [21, 22].

Since line-elements (3.20), (3.21) and (3.22) share the same basic intrinsic geometry, that same intrinsic geometry must be applied to all these line-elements, to determine, in each case, quantities associated with the spacetime they describe. The radius of curvature and the proper radius are therefore obtained for each line-element from the components of the metric tensor thereof and the fixed geometrical relations between them [23–26]. In the case of (3.20), the radius of curvature R_c, is

$$R_c = \frac{rR(t)}{1 + \frac{k}{4}r^2}, \tag{3.27}$$

and the proper radius R_p is

$$R_p = R(t) \int \frac{dr}{1 + \frac{k}{4}r^2}. \tag{3.28}$$

In the case of (3.21),

$$\begin{aligned} R_c &= \bar{r}R(t), \\ R_p &= R(t) \int \frac{d\bar{r}}{\sqrt{1 - k\bar{r}^2}}. \end{aligned} \tag{3.29}$$

In case of (3.23),

$$\begin{aligned} R_c &= \frac{R(t)}{\sqrt{k}} \sin\chi, \\ R_p &= \frac{R(t)}{\sqrt{k}} \int d\chi. \end{aligned} \tag{3.30}$$

Note that in each case, $R_c \neq R_p$ in general.

Now it is also assumed by the Standard Model cosmologists that in (3.20), $0 \leq r < \infty$, in (3.21), $0 \leq \bar{r} < \infty$, and in (3.22), $0 \leq \chi \leq \pi$ [22, 27, 28]. However, no Big Bang cosmologist has ever proved that these domains on the respective variables are valid. They have all only ever assumed that they are valid. That the assumptions are false is rather easily demonstrated [25, 26]. The correct intervals are $0 \leq r < \frac{2}{\sqrt{k}}$, $0 \leq \bar{r} < \frac{1}{\sqrt{k}}$ and $2n\pi \leq \frac{\pi}{2} + 2n\pi$ $(n = 0, 1, 2, ...)$.

Notwithstanding the fact that $R(t)$ is a priori unknown, it is also assumed by the Big Bang cosmologists that $R(t)$ is well-defined in line-elements (3.20) to (3.22), simply because those line-elements satisfy the field equations. However, that satisfaction of the field equations is a necessary but insufficient condition for a solution to Einstein's gravitational field has not been realisrd by the Standard Model cosmologists. In addition to the field equations, the intrinsic geometry of the line-element and boundary conditions must also be satisfied. Application of the intrinsic geometry of line-elements (3.20), (3.21) and (3.22) shows that a well-defined $R(t)$ therein does not exist: $R(t)$ is necessarily infinite for all values of the time t. This means that Einstein's Universe, insofar as the FLRW configuration is concerned, is infinite and unbounded in both space and time, and is therefore actually independent of time [25, 26].

3.4 The Friedmann Models

Friedmann's equation is dependent upon the assumption of a well-defined $R(t)$ [27, 29, 30]:

$$\dot{R}^2 + \bar{k} = \frac{8\pi G}{3}\rho R^2, \tag{3.31}$$

where $\rho = \rho(t)$ is the proper density of a Universe modclled by the tensor for a perfect fluid,

$$T_{\mu\nu} = (\rho + p)u_\mu u_v - pg_{\mu\nu}, \tag{3.32}$$

where $p = p(t)$ is pressure and u_μ is the covariant world-velocity of fluid particles. Both ρ and p are functions of t alone owing to the assumption of homogeneity. The derivation of (3.31) completely ignores the issue of satisfaction of the intrinsic geometry of the line-element (3.20), and its equivalents. Also, setting to zero the covariant derivative of (3.32), as $T^{\mu\nu}{}_{\mu}, = 0$, the Big Bang cosmologists obtain the equation of continuity, as

$$\dot{\rho} + (\rho + p)\frac{3\dot{R}}{R} = 0, \tag{3.33}$$

where the validity of this expression is also contingent upon the validity of the assumption of a well-defined $R(t)$ in metric (3.20) and its equivalents.

Now by setting $p = 0$ (i.e. for a. matter-dominated Universe), the Standard model proponents reduce (3.33) to,

$$\rho R^3 = \text{const.} \tag{3.34}$$

and Friedmann's equation to,

$$\dot{R}^2 + \bar{k} = \frac{A^2}{R}, \tag{3.35}$$

where $A > 0$ is a constant that subsumes $R(t_0)$, where t_0 is alleged to be the current age of the Universe.

The Hubble relation is defined by the Big Bang cosmologists as:

$$H(t) = \frac{\dot{R}(t)}{R(t)}. \tag{3.36}$$

The "present day" value of Hubble's "constant" is claimed to be $H_0 = H(t_0)$. Using this in Friedmann's equation (3.31), the Big Bang cosmologists obtain their so-called "critical density",

$$\dot{\rho}_c = \frac{3H_0^3}{8\pi G}, \tag{3.37}$$

and their so-called "deceleration parameter", with $p = 0$,

$$q_0 = \frac{4\phi G \rho_0}{3H_0^2} = \frac{\rho_0}{2\rho_c}, \tag{3.38}$$

where $p_0 = p(t_0)$. Again, all these results completely ignore the intrinsic geometry of the line-element and rest upon the unproven assumption that $R(t)$ is a priori well-defined in the line-element.

The so-called "Friedmann" models involve solving (3.35) for the three cases $\kappa = 0, \pm 1$, and are therefore based upon the unproven assumption of a well-defined $R(t)$ in the line-element (3.20) and its equivalents. Yet no relativist has ever proved that there exists an a priori well-defined $R(t)$, because none of them have ever realised that $R(t)$ must satisfy the intrinsic geometry of the line-element (3.20), and its equivalents.

Since it is easily proved [25] that $R(t)$ is necessarily infinite for all values of time t, the whole Standard (Big Bang) Cosmological Model is fallacious.

3.5 Recapitulation and Summary

The Big Bang Cosmology makes the assumptions (a) and (b) given above, and obtains the line-element (3.20), and by implicit coordinate transformations, metrics (3.21) and (3.22), satisfying the field equations.

The range on the variables $r, \bar{r}$ and χ in line-elements (3.20), (3.21) and (3.22) respectively are never deduced by the Big Bang proponents by an application of the intrinsic geometry of the line-elements. Instead, they have merely assumed, erroneously, that $0 \le r < \infty, 0 \le \bar{r} < \infty$ and $0 \le \chi \le \pi$.

The intrinsic geometry of the line-element has been completely ignored by the relativists, or more accurately, has gone thoroughly unrecognised so that it has never been applied by them.

Ignorance of the intrinsic geometry of the line-element manifests in the unproven (and demonstrably false) assumption that $R(t)$ is a priori well-defined.

Using the false assumption that $R(t)$ is well-defined, the Friedmann models and all the other Big Bang paraphernalia are constructed.

The Standard Cosmology and black hole proponents have never realised that there is a clear geometrical distinction between the radius of curvature (from the Gaussian curvature) and the proper radius (the radial geodesic) in the non-Efcleethean[1] spherically symmetric pseudo-Riemannain metric manifold of Einstein's gravitational field. They have therefore never realised that on the usual Minkowski line-element in spherical coordinates, the radius of curvature and the proper radius are identical (owing to the fact that Minkowski space is pseudo-Efcleethean). They have failed to understand that a geometry is entirely determined by its line-element. Furthermore, they have never realised that, in general, the quantity r appearing in their usual line-elements is neither a radius nor a distance in the spacetime described by those line-elements, but is in fact only a parameter for the radius of curvature and the proper radius of those line-elements.

In short, Big Bang cosmology and black holes are based upon fatal errors in the elementary differential geometry of a spherically symmetric metric manifold, and so they are entirely false.

Contrary to the now almost daily claims by the astronomers and astrophysicists, nobody has ever found a black hole. The alleged signatures of a black hole are an infinitely dense singularity and an event horizon. Hundreds of black holes have alleged to have been discovered, yet not one instance of an infinitely dense singularity or one instance of an event horizon has been identified. This amplifies that fact that the black hole did not come from observations. The notion of the black hole did not exist before it was conjured up from General Relativity. It is an entirely theoretical object that has not been found in Nature. But the theoretical derivation of the black hole is a gross violation of differential geometry. therefore, it is fallacious.

Similarly, before it was conjured up from General Relativity, the Big Bang concept did not exist. Hubble's relation has been reformulated as a red-shift/cosmological recessional velocity relation, from a red-shiftldistance relation, tenuous to begin with, to give some facade of physical validity. Being

[1]For the geometry due to Efcleethees, usually and abominably rendered as Euclid.

also a creature of pure theory, allegedly derived from General Relativity, Big Bang fails completely since it too is due to fatal errors in differential geometry. One cannot interpret observations in terms of concepts derived from General Relativity by erroneous mathematics. Yet that is precisely what the astronomers and astrophysical relativists have always done.

As for the CMB, its most likely source is the oceans of the Earth [31–38]. In any event it cannot be the afterglow of a Big Bang, as so commonly claimed.

References

[1] M. W. Evans, "Generally Covariant Unified Field Theory" (Abramis Academic, Suffolk, 2005 onwards), vols. 1–4, volume 5 in prep. (papers 71 to 93 on www.aias.us).

[2] M. W. Evans et al., papers 1–95 to date on www.aias.us and www.atomicprecision.com, also Omnia Opera Section on www.aias.us, 1992 to present for precursor theories.

[3] L. Felker, "The Evans Equations of Unified Field Theory" (Abramis Academic, Suffolk, 2007).

[4] K. Pendergast, "Mercury as Crystal Spheres" (Abramis Academic, Suffolk, in prep., preprint on www.aias.us).

[5] M. W. Evans, Acta Phys. Polon., **38**, 2211 (2007).

[6] M. W. Evans and H. Eckardt, Physica B, in press (2007).

[7] M. W. Evans, Physica B, in press (2007).

[8] M. W. Evans and L. B. Crowell, "Classical and Quantum Electrodynamics and the $\mathbf{B}^{(3)}$ Field" (World Scientific, 2001).

[9] M. W. Evans and J.-P. Vigier, "The Enigmatic Photon" (Kluwer, Dordrecht, 1994 to 2002 hardback and softback), in five volumes.

[10] M. W. Evans (ed.), "Modern Non-Linear Optics" in I. Prigogine and S. A. Rice (series eds.), "Advances in Chemical Physics" (Wiley, New York, 2001, second edition), vols. 119(1) to 119(3); ibid M. W. Evans and S. Kielich (eds.), (Wiley, New York, 1992, 1993 and 1997, first edition) vols. 85(1) to 85(3).

[11] S. P. Carroll, "Space-time and Geometry: an Introduction to General Relativity" (Addison Wesley, New York, 2005, online 1997 notes).

[12] Papers 93 and 95 of www.aias.us .

[13] S. J. Crothers, "A Brief History of Black Holes", Progress in Physics, 2, 54–57 (2005).

[14] S. J. Crothers, " Symmetric Metric Manifolds and the Black Hole Catastrophe" (www.aias.us, 2007).

[15] S. J. Crothers, "On the "Size" of Einstein's Spherically Symmetric Universe", progress in Physics, vol. 3, in press, (2007).

[16] A. S. Eddington, "The Mathematical Theory of Relativity" (Cambridge University Press, 2nd ed., 1960).

[17] S. J. Crothers, "On the Geometry of the General Solution for the Vacuum Field of the Point Mass", Progress in Physics, **2**, 3–14 (2005).

[18] K. Schwarzschild, "On the Gravitational Field of a Mass Point According to Einstein's Theory", Sitz. Preuss. Akad., Phys. Math., K1, 189 (1916).

[19] B.Lehnert, a review in ref. (10), vol. 119(2), pp. 1 ff.

[20] K. Schwarzschild, "On the Gravitational Field of a Sphere of Incompressible Fluid According to Einstein's Theory", Sitz. Preuss. Akad., Phys. Math., K1, 424 (1916).

[21] Levi-Civita T. The Absolute Differential Calculus, Dover Publications Inc., New York, 1977.

[22] Tolman R. C. Relativity Thermodynamics and Cosmology, Dover Publications Inc., New York, 1987.

[23] Crothers S. J. On the geometry of the general solution for the vacuum field of the point-mass. *Progress in Physics*, v. 2, 3–14, 2005, (www.ptep-online.com/index_files/2005/PP-02-01.PDF)

[24] Crothers S. J. Spherically Symmetric Metric Manifolds and the Black Hole Catastrophe, (www.aias.us).

[25] Crothers S. J. On the 'Size' of Einstein's Spherically Symmetric Universe. *Progress in Physics*, v. 3, p–pp, 2007, (www.ptep-online.com/index_files/2007/PP-11-10.PDF).

[26] Evans M. W., Eckardt H., Crothers S. J. The Coulomb and Ampere Maxwell Laws in Generally Covariant Unified Field Theory, paper 93, (www.aias.us).

[27] Misner C. W., Thorne K. S., Wheeler J. A. Gravitation. W. H. Freeman and Company, New York, 1973.

[28] Landau, L., Lifshitz, E. The Classical Theory of Fields, Addison-Wesley Publishing Company, Inc., Reading, Massachusettes, 1951.

[29] Foster, J., Nighingale, J. D. A Short Course in General Relativity, 2nd Ed., Springer-Verlag, New York, Inc., 1995.

[30] d'Inverno, R. Introducing Einstein's Relativity, Clarendon Press, Oxford 1992.

[31] Robitaille P-M. L. WMAP: a radiological analysis II. Spring Meeting of the American Physical Society Northwest Section, G1.0005, May 19–20, 2006.

[32] Robitaille P.-M. L. WMAP: a radiological analysis. *Progress in Physics*, 2007, v. 1, 3–18, (www.ptep-online.com/index_files/2007/PP-08-01.PDF).

[33] Robitaille P.-M. L. On the origins of the CMB: insight from the COBE, WMAP, and Relikt-1 Satellites. *Progress in Physics*, 2007, v. 1, 19–3, (www.ptep-online.com/index_files/2007/PP-08-02.PDF).

[34] Robitaille P.-M. L. On the Earth Microwave Background: absorption and scattering by the atmosphere. *Progress in Physics*, 2007, v. 3, 3–4, (www.ptep-online.com/index_files/2007/PP-11-11.PDF).

[35] Robitaille P.-M. L., Rabounski D. COBE and the absolute assignment of the CMB to the Earth. American Physical Society March Meeting, L20.00007, March 5-9, 2007.

[36] Robitaille P.-M. L., On the Nature of the Microwave Background at the Lagrange 2 Point. Part 1. *Progress in Physics*, 2007, v. 4., 74–83, (www.ptep-online.com/index_files/2007/PP-11-11.PDF).

[37] Rabounski D. The relativistic effect of the deviation between the CMB temperatures obtained by the COBE satellite. *Progress in Physics*, 2007, v. 1, 24–26, (www.ptep-online.com/index_files/2007/PP-08-03.PDF).

[38] Borissova L., Rabounski D. On the nature of the Microwave Background at the Lagrange 2 Point. Part II. *Progress in Physics*, 2007, v. 4., 84–95, (www.ptep-online.com/index_files/2007/PP-11-12.PDF).