THE ANTISYMMETRIC CONNECTION:

FUNDAMENTAL ERRORS IN THE EINSTEIN FIELD EQUATION

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ABSTRACT

It is shown that there are several irretrievable errors in the Einstein theory of cosmology used in the standard model, and in all derivative theories thereof. The root cause of these errors is that Einstein's theory used a connection in Riemann geometry that is symmetric in its lower two indices. The connection must however be antisymmetric in its lower two indices as shown in previous papers of this series (www.aias.us). The incorrect use of a symmetric connection means that the general relativity of the last ninety years or so is incorrect and should be developed with Einstein Cartan Evans (ECE) theory. All the major assumptions of Einsteinian cosmology are based on an assumed symmetric connection, notably the second Bianchi identity used in the field equation, and the geodesic method used by Einstein in deriving the Newtonian limit. Derivative theories such as the Hawking-Penrose singularity theorems also assume a symmetric connection, and are therefore mathematically incorrect and physically meaningless. All metrics of the Einstein field equation are incorrect. An error free cosmology based on ECE theory has been developed in earlier papers of this series.

Keywords: ECE theory, antisymmetric connection, Einstein field equation.

INTRODUCTION

In this paper the fundamental errors in the Einstein field equation are pinpointed with precision. It is shown that the academic subjects of general relativity and cosmology are so riddled with errors that they are meaningless to science. The latter was defined by Bacon as being a subject that consists of the simplest possible and mathematically correct hypotheses that can be tested against experimental data. The Einstein field equation is incorrect due to its arbitrary neglect of a fundamental property of spacetime called Riemannian torsion {1-10}. Derivative theories of general relativity and cosmology such as string theory, Big Bang, the existence of black holes, and the existence of dark matter are sequentially incorrect due to the neglect of torsion. These theories are essentially anti Baconian, they are incorrect mathematics and incorrect mathematics cannot be tested against data. They contain many ad hoc assumptions about the existence of unobservables, assumptions that just serve to compound the original incorrectness of the Einstein theory.

The fundamental idea of general relativity is that physics, or natural philosophy, is based on geometry. This idea goes back to classical Celtic and Greek times, when geometry was considered the epitome of beauty. The idea was used for about a thousand years after the Greeks, right up to the time of Kepler around the turn of the seventeenth century. It was thought that the orbits of celestial objects were governed by the music of the spheres. Orbits were thought to be governed therefore by the beauty of geometry, in particular the circle. Real orbits were described by epicycles, circles added to circles. This idea was anti Baconian in the sense that nature was forced to conform to human ideal. This is precisely what is happening today in cosmology and general relativity, the general public is being told, quite cynically and wrongly, that there exist elements in nature that are figments of fantasy based

on an incorrect equation, the Einstein field equation.

There has therefore been a retrograde movement that has corrupted the scientific enlightenment brought about by figures such as Copernicus, Brahe, Galileo, Kepler, Bacon and Newton. These scientists and philosophers developed the fundamental methods of natural philosophy by developing a mathematical description of data. This was a long and slow process which culminated in the Newtonian synthesis. The equations of motion of all objects were described by three basic laws using mathematics that were correct within the context of its time. These mathematics were again based on geometry in Newton's original development in a book called "The Mathematical Principles of Natural Philosophy". This book was based on experimental data meticulously gathered by astronomers such as Tycho Brahe and gradually synthesized with much effort into the three planetary laws of Johannes Kepler. Isaac Newton developed the mathematics to describe these laws as the title of his book suggests. It is not widely known even now that these mathematics were still based on geometry. However, the idea that nature and thus geometry were manifestations of subjective beauty was abandoned by Newton, geometry was used as a means of describing observation as demanded by the philosophy of Francis Bacon. This is known as "the idol of the cave" philosophy and is based on the ancient Greek philosophy of Plato. The word "idol" in this context is based on the classical Greek for "dream". The "cave" denotes the darkness of the human mind when unguided by experimental measurement, by data taken from nature. The human mind produces fantasies that become wilder and wilder, which is exactly what we see on our television screens today, Big Bang that never was, black holes that do not exist, dark matter that is not there in reality, a string theory that has never been proven experimentally. All these flow from a flawed geometry as shown in this paper and earlier papers of this series (www.aias.us).

Gradually the mathematical methods used by Newton were simplified and extended to include rotational motion. Many mathematical methods were developed in the seventeenth, eighteenth and nineteenth centuries by figures such Leibniz, Euler, Lagrange and Laplace. These extended the original Newtonian ideas into a subject known as “classical mechanics”. In the context of cosmology “Celestial Mechanics” by Laplace was a high point of the enlightenment. Later, in the nineteenth century, Hamilton profoundly added to the subject. It was thought that the ideas of Newton, albeit extended, were adequate for the description of nature. However, all that changed dramatically in the late eighteen eighties following an experiment by Michelson and Morley which contradicted “common sense”. An experiment which showed that the speed of light behaved in a way that was not compatible with Newtonian ideas. Around the same time Oliver Heaviside produced his vector equations of classical electrodynamics from the earlier quaternion equations of James Clerk Maxwell. The Maxwell Heaviside equations were not compatible again with Newtonian ideas, so classical dynamics and classical electrodynamics obeyed fundamentally different laws. The problem arose of reconciling what appeared to be two entirely different subjects of physics.

Following upon the results of the Michelson Morley experiment in about 1887, Oliver Heaviside began to correspond with George Francis Fitzgerald on how to produce a theory to explain the perplexing result of the experiment, that the speed of light appeared not to vary in different directions or frames of reference. The subject of relativity was brought into being by these discussions between Heaviside and Fitzgerald in the late eighteen eighties. The subject was later developed by many scientists, notably Henrik Anton Lorentz and Henri Poincare, who began to implement the then new tensor calculus. Around the turn of the twentieth century (1900) the Maxwell Heaviside equations were put into tensor format using the Lorentz transformation from one frame of reference to another. The Lorentz transformation is

generally considered to be the key equation of special relativity, a subject that is defined by classical electrodynamics. This is because the Maxwell Heaviside equations obey the Lorentz transformation, not the Galilean transformation of the Newtonian laws. The Lorentz transform implements a vector in four dimensions, three space dimensions and one time dimension. Therefore time is no longer independent of space as in the Newtonian ideal. Spacetime is not an idea that was introduced by Einstein, it was introduced by several earlier scientists, notably Heaviside and Lorentz.

The equations of special relativity may be thought to be the Heaviside equations of classical electrodynamics, written down around the time that Einstein was born in 1879. Einstein's contribution to special relativity was to put the finishing touches to the work of those who had gone before him. The big problem is that Einstein has been elevated into a cult figure, and this process has led to a corruption of the scientific enlightenment. The tendency is to take an equation by Einstein and to try to prove endlessly and without purpose that that equation must be correct to ever greater precision instead of finding the flaws in Einstein's work and constructively correcting them as in this paper. The contributions made by Einstein in 1905 were to propose that the speed of light is the same in a frame that moves at constant velocity with respect to another, and to propose, effectively, that the Lorentz transform applies to classical dynamics as well as to classical electrodynamics. This was therefore an early unified field theory, giving a unified view of part of classical dynamics and of electrodynamics. Later, Einstein also proposed that there exists a relativistic linear momentum. This is the idea that actually leads to his famous rest energy equation, that rest energy is mass multiplied by the square of the speed of light. Around the same time, Minkowski spacetime was developed, a concept which simplifies the equations of special relativity. Horst Eckardt {1-10} has recently uncovered several flaws in Einstein's

interpretation of his own equations of special relativity. The ideas by Eckardt are correct, but the less enlightened part of the contemporary academic world is so ossified that it refuses to countenance that Einstein could make mistakes. Einstein himself admitted frequently that he could make mistakes, and frequently corrected them in his papers.

Minkowski spacetime is frequently known as flat spacetime, and this idea suggests automatically that there can exist spacetimes that are not flat. These are the spacetimes of general relativity, in which physics is thought to be governed by geometry again. This time though, the equations based on this notion must be such that they can describe all of dynamics, now known as relativistic dynamics instead of classical dynamics. Specifically the notion of acceleration of one frame with respect to another has to be incorporated into relativistic dynamics because in special relativity a frame moves with a uniform velocity with respect to another, and does not accelerate. Einstein's primary contribution, and the only one that has lasted the test of about ninety years of science history, is that general relativity can be based on geometry. This means that tensor equations retain their format in any frame of reference, i.e. in a frame that moves in any way with respect to another. This is known as the principle of covariance. It was applied originally by Einstein to dynamics, but not to electrodynamics, introducing a basic schism in physics. This schism has only recently been bridged by the emergence in 2003 {1-10} of Einstein Cartan Evans (ECE) unified field theory, in which all the equations and laws of physics are generally covariant. This means that they retain their format in a frame of reference moving arbitrarily with respect to another.

The problem faced by Einstein and his contemporaries was what geometry to use. Minkowski geometry was known to them as being flat spacetime, so what represents non-flat spacetime? This question may seem bizarre to the uninitiated, but it is designed to find what represents acceleration in general relativity, a subject which is itself designed to ensure

complete objectivity in physics. Complete objectivity is the Baconian ideal: the description of nature must be free from any anthropomorphic influence and that description is not thereby an idol of the cave. In the early nineteenth century Riemann had proposed the geometry that was ultimately used by Einstein having been introduced to it by mathematicians. In Riemann's geometry TWO fundamental tensors are used to describe the way in which any geometry departs from the flat geometry of Minkowski. The latter is in itself a unification of the flat geometry of Euclid merged with time. These fundamental tensors are torsion and curvature. Einstein began to go wrong in several ways, the fatal mistake made by Einstein and all his contemporaries was to throw out the Riemannian torsion. This has led to a catastrophic corruption of the enlightenment, because the error has been repeated in academic physics, (the optimistically named "standard model" of physics) for more than a hundred years.

The torsion and curvature tensors are defined by the action of an object known as the commutator of covariant derivatives on any kind of tensor in any kind of space and any dimension. General relativity is restricted to four dimensional spacetime. The commutator is an operator, meaning that it must act on a tensor. It is sufficient to consider the commutator acting on a vector in four dimensions. The commutator is associated with two indices denoted as subscripts. When these indices are interchanged, the commutator changes sign. When the indices are the same the commutator is zero, it vanishes and in mathematical parlance is said to be a null operator. The latter acts on the four vector to produce zero torsion and zero curvature. When the two indices of the commutator are different the commutator acts on the vector to produce both non-zero torsion and non-zero curvature. The structure of the defining equation is such that the torsion and curvature must BOTH be non-zero. The key point is that it is not possible to assert (or claim illogically) that there can be a non-zero curvature and a

zero torsion. Unfortunately, this is the error committed by Einstein and his contemporaries, and repeated until the emergence of Einstein Cartan Evans (ECE) theory in 2003.

The error made by those contemporaries of Einstein now appears to be so glaring that one wonders why it was ever made. The error amounts to the incorrect assertion that there can be a non-zero commutator with equal indices. It is as simple as that. The only possible type of non-zero commutator must have indices that are different, and it must change sign when these indices are switched. It is said to be antisymmetric in its indices. This error generates many sequential errors as shown in the sections of this paper, and a combination of all of them makes the Einstein theory completely unworkable and obsolete. The object that produces curvature and torsion is known as the connection. The most glaring sequential, or secondary, error in the twentieth century development of general relativity is that the connection was erroneously claimed to be symmetric in its lower two indices, whereas the correct mathematics shows that the connection has the same antisymmetry as the commutator. The whole of the Einsteinian method collapses in consequence of this error. This becomes clear as follows. After many false turns, Einstein finally decided to use an equation of Riemann geometry known to him as "the second Bianchi identity". Contemporary scholarship has shown {1-10} that this equation holds if and only if the connection is symmetric. It is not a true identity because the torsion is omitted incorrectly. The arbitrary and incorrect choice of a symmetric connection means that the torsion is incorrectly zero while the curvature is incorrectly non-zero. The second Bianchi identity was made proportional through the Einstein constant k to the covariant Noether Theorem - the conservation of energy / momentum theorem in non-Minkowski spacetime. A particular choice of integration of this assumed proportionality gives the fabled Einstein field equation.

The rest of twentieth century relativity rests on solving this incorrect equation

and so the subject has caused great harm to scientific enlightenment. “Let Newton be and all is light”, and now all is dark matter again. There are books full of solutions to an incorrect equation, each solution claiming, quite wrongly, to say something about physics. The use of an incorrect connection symmetry is the worst and most basic error, discovered by this author in paper 122 of this series (www.aias.us), and others have persistently criticised the field equation for over ninety years: for example Schroedinger, Dirac, Eddington and Levi-Civita. The latter frequently had to correct Einstein’s errors in Riemann geometry. With Ricci, Levi-Civita was one of the pioneers of tensors in about 1900. Historical scholarship is needed to explain why the developers of Riemann geometry in the early twentieth century made such a blunder as to use the wrong connection symmetry. Even more so, it must be explained why the error is repeated by academia and foisted on the unsuspecting general public in the form of TV shows and so on claiming the existence of lurid fantasies, the very idols against which Bacon warned. Part of the answer must surely be the incomprehensible and murky abstraction of academic physics and mathematics. So in the criticisms of this paper, the precise points of collapse of the academic cosmology are pinpointed in the simplest possible way. The error in the standard model is so blatant and so glaring that an intelligent thinker with no mathematical training at all can understand it.

For a year or so after the proposal of the field equation in 1915, no solution was found. Indeed Einstein thought it to be insoluble. In 1916, however, Schwarzschild published two papers which solved the equation analytically. In neither of these solutions did a singularity (or infinity) appear, as pointed out repeatedly by Crothers and others {1-10}. Despite this, a solution was wrongly and cynically attributed to Schwarzschild, a solution with an incorrect singularity. This is the basis of the fantasy of “Big Bang”, a derogatory term coined by Hoyle, as is well known to the general public. Sir Fred Hoyle clearly did not take

the idea seriously, the idea that the universe must have "started", and then started from a mathematically singularity. Shortly thereafter other closely related solutions were found by Friedmann, Lemaitre, Robertson and Walker (FLRW metric). As argued these are solutions to an incorrect equation, so are merely meaningless mathematics which should have been junked long ago. These solutions are expressed in terms of objects called metrics, which like the connection, measure the way in which spacetime departs from the Minkowski spacetime. General relativity was an obscure subject for some years after that until some bizarre solutions were proposed by Wheeler and coined "black holes". These are again solutions to an incorrect equation, so are meaningless to physics, in any context. The discovery of the way in which stars orbit in spiral galaxies finally showed the Einstein field equation to be unable hopelessly to describe the proliferation of experimental data in millions of galaxies. At that point in time, about forty years ago, cosmology disintegrated as an academic subject because of the introduction of "dark matter" to describe these galactic orbits and other data. It was cynically claimed that the universe consisted mainly of dark matter, snuffing out the Baconian enlightenment and introducing a concept that was and is as dark as the Baconian cave. In other words dark matter is just a fudge factor introduced at random, and not science at all. Dark matter introduces an appalling dichotomy into cosmology because the Einstein equation is still claimed, quite cynically, to be a precise descriptor of such things as solar system orbits, while at the same time it is abandoned as a descriptor of galactic orbits, abandoned in favour of a dark matter that is supposed to fill 95% or more of the universe. Into this absurd confusion stepped ECE theory in 2003, and ECE theory successfully describes all known orbits using the correct geometry {1-10}. This includes galactic orbits, which ECE theory describes straightforwardly in terms of the original Riemannian torsion, a concept of geometry and thus of the philosophy of general relativity {1-10}.

One of the worst hikes pulled on the long suffering general public in the twentieth century was the claim that the Eddington experiment of the early twenties had "verified" the Einstein field equation through the observation of light bending. Eddington did not have the precision to make such a claim, later experiments proved that his type of instrument could not give reproducible results. Even within the Eddington experiment itself there were two (perhaps more) contradictory sets of data, only one seemed to verify the Einsteinian prediction that light should be bent by the sun by twice the Newtonian prediction. It seemed that J. J. Thomson arbitrarily and personally chose the data set that seemed to verify Einstein! The latter was catalysed into instant fame and ceased to be a fallible scientist. It is now known that no set of experimental data could ever have "verified" the Einstein field equation because of its glaring errors in geometry as argued already. In ECE theory therefore, new and simpler field equations have been produced based on a correct geometry, one that properly uses a non zero torsion and curvature. The bending of light by gravity (known technically as the relativistic Kepler problem) has been explained in a new way, using an orbital theorem based on spherical isotropy (uniformness) of spacetime (paper 111 of this series).

The rigorously correct version of the flawed "first and second Bianchi identities" of the obsolete cosmology was given by Elie Cartan in the early twenties. This author has produced a new form of the Cartan identity using a mathematical method known as the Hodge transformation. This new identity is known as the Evans Identity, and proves itself without further ado in paper 137 of this series and in earlier proofs of this series (www.aias.us). The Evans Identity plays a central role in the new cosmology, and shows that every single solution of the Einstein field equation fails because of the neglect of torsion. Both Cartan and Evans Identities are rigorously true and self checking - they prove themselves in that one side of the identity is precisely the same as the other when written out

in a particular way. These rigorously correct identities are used as the basis for the field equations both of dynamics and electrodynamics, thus unifying physics for the first time in the shape of ECE theory. The latter has met with complete professional acceptance outside areas of vested academic interest in failed cosmology. It is not in the interest of failed academic dogmatists to accept new reason, but these zealots and anti-scientists are a tiny minority. Using site feedback data from computers it is now possible to measure precisely the impact of ECE theory, and to measure it in many ways. The impact is unprecedented and sustained, signalling the emergence of a major paradigm shift in physics.

The Evans Identity balances the covariant derivative of torsion on one side of the equation with a particular type of curvature on the other. The Identity may be used as in this sereis of papers and books (www.aias.us) to test the many erroneous solutions that proliferate, solutions of the erroneous Einstein field equation. These solutions all assume that torsion vanishes, so the curvature tensor in the Evans Identity should vanish too. Of course it does not, the basic Einstein field equation itself is erroneous precisely because of its assumption of zero torsion, in other words its assumption of a symmetric connection. In order to demonstrate this to the impartial intellectual, many metrics have been tested in this series of papers (for example papers 93, 96, 117 and 120). These metrics are all exact analytical solutions of the Einstein field equation. These metrics are the very basis for the lurid TV programmes on Big Bang, black holes and daleks. In this book all the main black hole and big bang metrics fail the test of the Evans Identity, so the Big Bang never existed, and there are books full of criticisms on it. The academic system that insists on a fundamentally erroneous physics has disintegrated into useless self glorification and has lost any authority it may imagine itself to have had over thought. There is never authority over individual thought. Time and time again in the course of history, dictators and bigots have learned this lesson.

The very simple method we have used to disprove the Einstein equation begs the question of why it has managed to survive for over ninety years in the teeth of so much criticism. Even stranger is the fact that millions are spent on spacecraft designed to "prove" an equation which is so hopelessly unable to describe the proliferation of galactic orbits throughout the universe. Indeed the latter has to be filled with dark fudge because of the complete failure of the Einstein field equation to describe galactic orbits which are commonplace observables of astronomy. Einstein himself was always uncertain about the basic validity of his equation, especially after discussions with Cartan in the twenties. These discussions showed Einstein that he had neglected torsion. At that point in time it should have been realized that the connection is antisymmetric and the Einstein field equation abandoned in favour of a torsion-based cosmology. It is assumed that such a course of action was not taken because the commutator method of generating curvature and torsion simultaneously was either not known or not understood. The absurd notions of Big Bang and black holes were abandoned by Einstein in about 1939, in a little known paper {1-10} that is not mentioned by contemporary TV zealots, our latter day corruptors of scientific enlightenment. It seems that self aggrandizement, thirst for fame and money, has taken over academia when it comes to general relativity and cosmology. It is so easy now to make those lurid animations and mathematical garbage can be beautified by computer.

In sinister and dark speculation it may be that the field equation is being kept alive merely to acquire money from the general public. It is tied up in string theory to make it look impressive, but all the strings in the world will not mend the ghastly error of the commutator symmetry. A string theory metric that pretends to be a solution of the failed field equation has been tested in paper 120 (www.aias.us), and fails the test of the Evans Identity along with all black hole metrics. So hammered into the mind of students is the field equation, warts and all,

that any notion, any inkling, that it may be wrong is dismissed as lunacy. This is the traditional way of all bigots. This mentality was first described by Plato, on which Bacon based his idols of the cave philosophy, the foundation of all science. The inhabitants of Plato's cave are able only to see the dancing flicker of shadows on the walls, this is their only perception of reality. One of their number wanders into the world outside, which is filled with sunshine. He is amazed at the beauty of nature, and describes this beauty to the cave dwellers. They do not believe him, their world is one of murky shadows, fantasies and dreams of their own making. The nightmare that besets us scientists now is that failed equation which is plastered into the minds of the unsuspecting public. The beauty of nature deserves better than this. As Walter Pater wrote: "Many attempts have been made by writers on art and poetry to define beauty in the abstract, to express it in the most general terms, to find some universal formula for it." That formula is not the Einstein field equation.

The wild fantasies of the twentieth century - idols in physics, idols in mathematics, do not describe nature, they are concepts conjured in darkness. The present author describes these idols as unobservables, things that are invented but do not exist in nature. There are many examples of these: string theory, superstring theory, indeterminacy, virtual particles, things going backwards in time, things that happen without a cause, things that move at any speed, renormalization, dimensional regularization, entirely abstract gauge spaces, structured vacua, spontaneous symmetry breaking, the god particle, asymptotic freedom, confined quarks that are designed never to be observed, Big Bang, black holes, dark matter, dark flow, physically meaningful singularities, all are parameters which are adjusted to fit experimental data. Given enough adjustable parameters, anything can be fitted, and there is no science, only epicycles, idols piled upon each other in the darkest recesses of the human mind. Where is the beauty in that nightmare? If all these big words cost nothing, no

one would take notice of them, they would be the ravings of a lunatic. In our times however they have come to dominate the public psyche to such an extent that tens of billions of dollars are burnt at CERN in search of that god particle. Such is the futile arrogance of human nature at a time when the species faces extinction.

Such is the vested interest in a ghastly error, that commutator again, that strenuous efforts are made by the worst of the bigots to prove that a commutator may be symmetric. Elaborate and false proofs, deliberate and repeated and sometimes published fraud, hyper-abstract mathematics, geometries that have nothing to do either with Riemann or Cartan, and the more murky but time honoured methods of the totalitarian regime. All have been turned against the unfortunate and simple minded commutator. There is dark matter, dark flow, dark jelly, dark custard and dark cheese, but that failed field equation is still the number one idol. Gravity Probe B for example, wasted millions on trying to prove it, and found nothing as described in paper 117 of this series (www.aias.us). In the meantime ECE theory has described everything that the incorrect field equation of Einstein fails to describe. Many questions beg to be answered. Why do purportedly intellectual journals publish articles on an incorrect commutator symmetry? Why are new thinkers described as lunatics by the editors of these journals, editors who do not read articles, and send them to referees who do not read articles? Why is the almost universal acceptance of ECE theory dismissed by bigots who are allowed to extract so much taxation from the long suffering public? Why is urgently needed research into new energy so neglected for a god particle that cannot exist in nature? Does animation of garbage have such power over the individual human mind?

These are questions about human nature itself, does it prefer extinction to thought?

In Section 2 the flaw in the so called “first Bianchi identity” is pinpointed as the

incorrect assumption of a symmetric connection, and the so called "second Bianchi identity" derived from the first. Both identities are corrected using the Riemannian torsion, and are correctly written out. In section 3 the Jacobi identity is applied to Riemannian geometry and it is shown that the Jacobi identity does not lead to "the second Bianchi identity" as claimed in the standard literature. In Section 4 the index contractions in "the second Bianchi identity" that lead to the Einstein tensor are shown to be incorrect, again because of the incorrect assumption of a symmetric connection. The Einstein tensor is in consequence meaningless, as are the Ricci tensor and scalar. Finally in Section 5 the geodesic theory used by Einstein to derive the Newtonian limit is shown to be incorrect in several ways. These sections sample some of the numerous sequential errors of using the Einstein field equation, errors which have multiplied over ninety years of use.

2. THE SO CALLED FIRST AND SECOND BIANCHI IDENTITIES

The first Bianchi identity of the obsolete standard model is, in shorthand notation {1-10}:

$$R \wedge \mathrm{q} = 0 \tag{1}$$

where R is the Cartan curvature form and q the Cartan tetrad form. In the standard notation of differential geometry {11} this is:

$$R^a_b \wedge q^b = 0 \tag{2}$$

In tensor notation it becomes:

$$R^a_{\mu\nu\rho} + R^a_{\rho\mu\nu} + R^a_{\nu\rho\mu} = 0 \tag{3}$$

using the definition {1-11} of the wedge product of a two-form (R^a_b) and a one-form (q^b) of differential geometry. The first Bianchi identity in its usual format is:

$$R^\kappa_{\mu\nu\rho} + R^\kappa_{\rho\mu\nu} + R^\kappa_{\nu\rho\mu} = 0 \tag{4}$$

Eq. (4) is not an identity at all because it incorrectly assumes a symmetric connection and so incorrectly assumes a zero torsion and non-zero curvature. The correct identity was first given by Cartan {1-11} and in shorthand notation is:

$$D \wedge T := 0 \tag{5}$$

where D ^ T denotes the covariant exterior derivative of the Cartan torsion form T. In tensor format Eq. (5) becomes:

$$D_\mu T^\kappa_{\nu\rho} + D_\rho T^\kappa_{\mu\nu} + D_\nu T^\kappa_{\rho\mu} := R^\kappa_{\mu\nu\rho} + R^\kappa_{\rho\mu\nu} + R^\kappa_{\nu\rho\mu} \neq 0 \tag{6}$$

As proven in paper 102 of this series, and in other papers (www.aias.us) Eq. (6) is a precisely correct identity, it is the cyclic sum on the right hand of Eq. (6) identically equal to the same cyclic sum of the definitions of each of the curvature tensors of the sum.

The Riemannian torsion in Eq. (6) is:

$$T^\lambda_{\mu\nu} = \Gamma^\lambda_{\mu\nu} - \Gamma^\lambda_{\nu\mu} \tag{7}$$

where $\Gamma^\lambda_{\mu\nu}$ is the connection of the Riemannian manifold. Eq. (6) follows from the fundamental commutator equation {1-11}:

$$\left[D_\mu , D_\nu\right] V^\rho = R^\rho_{\sigma\mu\nu} V^\sigma - T^\lambda_{\mu\nu} D_\lambda V^\rho \tag{8}$$

and Eq. (7) also follows from Eq. (8). Written out more fully, Eq. (8) is:

$$\left[D_\mu , D_\nu\right] V^\rho = - (\Gamma^\lambda_{\mu\nu} - \Gamma^\lambda_{\nu\mu}) D_\lambda V^\rho + R^\rho_{\sigma\mu\nu} V^\sigma \tag{9}$$

Therefore:

$$\left[D_\mu , D_\nu\right] V^\rho = - \Gamma^\lambda_{\mu\nu} D_\lambda V^\rho + \ldots \tag{10}$$

By definition:

$$\left[D_\mu , D_\nu\right] = - \left[D_\nu , D_\mu\right] \tag{11}$$

So from Eq. (10):

$$\Gamma^{\lambda}_{\mu\nu} = -\,\Gamma^{\lambda}_{\nu\mu} \tag{12}$$

The connection is ALWAYS antisymmetric in its lower two indices because these are always commutator indices, Q.E.D.

Note carefully that if

$$\mu = \nu$$

then the following result is ALWAYS true:

$$\left.\begin{aligned} \left[D_\mu\ ,\ D_\nu\right] &= 0\ , \\ \mu &= \nu \end{aligned}\right\} \tag{14}$$

and so the symmetric connection is always zero:

$$\Gamma^{\lambda}_{\mu\nu} = \Gamma^{\lambda}_{\nu\mu} = 0 \tag{15}$$

It follows from Eq. (8) that both the curvature and torsion tensors vanish when the connection is symmetric

$$R^{\rho}_{\sigma\mu\nu} = T^{\lambda}_{\mu\nu} = 0 \quad ,\ \mu = \nu \tag{16}$$

The reason is that the commutator becomes a null operator for all V^{ρ} when:

$$\mu = \nu \tag{17}$$

In this case, the defining equation (8) reduces to the trivial result:

$$0 = 0 \tag{18}$$

The error in the standard model is Eq. (15), and is catastrophic. It works its way through the entire subject, causing many sequential errors. Notably, the standard equation linking the connection to the symmetric metric $(g_{\mu\nu})$ is incorrect because it assumes Eq. (15) , thus:

$$\Gamma^{\sigma}_{\mu\nu} = ?\,\frac{1}{2}\,g^{\sigma\rho}\,(\partial_\mu\,g_{\nu\rho} + \partial_\nu\,g_{\rho\mu} - \partial_\rho\,g_{\mu\nu}) \tag{19}$$

The connection of the standard model has the incorrect symmetry:

$$\Gamma^{\lambda}_{\mu\nu} = ?\ \Gamma^{\lambda}_{\nu\mu} \neq ?\ 0 \tag{20}$$

The standard model uses

$$T^{\lambda}_{\mu\nu} = ?\ 0 \tag{21}$$

and at the same time:

$$R^{\rho}_{\sigma\mu\nu} \neq 0 \tag{22}$$

This is incorrect from Eq. (10). If the torsion is zero, so must be the curvature. Conversely if the curvature is non-zero, so must be the torsion. Both tensors must always be defined by the antisymmetric connection. The tensors can never be defined by a symmetric connection, because then they would both vanish.

The so called second Bianchi identity of the standard model is merely a consequence of the so called first Bianchi identity as shown as follows. So both equations are incorrect due to the use of a symmetric connection. The second Bianchi identity is the very basis of the Einstein field equation, so the latter is irretrievably erroneous, being based on an incorrect geometry. In shorthand notation the "second Bianchi identity" is:

$$D \wedge R = 0 \tag{23}$$

which in the notation of differential geometry is:

$$D \wedge R^{a}_{b} = 0 \tag{24}$$

In tensor notation the standard expression of Eq. (24) is {1-11}:

$$D_{\lambda}\ R^{\rho}_{\sigma\mu\nu} + D_{\sigma}\ R^{\lambda}_{\rho\mu\nu} + D_{\rho}\ R^{\lambda}_{\lambda\mu\nu} = 0 \tag{25}$$

To derive the "second Bianchi identity" from "the first Bianchi identity", express the latter as three equations:

$$R^{\kappa}_{\rho\mu\nu} + R^{\kappa}_{\nu\rho\mu} + R^{\kappa}_{\mu\nu\rho} = 0 \tag{26}$$

$$R^{\kappa}_{\rho\sigma\mu} + R^{\kappa}_{\mu\rho\sigma} + R^{\kappa}_{\sigma\mu\rho} = 0 \tag{27}$$

$$R^{\kappa}_{\rho\nu\sigma} + R^{\kappa}_{\sigma\rho\nu} + R^{\kappa}_{\nu\sigma\rho} = 0 \tag{28}$$

Operate on Eq. (26) with D_σ , on Eq. (27) with D_ν , and on Eq. (28) with D_μ :

$$D_\sigma\, R^{\kappa}_{\rho\mu\nu} + D_\sigma\, R^{\kappa}_{\nu\rho\mu} + D_\sigma\, R^{\kappa}_{\mu\nu\rho} = 0 \tag{29}$$

$$D_\nu\, R^{\kappa}_{\rho\sigma\mu} + D_\nu\, R^{\kappa}_{\mu\rho\sigma} + D_\nu\, R^{\kappa}_{\sigma\mu\rho} = 0 \tag{30}$$

$$D_\mu\, R^{\kappa}_{\rho\nu\sigma} + D_\mu\, R^{\kappa}_{\sigma\rho\nu} + D_\mu\, R^{\kappa}_{\nu\sigma\rho} = 0 \tag{31}$$

Now add Eq. (29) to (31) to give:

$$D_\sigma\, R^{\kappa}_{\rho\mu\nu} + D_\nu\, R^{\kappa}_{\rho\sigma\mu} + D_\mu\, R^{\kappa}_{\rho\sigma\nu}$$

$$+ D_\sigma\, (R^{\kappa}_{\mu\nu\rho} + R^{\kappa}_{\nu\rho\mu}) + D_\nu\, (R^{\kappa}_{\mu\rho\sigma} + R^{\kappa}_{\sigma\mu\rho}) + D_\mu\, (R^{\kappa}_{\sigma\rho\nu} + R^{\kappa}_{\nu\sigma\rho}) = 0 \tag{32}$$

Finally add the following term:

$$D_\sigma\, R^{\kappa}_{\rho\mu\nu} + D_\nu\, R^{\kappa}_{\rho\sigma\mu} + D_\mu\, R^{\kappa}_{\rho\sigma\nu}$$

to both sides of Eq. (32) to find that:

$$D_\sigma\, R^{\kappa}_{\rho\mu\nu} + D_\nu\, R^{\kappa}_{\rho\sigma\mu} + D_\mu\, R^{\kappa}_{\rho\sigma\nu} = 0 \tag{33}$$

Q.E.D.

Eq. (33) was actually given by Ricci, who named it “the second Bianchi identity” after his colleague Bianchi. The correct “first Bianchi identity” was first given by Cartan in the early twenties of the last century and is:

$$D_\mu\, T^{a}_{\nu\rho} + D_\rho\, T^{a}_{\mu\nu} + D_\nu\, T^{a}_{\rho\mu} := R^{a}_{\mu\nu\rho} + R^{a}_{\rho\mu\nu} + R^{a}_{\nu\rho\mu} \tag{34}$$

so the correct version of Eq. (33) is:

$$D_\sigma\, R^{a}_{\rho\mu\nu} + D_\nu\, R^{a}_{\rho\sigma\mu} + D_\mu\, R^{a}_{\rho\sigma\nu} := D_\sigma D_\rho\, T^{a}_{\mu\nu} + D_\nu D_\rho\, T^{a}_{\sigma\mu} + D_\mu D_\rho\, T^{a}_{\nu\sigma} \neq 0 \tag{35}$$

in which:

$$\Gamma^{\lambda}_{\mu\nu} = -\,\Gamma^{\lambda}_{\nu\mu} \tag{36}$$

To prove Eq. (35) is straightforward as follows. Write Eq. (34) as:

$$S^a_{\mu\nu\rho} + S^a_{\rho\mu\nu} + S^a_{\nu\rho\mu} := 0 \tag{37}$$

where:

$$S^a_{\mu\nu\rho} = R^a_{\mu\nu\rho} - D_\mu T^a_{\nu\rho} \tag{38}$$

Thus:

$$D_\sigma (S^a_{\mu\nu\rho} + S^a_{\rho\mu\nu} + S^a_{\nu\rho\mu}) = 0 \tag{39}$$

$$D_\nu (S^a_{\rho\sigma\mu} + S^a_{\mu\rho\sigma} + S^a_{\sigma\mu\rho}) = 0 \tag{40}$$

$$D_\mu (S^a_{\rho\sigma\nu} + S^a_{\sigma\rho\nu} + S^a_{\nu\sigma\rho}) = 0 \tag{41}$$

Add Eq. (39) to (41):

$$D_\sigma S^a_{\rho\mu\nu} + D_\nu S^a_{\rho\sigma\mu} + D_\mu S^a_{\rho\sigma\nu} +$$

$$+ D_\sigma (S^a_{\mu\nu\rho} + S^a_{\nu\rho\mu}) + D_\nu (S^a_{\mu\rho\sigma} + S^a_{\sigma\mu\rho}) + D_\mu (S^a_{\sigma\rho\nu} + S^a_{\nu\sigma\rho}) = 0 \tag{42}$$

Add to both sides of Eq. (42) the term:

$$D_\sigma S^a_{\rho\mu\nu} + D_\nu S^a_{\rho\sigma\mu} + D_\mu S^a_{\rho\sigma\nu}$$

to obtain:

$$2 (D_\sigma S^a_{\rho\mu\nu} + D_\nu S^a_{\rho\sigma\mu} + D_\mu S^a_{\rho\sigma\nu})$$

$$+ D_\sigma (S^a_{\mu\nu\rho} + S^a_{\nu\rho\mu} + S^a_{\rho\mu\nu}) + D_\nu (S^a_{\mu\rho\sigma} + S^a_{\sigma\mu\rho} + S^a_{\rho\sigma\mu}) +$$

$$D_\mu (S^a_{\sigma\rho\nu} + S^a_{\nu\sigma\rho} + S^a_{\rho\nu\sigma}) = D_\sigma S^a_{\rho\mu\nu} + D_\nu S^a_{\rho\sigma\mu} + D_\mu S^a_{\rho\sigma\nu} \tag{43}$$

Finally use Eqs. (39) to (41) in Eq. (43) to find that:

$$D_\sigma S^a_{\rho\mu\nu} + D_\nu S^a_{\rho\sigma\mu} + D_\mu S^a_{\rho\sigma\nu} = 0 \tag{44}$$

which is Eq. (35), Q.E.D..

In differential form notation Eq. (35) is:

$$D \wedge (D_\rho T^a) := D \wedge R^a_\rho \tag{45}$$

The ρ index is always the same on both sides so may be omitted and its presence understood. This is the usual procedure in differential geometry {1-11}. So the incorrect Eq. (24) is corrected to :

$$D \wedge (D\,T^{a}) := D \wedge R^{a} \tag{46}$$

$$\neq 0$$

and this equation also simplifies the procedure first given in paper 88 (www.aias.us).

3 THE JACOBI IDENTITY APPLIED CORRECTLY TO RIEMANN GEOMETRY

Another fundamental error of the obsolete Einsteinian cosmology is the claim {11} that the Jacobi identity gives the "second Bianchi identity". It is shown as follows that it does not. The Jacobi identity is:

$$\left[\left[A\,,B\right],C\right] + \left[\left[C\,,A\right],B\right] + \left[\left[B\,,C\right],A\right] := 0 \tag{47}$$

where:

$$\left[A\,,B\right] = -\left[B\,,A\right] = A\,B - B\,A \tag{48}$$

Eq. (47) is proven as follows:

$$\left[(AB - BA),\,C\right] + \left[(CA - AC)\,,B\right] + \left[(BC - CB)\,,\,A\right]$$

$$= (AB - BA)\,C - C(AB - BA) + (CA - AC)\,B - B\,(CA - AC) +$$

$$(BC - CB)\,A - A(BC - CB) := 0 \tag{49}$$

Q.E.D.

Applying the Jacobi identity to the covariant derivatives of Riemann geometry, we obtain equations such as:

$$\left(\left[D_{\rho}\,,\left[D_{\mu},D_{\nu}\right]\right] + \left[D_{\nu},\left[D_{\rho},D_{\mu}\right]\right] + \left[D_{\mu}\,,\left[D_{\nu}\,,D_{\rho}\right]\right]\right) V^{\sigma} := 0 \tag{50}$$

Working out the algebra of Eq. (50), following papers such as 99 of this series (www.aias.us):

$$\left[D_\rho\ ,\ \left[D_\mu, D_\nu\right]\right] V^\sigma = D_\rho\ (R^\sigma_{\alpha\mu\nu}\ V^\alpha\ -\ T^\lambda_{\mu\nu} D_\lambda\ V^\sigma\ ) - \left[D_\mu\ , D_\nu\right]\ D_\rho\ V^\sigma\ :=\ 0 \tag{51}$$

$$\left[D_\nu\ ,\ \left[D_\rho, D_\mu\right]\right] V^\sigma = D_\nu\ (R^\sigma_{\alpha\rho\mu}\ V^\alpha\ -\ T^\lambda_{\rho\mu} D_\lambda\ V^\sigma\ ) - \left[D_\rho\ , D_\mu\right]\ D_\nu\ V^\sigma\ :=\ 0 \tag{52}$$

$$\left[D_\mu\ ,\ \left[D_\nu, D_\rho\right]\right] V^\sigma = D_\mu\ (R^\sigma_{\alpha\nu\rho}\ V^\alpha\ -\ T^\lambda_{\nu\rho} D_\lambda\ V^\sigma\ ) - \left[D_\nu\ , D_\rho\right]\ D_\mu\ V^\sigma\ :=\ 0 \tag{53}$$

Now use the rule for the commutator acting on the general tensor {1-11}:

$$\left[D_\rho, D_\sigma\right] X^{\mu 1\ \ldots \mu k}_{\nu 1\ \ldots \nu l} = R^{\mu 1}_{\lambda\rho\sigma}\ X^{\lambda \mu 2\ \ldots \mu k}_{\nu 1\ \ldots \nu l}$$

$$-\ R^\lambda_{\nu 1\rho\sigma}\ X^{\mu 1\ \ldots \mu k}_{\lambda \nu 2\ \ldots \nu l} - \ldots -\ T^\lambda_{\rho\sigma}\ D_\lambda X^{\mu 1\ \ldots \mu k}_{\nu 1\ \ldots \nu l} \tag{54}$$

In Eqs. (51) to (53) the quantities $D_\rho\ V^\sigma$, $D_\nu\ V^\sigma$ and $D_\mu\ V^\sigma$, acted upon by the commutators, are second rank tensors. Thus, from Eq. (54):

$$\left[D_\mu, D_\nu\right]\ D_\rho\ V^\sigma\ =\ R^\sigma_{\lambda\mu\nu}\ D_\rho\ V^\sigma - R^\lambda_{\rho\mu\nu}\ D_\lambda\ V^\sigma\ -\ T^\lambda_{\mu\nu}\ D_\lambda\ V^\sigma \tag{55}$$

$$\left[D_\rho, D_\mu\right]\ D_\nu\ V^\sigma\ =\ R^\sigma_{\lambda\rho\mu}\ D_\nu\ V^\sigma - R^\lambda_{\nu\rho\mu}\ D_\lambda\ V^\sigma\ -\ T^\lambda_{\rho\mu}\ D_\lambda\ V^\sigma \tag{56}$$

$$\left[D_\nu, D_\rho\right]\ D_\mu\ V^\sigma\ =\ R^\sigma_{\lambda\nu\rho}\ D_\mu\ V^\sigma - R^\lambda_{\mu\nu\rho}\ D_\lambda\ V^\sigma\ -\ T^\lambda_{\nu\rho}\ D_\lambda\ V^\sigma \tag{57}$$

So Eq. (50) is:

$$(\ D_\rho R^\sigma_{\alpha\mu\nu} +\ D_\nu R^\sigma_{\alpha\rho\mu} +\ D_\mu R^\sigma_{\alpha\nu\rho})\ V^\alpha + (T^\lambda_{\mu\nu} + T^\lambda_{\rho\mu} + T^\lambda_{\nu\rho})\ D_\lambda V^\sigma$$

$$-\ (R^\sigma_{\lambda\mu\nu} D_\rho\ V^\sigma + R^\sigma_{\lambda\rho\mu} D_\nu\ V^\sigma + R^\sigma_{\lambda\nu\rho} D_\mu\ V^\sigma\ )\ :=\ 0 \tag{58}$$

where we have used the Cartan identity:

$$D_\rho T^\lambda_{\mu\nu} + D_\nu T^\lambda_{\rho\mu} + D_\mu T^\lambda_{\nu\rho}\ :=\ R^\lambda_{\rho\mu\nu} +\ R^\lambda_{\nu\rho\mu} + R^\lambda_{\mu\nu\rho} \tag{59}$$

It is seen that Eq. (58) does NOT give the "second Bianchi identity", contrary to what is claimed {11} in the standard literature.

4. MEANINGLESSNESS OF THE EINSTEIN TENSOR

The Einstein tensor is defined in the obsolete literature as:

$$G_{\mu\nu} := R_{\mu\nu} - \frac{1}{2} R\, g_{\mu\nu} \tag{60}$$

where $R_{\mu\nu}$ is the symmetric Ricci tensor, R the Ricci scalar and $g_{\mu\nu}$ the symmetric metric. The Einstein tensor is obtained from the incorrect "second Bianchi identity" so the Einstein tensor is also incorrect at the outset. The Einstein field equation has no meaning. The obsolete procedure adapted to contract Eq. (25) to Eq. (60) is as follows. First contract Eq. (25) with inverse metric tensors:

$$g^{\nu\sigma}\, g^{\mu\lambda}\, (D_\lambda R_{\rho\sigma\mu\nu} + D_\rho R_{\sigma\lambda\mu\nu} + D_\sigma R_{\lambda\rho\mu\nu}) = ?\ 0 \tag{61}$$

By metric compatibility:

$$g^{\mu\lambda} D_\lambda\, (g^{\nu\sigma} R_{\rho\sigma\mu\nu}) + D_\rho (g^{\nu\sigma} g^{\mu\lambda} R_{\sigma\lambda\mu\nu}) + g^{\nu\sigma} D_\sigma (g^{\mu\lambda} R_{\lambda\rho\mu\nu}) = ?\ 0 \tag{62}$$

The inverse metric tensor is taken as symmetric:

$$g^{\mu\lambda} = g^{\lambda\mu} \tag{63}$$

It is assumed incorrectly that the connection is symmetric:

$$\Gamma^{\lambda}_{\mu\nu} = ?\ \ \Gamma^{\lambda}_{\nu\mu} \quad \neq ?\ 0 \tag{64}$$

On the basis of the error (64) the following sequential errors are made:

$$R_{\rho\sigma\nu\mu} = ?\ \ - R_{\sigma\rho\nu\mu} \tag{65}$$

and

$$R_{\mu\nu\rho\sigma} = ?\ \ - R_{\rho\sigma\mu\nu} \tag{66}$$

These are incorrect symmetries. The only correct symmetry is:

$$R_{\rho\sigma\mu\nu} = - R_{\rho\sigma\nu\mu} \tag{67}$$

Further sequential errors now appear as follows. The incorrect symmetry (66) is used to define the Ricci tensor:

$$R_{\mu\rho} = ?\ R_{\rho\mu} = g^{\nu\sigma}R_{\mu\nu\rho\sigma} = g^{\sigma\nu}R_{\mu\sigma\rho\nu} \tag{68}$$

and the concept of Ricci tensor is therefore in itself incorrect. Finally the following sequential error is made:

$$g^{\nu\sigma}\ g^{\mu\lambda}R_{\sigma\lambda\mu\nu} = ? - g^{\nu\sigma}\ g^{\mu\lambda}R_{\lambda\sigma\mu\nu} \tag{69}$$

and used to incorrectly define the concept of Ricci scalar:

$$R = ?\ g^{\mu\lambda}R_{\lambda\mu} = g^{\nu\sigma}g^{\mu\lambda}R_{\lambda\sigma\mu\nu} \tag{70}$$

The Ricci scalar is also meaningless. Using these errors Eq. (25) becomes:

$$D^{\mu}\ R_{\rho\mu} - D_{\rho}R + D^{\nu}\ R_{\rho\mu} = ?\ 0 \tag{71}$$

and Eq. (71) written as the incorrect:

$$D^{\mu}\ G_{\mu\nu} = ?\ 0 \tag{72}$$

Einstein compounded these errors (made by his contemporary mathematicians) with the claim that:

$$D^{\mu}\ G_{\mu\nu} = \mathrm{k}\ D^{\mu}T_{\mu\nu} \tag{73}$$

where

$$T_{\mu\nu} = T_{\nu\mu} \tag{74}$$

is the canonical energy momentum tensor of Noether. It was finally claimed that Eq. (73) can be integrated as follows:

$$G_{\mu\nu} = \mathrm{k}\ T_{\mu\nu} \tag{75}$$

This is the Einstein field equation and is therefore meaningless in physics.

5. ERRORS IN THE GEODESIC METHOD USED BY EINSTEIN

The theory of parallel transport {1-11} depends on the connection and different connections will give different answers. The parallel transport equation used by Einstein is true if and only if the connection is symmetric:

$$\frac{dV^{\mu}}{d\lambda} + \Gamma^{\mu}_{\sigma\rho} \frac{dx^{\sigma}}{d\lambda} V^{\rho} = 0 \qquad (76)$$

However, the connection is now known to be antisymmetric, so Eq. (76) fails at the outset. Eq. (76) is derived from the parallel transport of the tangent vector to a path x^{μ} (λ). The tangent vector is defined as:

$$T^{\mu} := \frac{dx^{\mu}}{d\lambda} \qquad (77)$$

and the parallel transport is denoted:

$$\frac{D}{d\lambda}\left(\frac{dx^{\mu}}{d\lambda}\right) = 0 \qquad (78)$$

When the correct antisymmetric connection is used a different method must be employed, based {11} on the definition of a time-like path. The proper time is:

$$\tau = \int \left(- g_{\mu\nu} \frac{dx^{\mu}}{d\lambda} \frac{dx^{\nu}}{d\lambda}\right)^{1/2} d\lambda \qquad (79)$$

and the calculus of variations gives {11}:

$$\frac{d^2x^{\rho}}{d\tau^2} + \frac{1}{2} g^{\rho\sigma}(\partial_{\mu} g_{\nu\sigma} + \partial_{\nu} g_{\sigma\mu} - \partial_{\sigma} g_{\mu\nu}) \frac{dx^{\mu}}{d\tau} \frac{dx^{\nu}}{d\tau} = 0 \qquad (80)$$

This is the correct geodesic equation for the correct antisymmetric connection.

The error made by Einstein and his contemporary mathematicians was to assume that:

$$\Gamma^{\sigma}_{\mu\nu} = ? \frac{1}{2} g^{\rho\sigma}(\partial_{\mu} g_{\nu\sigma} + \partial_{\nu} g_{\sigma\mu} - \partial_{\sigma} g_{\mu\nu}) \qquad (81)$$

so that Eqs. (76) and (80) are the same. Eq. (81) again depends on the assumption of a symmetric connection as shown as follows. Assume metric compatibility:

$$D_\rho g_{\mu\nu} = 0 \tag{82}$$

From Eq. (82):

$$D_\rho g_{\mu\nu} = \partial_\rho g_{\mu\nu} - \Gamma^\lambda_{\rho\mu} g_{\lambda\nu} - \Gamma^\lambda_{\rho\nu} g_{\mu\lambda} = 0 \tag{83}$$

$$D_\mu g_{\nu\rho} = \partial_\mu g_{\nu\rho} - \Gamma^\lambda_{\mu\nu} g_{\lambda\rho} - \Gamma^\lambda_{\mu\rho} g_{\nu\lambda} = 0 \tag{84}$$

$$D_\nu g_{\rho\mu} = \partial_\nu g_{\rho\mu} - \Gamma^\lambda_{\nu\rho} g_{\lambda\mu} - \Gamma^\lambda_{\nu\mu} g_{\rho\lambda} = 0 \tag{85}$$

Subtract Eqs. (84) and (85) from Eq. (83)

$$\partial_\rho g_{\mu\nu} - \partial_\mu g_{\nu\rho} - \partial_\nu g_{\rho\mu} - \Gamma^\lambda_{\rho\mu} g_{\lambda\nu} - \Gamma^\lambda_{\rho\nu} g_{\mu\lambda} + \Gamma^\lambda_{\mu\nu} g_{\lambda\rho} + \Gamma^\lambda_{\mu\rho} g_{\lambda\nu} + \Gamma^\lambda_{\nu\rho} g_{\lambda\mu} + \Gamma^\lambda_{\nu\mu} g_{\rho\lambda} = 0 \tag{86}$$

In the obsolete physics it was assumed incorrectly that:

$$\Gamma^\lambda_{\mu\rho} = ?\ \Gamma^\lambda_{\rho\mu} \tag{87}$$

$$\Gamma^\lambda_{\rho\nu} = ?\ \Gamma^\lambda_{\nu\rho} \tag{88}$$

The metric is symmetric, so it was assumed incorrectly that:

$$\Gamma^\lambda_{\rho\mu} g_{\lambda\nu} = ?\ \Gamma^\lambda_{\mu\rho} g_{\nu\lambda} \tag{89}$$

and

$$\Gamma^\lambda_{\rho\nu} g_{\mu\lambda} = ?\ \Gamma^\lambda_{\nu\rho} g_{\lambda\nu} \tag{90}$$

so that Eq. (86) reduces to:

$$\partial_\rho g_{\mu\nu} - \partial_\mu g_{\nu\rho} - \partial_\nu g_{\rho\mu} + \Gamma^\lambda_{\mu\nu} g_{\lambda\rho} + \Gamma^\lambda_{\nu\mu} g_{\rho\lambda} = 0 \tag{91}$$

Finally it was assumed incorrectly that

$$\Gamma^\lambda_{\mu\nu} = ?\ \Gamma^\lambda_{\nu\mu} \tag{92}$$

so the incorrect result was obtained that:

$$\Gamma^\sigma_{\mu\nu} = ?\ \frac{1}{2}\, g^{\sigma\rho}(\partial_\mu\, g_{\nu\rho} + \partial_\nu\, g_{\rho\mu} - \partial_\rho\, g_{\mu\nu}) \tag{93}$$

This incorrect formula is found in all the textbooks of the past ninety years. With these few examples it has been shown that the standard cosmology is riddled with errors, errors which

are cured by ECE cosmology {1-10}.

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