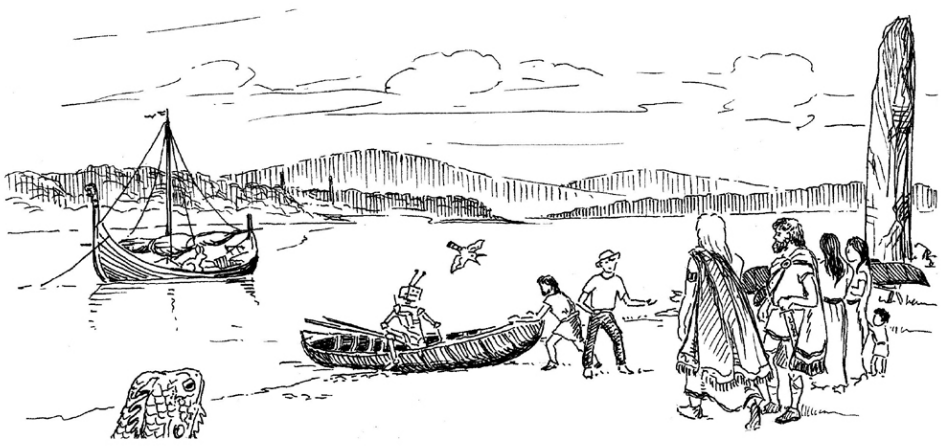
The World of
T.C. Lethbridge

a researcher's guide by
William Shepherd
APPENDIX



THE LETHBRIDGE FILES

'What is magic today will be science tomorrow' (T.C. Lethbridge)

APPENDIX

Appendix A. Brave New Universe by Brian Greene
© Brian R. Greene 2004 [88]

In 1919, Einstein received a paper that could easily have been dismissed as the ravings of a crank. It was written by a little-known German mathematician named Theodor Kaluza, and in a few brief pages it laid out an approach for unifying the two forces known at the time, gravity and electromagnetism.

To achieve this goal, Kaluza proposed a radical departure from something so basic, so completely taken for granted, that it seemed beyond questioning. He proposed that the universe does not have three space dimensions. Instead, Kaluza asked Einstein and the rest of the physics community to entertain the possibility that the universe has *four* space dimensions so that, together with time, it has a total of five space-time dimensions.

Kaluza proposed that in addition to left/right, back/forth, and up/down, the universe actually has one more spatial dimension that, for some reason, no one has ever seen. If correct, this would mean that there is another independent direction in which things can move, and therefore that we need to give four pieces of information to specify a precise location in space, and a total of five pieces of information if we also specify a time.

Kaluza realized that the equations of Einstein's general theory of relativity could fairly easily be extended mathematically to a universe that had one more space dimension. Kaluza undertook this extension and found, naturally enough, that the higher-dimensional version of general relativity not only included Einstein's original gravity equation but, because of the extra space dimension, also had extra equations.

When Kaluza studied these extra equations, he discovered something extraordinary: the extra equations were none other than the equations Maxwell had discovered in the nineteenth century for describing the electromagnetic field! By imagining a universe with one new space dimension, Kaluza had proposed a solution to what Einstein viewed as one of the most important problems in all physics. Kaluza had found a framework that combined Einstein's original equations of general relativity with those of Maxwell's equations of electromagnetism.

Then, in 1926, the Swedish physicist Oskar Klein injected a new twist into Kaluza's idea, one that suggested where the extra dimension might be hiding. Klein's contribution was to suggest that what's true for an object *within* the universe might be true for the fabric of the universe itself. Namely, just as the tightrope's surface has both large and small dimensions, so does the fabric of space.

Maybe the three dimensions we all know about - left/right, back/forth, and up/down - are like the horizontal extent of the tightrope, dimensions of the big, easy-to-see variety. But just as the surface of the tightrope has an additional, small, curled-up, circular dimension, maybe the fabric of space also has a small, curled-up, circular dimension, one so small that no one has powerful enough magnifying equipment to reveal its existence. Because of its tiny size, Klein argued, the dimension would be hidden.

With this modification to Kaluza's original idea, Klein provided an answer to how the universe might have more than the three dimensions of common experience that could remain hidden, a framework that has since become known as *Kaluza-Klein theory*. And since an extra dimension of space was all Kaluza needed to merge general relativity and electromagnetism, *Kaluza-Klein theory* would seem to be just what Einstein was looking for.

Indeed Einstein and many others became quite excited about unification through a new, hidden space dimension, and a vigorous effort was launched to see whether this approach would work in complete detail. Einstein continued to dabble in the *Kaluza-Klein theory* until at least the early 1940s. But the theory encountered difficulties in trying to describe the microworld, and in particular the incorporation of the electron into the extra-dimensional picture.

There was another reason scientists were hesitant about the approach. Many found it both arbitrary and extravagant to postulate a hidden spatial dimension. If you asked Kaluza and Klein *why* the universe had five spacetime dimensions rather than four, or six, or seven, or 7,000 for that matter, they wouldn't have had an answer much more convincing than "Why not?"

More than three decades later, the situation changed radically with the advent of string theory,[89] the first approach to merge general relativity and quantum mechanics, with the potential to unify our understanding of all forces and all matter. But the quantum mechanical equations of string theory don't work in four spacetime dimensions, nor in five, six or seven, or 7000. Instead, the equations of string theory work only in ten spacetime dimensions - nine of space, plus time. String theory *demands* more dimensions.

[88] Source: Chapters 12 & 13 in *The Fabric of the Cosmos* by Brian Greene. The published text, from page 360 to 400 in the Penguin 2007 edition, has been compressed by four-fifths to give a flavour of how our everyday 'three space and one time dimension' reality is being extended at the leading edge of theoretical physics as new facts about this reality emerge. [Ed]

[89] A *string* is a one-dimensional vibrating filament of energy, superseding atoms and particles as the smallest unit from which protons, quarks etc. are constituted. Superstring theory incorporates these vibrating strings as one dimensional loops (closed strings) or snippets (open strings) to unite general relativity, quantum mechanics and supersymmetry. [Ed]

Prior to string theory, no theory said anything at all about the number of spatial dimensions in the universe. Every theory from Newton to Maxwell to Einstein assumed that the universe had three space dimensions, much as we all assume the sun will rise tomorrow. Kaluza and Klein proffered a challenge by suggesting that there were four space dimensions, but this amounted to yet another assumption - a different assumption, but an assumption nonetheless.

Now, for the first time, string theory provided equations that *predicted* the number of space dimensions. A calculation - not an assumption, not a hypothesis, not an inspired guess - determines the number of space dimensions according to string theory, and the surprising thing is that the calculated number is not three but nine. String theory leads us, inevitably, to a universe with six extra space dimensions and hence provides a compelling, ready-made context for invoking the ideas of Kaluza and Klein. Their original proposal assumed only one hidden dimension, but it's easily generalized to two, three, or even six extra dimensions required by string theory.

However, there's an awkward detail regarding string theory. Over the last three decades, not one but *five* distinct versions of string theory have been developed. While their names are not of the essence, they are called *Type 1, Type IIA, Type IIB, Heterotic-O*, and *Heterotic-E*, and they all share the same essential features; the basic ingredients are strands of vibrating energy - and as calculations in the 1970s and 1980s revealed, each theory requires six extra space dimensions; but when they are analyzed in detail, significant differences appear.

During the late 1980s and early 1990s, with many physicists hotly pursuing an understanding of one or another of the string theories, the enigma of the five versions was not a problem researchers typically dealt with on a day-to-day basis. Instead, it was one of those quiet questions that everyone assumed would be addressed in the distant future, when the understanding of each individual string theory had become significantly more refined.

But in the summer of 1995, with little warning, these modest hopes were wildly exceeded when Edward Witten - who for two decades has been the world's most renowned string theorist - uncovered a hidden unity that tied all five string theories together. Witten showed that rather than being distinct, the five theories are actually just five different ways of mathematically analyzing a *single* theory. The unifying master theory has tentatively been called *M-theory*.

Witten's work revealed that the approximate string theory equations, used in the 1970s and 1980s to conclude that the universe must have nine space dimensions, missed the true number by one. The exact answer, his analysis showed, is that the universe according to *M-theory* has ten space dimensions, that is eleven spacetime dimensions.[90]

Much as Kaluza found that a universe with five spacetime dimensions provided a framework for unifying electromagnetism and gravity, and much as string theorists found that a universe with ten spacetime dimensions provided a framework for unifying quantum mechanics and general relativity, Witten found that a universe with eleven spacetime dimensions provided a framework for unifying all string theories.

Following Witten's paper, the avalanche of subsequent results led to the realization that string theory, and the M-theoretic framework to which it now belongs, contains ingredients besides strings. The analyses showed that there are two-dimensional objects called, naturally enough, *membranes* or - in deference to systematically naming their higher-dimensional cousins - *two-branes*.

There are objects with three spatial dimensions called *three-branes*. And, although increasingly difficult to visualize, the analyses showed that there are also objects with *p* spatial dimensions, where *p* can be any whole number less than 10, known - with no derogation intended - as *p-branes*. Thus strings are but one ingredient in string theory, not the ingredient.

This raises an intriguing possibility. Might we, right now, be living within a three-brane? Like Snow White, whose world exists within a two-dimensional movie screen - a two-brane - that itself resides within a higher-dimensional universe (the three space dimensions of the movie theatre), might everything we know exist within a three-dimensional screen - a three-brane - that itself resides within the higher-dimensional universe of string/M-theory?

Could it be that what Newton, Leibniz, Mach, and Einstein called three-dimensional space is actually a particular three-dimensional entity in string/M-theory? Or, in a more relativistic language, could it be that the four-dimensional spacetime developed by Minkowski and Einstein is actually the wake of a three-brane as it evolves through time? In short might the universe as we know it be a brane? The possibility that we are living within a three-brane - the so-called *braneworld scenario* - is the latest twist in string/M-theory's story.

If we are living within a three-brane - if our four-dimensional spacetime is nothing but the history swept out by a three-brane through time - then the venerable question of whether spacetime is a something would be cast in a

[90] Lethbridge was very specific that *'length'* has a rate of 13⅓-inches and *'thickness'* a rate of 26⅔. A further 13⅓ would give a rate of 40-inches. Might this be the third space dimension? Lethbridge would have been aware of the significance of this possibility (hence the precision of the thirds), but I am not aware of any mention of this in his published books. Three whorls would be required to give the nine space dimensions of string theory, while a fourth would be needed to accommodate the needs of string/M-theory's ten space dimensions. Perhaps somebody in London's Docklands might care to experiment with left/right, back/forth and in/out in one of the atriums in the *City of London's Financial District*? [Ed]

brilliant new light. Familiar four-dimensional spacetime would arise from a real physical entity in string/M-theory, a three-brane, not from some vague or abstract idea.

In this approach, the reality of our four-dimensional spacetime would be on a par with the reality of an electron or a quark.[91] But if the universe we're aware of really is a three-bane, wouldn't even a casual glance reveal that we are immersed within something - within the three-brane interior?

Well, we've already learned of things within which modern physics suggest we may be immersed - a Higgs ocean; space filled with dark energy; myriad quantum field fluctuations - none of which make themselves directly apparent to unaided perceptions. So it shouldn't be a shock to learn that string/M-theory adds another candidate to the list of invisible things that may fill 'empty' space. But let's not get cavalier.

For each of the previous possibilities, we understand its impact on physics and how we might establish that it truly exists. Indeed, for two of the three - dark energy and quantum fluctuations - we've seen that strong evidence supporting their existence has already been gathered; and evidence for the Higgs field is being sought at current and future accelerators. So what is the corresponding situation for life within a three-brane? If the brane-world scenario is correct, why don't we see the three-brane, and how would we establish that it exists?

The answer highlights how the physical implications of string/M-theory in the braneworld context differ radically from the earlier 'branefree' (or, as they're sometimes affectionately called 'no-braner') scenarios. Consider, as an important example, the motion of light - the motion of photons. In string theory, a photon is a particular string vibrational pattern. More specifically, mathematical studies have shown that in the braneworld scenario, only open string vibrations, not closed ones, produce photons, and this makes a big difference.

Open string end-points are constrained to move within the three-brane, but are otherwise completely free. This implies that photons (open strings executing the photon mode of vibration) would travel without any constraint or obstruction throughout our three-brane. And that would make the brane appear completely transparent - *completely invisible* - thus preventing us from seeing that we are immersed within it.

That's an intense realization with important consequences. Earlier, we required the extra dimensions of string/M-theory to be tightly curled up. The reason, clearly, is that we don't see the extra dimensions and so they must be hidden away. And one way to hide them is to make them smaller than we or our equipment can detect.

But let's now examine the issue in the braneworld scenario. How do we detect things? Well, when we use our eyes, we use the electromagnetic force; when we use powerful instruments like electron microscopes, we also use the electromagnetic force; when we use atom smashers, one of the forces we use to probe the ultrasmall is, once again, the electromagnetic force.

But if the electromagnetic force is confined to our three-brane, our three space dimensions, it is *unable* to probe the extra dimensions, regardless of their size. Photons cannot escape our dimensions, enter the extra dimensions, and then travel back to our eyes or equipment allowing us to detect the extra dimensions, *even if they were as large as the familiar space dimensions*.

So, if we live in a three-bane, there is an alternative explanation for why we're not aware of the extra dimensions. It is not necessarily that the extra dimensions are extremely small. They could be big. We don't see them because of the *way* we see. We see by using the electromagnetic force, which is unable to access any dimensions beyond the three we know about. Like an ant walking along a lily pad, completely unaware of the deep waters lying just beneath the visible surface, we could be floating within a grand, expansive, higher-dimensional space, but the electromagnetic force - eternally trapped within our dimensions - would be unable to reveal this.

Okay, you might say. But the electromagnetic force is only one of nature's four forces. What about the other three? Can they probe into the extra dimensions, thus enabling us to reveal their existence? For the strong and the weak nuclear forces, the answer is, again, no. In the braneworld scenario, calculations show that the messenger particles for these forces - gluons and W and Z particles - also arise from open-string vibrational patterns, so they are just as trapped as photons, and processes involving the strong and weak nuclear forces are just as blind to the extra dimensions.

The same goes for particles of matter. Electrons, quarks, and all the other particle species also arise from the vibrations of open strings with trapped endpoints. Thus, in the braneworld scenario, you and I and everything we've ever seen are permanently imprisoned within our three-brane. Taking account of time, everything is trapped within our four-dimensional slice of spacetime.

Well, almost everything. For the force of gravity, the situation is different. Mathematical analyses of the braneworld scenario have shown that gravitons arise from the vibrational pattern of closed strings, much as they do in the

[91] You could still ask whether the larger spacetime within which strings and branes exist - the eleven dimensions of string/M-theory - is itself an entity; the reality of the spacetime arena we directly experience, though, would be rendered obvious.

previously discussed no-braner scenario. And closed strings - strings with no endpoints - are not trapped by branes. They are as free to leave a brane as they are to roam on through it.

So, if we were living in a brane, we would not be completely cut off from the extra dimensions. Through the gravitational force, we could both influence and be influenced by the extra dimensions. Gravity, in such a scenario, would provide our sole means for interacting beyond our three space dimensions.

How big could the extra dimensions be before we'd become aware of them through the gravitational force? Hundreds of years of experiments have confirmed that gravity varies inversely with the square of distance, giving strong evidence that there are three space dimensions. But as of 1998, no experiment had ever probed gravity's strength on separations smaller than a millimetre.

This led to the proposal that in the braneworld scenario extra dimensions could be as large as a millimetre and would still have been undetected. This radical suggestion inspired a number of experimental groups to initiate a study of gravity at submillimeter distance in hopes of finding violations of the inverse square law; so far, none have been found, down to a tenth of a millimetre. Thus, even with today's state-or-the-art gravity experiments, if we are living within a three-brane, the extra dimensions could be as large as a tenth of a millimetre, and yet we wouldn't know it.

This is one of the most striking realizations of the last decade. Using the three nongravitational forces, we can probe down to about a billionth of a billionth (10^{-18}) of a metre, and no one has found any evidence of extra dimensions. [92]

But in the braneworld scenario, the nongravitational forces are impotent in searching for extra dimensions since they are trapped on the brane itself. Only gravity can give insight into the nature of the extra dimensions, and, as of today, the extra dimensions could be as thick as a human hair and yet they'd be completely invisible to our most sophisticated instruments.

Right now, right next to you, right next to me, and right next to everyone else, there could be another spatial dimension - a dimension beyond left/right, back/forth, and up/down, a dimension that's curled up but still large enough to swallow something as thick as this page - that remains beyond our grasp.[93]

Over the last century, [94] we've become intimately acquainted with some previously hidden features of space and time through Einstein's two theories of relativity and through quantum mechanics. The slowing of time, the relativity of simultaneity, alternative slicings of spacetime, gravity as the warping and curving of space and time, the probabilistic nature of reality, and long-range quantum entanglement were not on the list of things that even the best of the world's nineteenth century physicists would have expected to find just around the corner. And yet there they were, as attested to by both experimental results and theoretical explanations.

In our age, we've come upon our own panoply of unexpected ideas. Dark matter and dark energy that appear to be, far and away, the dominant constituents of the universe. Gravitational waves - ripples in the fabric of spacetime - which were predicted by Einstein's relativity and may one day allow us to peek further back in time than ever before. A Higgs ocean, which permeates all of space and which, if confirmed, will help us to understand how particles acquire mass. Inflationary expansion, which may explain the shape of the cosmos, resolve the puzzle of why it's so uniform on large scales, and set the direction to time's arrow.

String theory, which posits loops and snippets of energy in place of point particles and promises a bold version of Einstein's dream in which all particles and all forces are combined into a single theory. Extra space dimensions emerging from the mathematics of string theory, and possibly detectable in accelerator experiments during the next decade. A braneworld, in which our three space dimensions may be but one universe among many, floating in a higher-dimensional spacetime. And perhaps even emergent spacetime, in which the very fabric of space and time is composed of more fundamental spaceless and timeless entities.

During the next decade, even more powerful accelerators will provide much needed experimental input, and many physicists are confident that data gathered from the highly energetic collisions that are planned will confirm a number of these pivotal theoretical constructs. I share this enthusiasm and eagerly await the results.

Until our theories make contact with observable, testable phenomena, they remain in limbo - they remain promising collections of ideas that may or may not have relevance for the real world. The new accelerators will advance the overlap between theory and experiment substantially, and, we physicists hope, will usher many of these ideas into the realm of established science.

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[92] 'The strings (of string theory) are so small that a direct observation would be tantamount to reading the text on this page from a distance of 100 light years: it would require resolving power nearly a billion billion times finer than our current technology allows.' Brian Greene in *The Fabric of the Cosmos* (page 352). [Ed]

[93] There is even a suggestion that gravity itself can be trapped, not by a sticky brane, but by extra dimensions that curve in just the right way, relaxing even further the constraints on their size.

[94] The last five paragraphs have been taken from the final chapter of *The Fabric of the Cosmos* (page 492 in the Penguin 2007 edition). [Ed]

Appendix B. Science & Religion by Stephen Jay Gould

The magisterium of science covers the empirical realm: what is the universe made of (fact) and why does it work this way (theory). The magisterium of religion extends over questions of ultimate meaning and moral value. These two magisteria do not overlap. Nor do they encompass all inquiry (consider, for example, the magisterium of art and the meaning of beauty). To cite the old clichés, science gets the age of rocks, and religion the rock of ages; science studies how the heavens go, religion how to go to heaven.

I believe, with all my heart, in a respectful, even loving, concordat between the magisteria of science and religion. This is a principled position on moral and intellectual grounds, not a merely diplomatic solution. But it cuts both ways. If religion can no longer dictate the nature of factual conclusions residing properly within the magisterium of science, then scientists cannot claim higher insight into moral truth from any superior knowledge of the world's empirical constitution.

In advocating this argument over many years, I have found that skeptical friends and colleagues do not challenge the logic of the argument - which almost everyone accepts as both intellectually sound and eminently practical in our world of diverse passions - but rather question my claim that most religious and scientific leaders actually do advocate such precepts.

We all recognize, of course, that many folks and movements hold narrow and aggressive partisan positions, usually linked to an active political agenda, and based on exalting one side while bashing the other. Obviously, extremists of the so-called Christian right, particularly the small segment dedicated to imposing creationism on the science curricula of American public schools, represent the most visible subgroup of these partisans.

But I also include, among my own scientific colleagues, some militant atheists whose blinkered concept of religion grasps none of the subtlety or diversity, and equates this entire magisterium with the silly and superstitious beliefs of people who think they have seen a divinely crafted image of the Virgin in the drying patterns of morning dew on the plate-glass windows of some auto show-room in New Jersey.

I believe that we must pursue a primarily political struggle, not an intellectual discourse, with these people. With some exceptions, of course, people who have dedicated the bulk of their energy, and even their life's definition, to such aggressive advocacy at the extremes do not choose to engage in serious and respectful debate. All people committed to the defense of honorable differences will have to remain vigilant and prevail politically.

Even after we put the extremists aside, however, many people still suppose that major religious and scientific leaders must remain at odds (or at least must interact in considerable tension) because these two incompatible fields inevitably struggle for possession of the same ground.

If I can therefore show that the doctrine of *Non-Overlapping Magisteria* enjoys strong and fully explicit support, even from the primary cultural stereotypes of hard-line traditionalism, then its status as a sound position of general consensus, established by long struggle among people of goodwill in both magisteria - and not as a funny little off-the-wall suggestion by a few misguided peacemakers on an inevitable battlefield - should emerge into the clearest possible light.

Modern creationism, alas, has provoked a real battle thus supporting the *Doctrine of Non-Overlapping Magisteria* with a positive example of the principle that all apparent struggles between science and religion really arise from violations of the doctrine, when a small group allied to one magisterium tries to impose its irrelevant and illegitimate will upon the other's domain. Such genuine historical battles do not pit science against religion, but represent a power play by zealots formally allied to one side, and trying to impose their minority views upon the magisterium of the other side.

The saga of attempts by creationists to ban the teaching of evolution, or to force their own fundamentalist version of life's history into science curricula of public schools, represents one of the most interesting, distinctive, and persistent episodes in the cultural history of twentieth-century America. I have no problem with the largest and most potentially influential of all creationist groups in America, the *Jehovah's Witnesses* - for they do not try to impose their theological beliefs upon public school science curricula, and they agree with my view that churches and homes are the proper venue for teaching such private and partisan doctrines.

Our struggle with creationism is political and specific, not religious at all, and not even intellectual in any genuine sense. *Young-earth Creationism* offers nothing of intellectual merit but just a hodgepodge of claims properly judged within the magisterium of science. The forceful and persistent attempt by *Young-earth Creationists* to insinuate their

[95] Source: *Rock of Ages: Science and Religion in the Fullness of Life* by Stephen Jay Gould (Jonathan Cape, 2001, ISBN 0-224-06092-9).

partisan and minority theological dogma into the science curricula of American public schools cannot be read, in any legitimate way, as an episode in any supposedly general warfare between science and religion.

In the early 1920s, several Southern states passed flat-out anti-evolution statutes. The Tennessee law, for example, declared it a crime to teach that 'man had descended from a lower order of animals.' In a challenge to the constitutionality of these statutes, the *American Civil Liberties Union* instigated the famous Scopes trial in Dayton, Tennessee in 1925. William Jennings Bryan decided to make his last stand on this issue thereby giving the creationist movement both influence and contacts.[96]

John Scopes was a young free-thinker, who was quite popular among his fundamentalist students and worked as the physics teacher and track coach of the local high school. He had substituted for the fundamentalist biology teacher during an illness and had assigned the chapters on evolution from the class textbook, *A Civic Biology*, by George William Hunter. Scopes consented to be the stalking horse for a legal challenge to the constitutionality of the Tennessee anti-evolution law.[97]

In the 1980s the creationists regrouped, and came back fighting with a new strategy designed to circumvent constitutional problems. They had always honorably identified their alternative system as explicitly theological, and doctrinally based in a literal reading of the Bible. But now they expurgated their texts, inventing the oxymoronic concept of 'creation science'. Religion, it seems, and contrary to all previous pronouncements, has no bearing upon the subject at all. The latest discoveries of pure science now reveal a factual world that just happens to correlate perfectly with the literal pronouncements of the *Book of Genesis*.

In such a circumstance, legislative intervention becomes unnecessary. And besides, the creationists continued, we're not asking schools to ban evolution anymore. Now we are only demanding 'equal time' for 'creation science' in any classroom that also teaches evolution. Of course, if they decide not to teach evolution at all…well…then…

A few years ago, I came across a theological term that tickled my fancy, both for its touch of the arcane, and its mellifluous ring - *irenics* (from the Greek word for 'peace'), defined in opposition to *polemics,* as a branch of Christian theology that 'presents points of agreement among Christians with a view to the ultimate unity of Christianity' (*Oxford English Dictionary*).

By extension (and the word has crept out of theological circles and into general English usage), irenic people and proposals 'tend to promote peace, especially in relation to theological and ecclesiastical differences.' Now I'm an irenic fellow at heart - and I trust that most of us so regard ourselves, whatever personal quirks and foibles stand in the way of realization.

I believe in an irenic solution under a large umbrella extending far beyond the purely Christian realm of official definitions cited above. I join nearly all people of goodwill in wishing to see two old and cherished institutions, our two rocks of ages - science and religion - coexisting in peace while each works to make a distinctive patch for the integrated coat of many colors that will celebrate the distinctions of our lives, yet cloak human nakedness in a seamless covering called wisdom.

Irenics sure beats the polemics of ill-conceived battle between science and religion - a thoroughly false model that too often continues to envelop us for illogical reasons of history and psychology. I do get discouraged when some of my colleagues tout their private atheism (their right, of course, and in many ways my own suspicion as well) as a panacea for human progress against an absurd caricature of 'religion', erected as a straw man for rhetorical purposes.

Religion just can't be equated with Genesis literalism, the miracle of the liquefying blood of Saint Januarius (which at least provides an excuse for the wonderful and annual *San Gennaro Festival* on the streets of New York), or the Bible codes of kabbalah and modern media hype.

If these colleagues wish to fight superstition, irrationalism, philistinism, ignorance, dogma, and a host of other insults to the human intellect (often politically converted into dangerous tools of murder and oppression as well), then God bless them - but don't call this enemy 'religion'.

Similarly, of course, I pronounce my anathema upon those dogmatists and 'true believers' who, usurping the good name of religion for their partisan doctrines, try to suppress the uncomfortable truths of science, or to impose their peculiar brand of moral fiber upon people with legitimately different tastes. In the past, religion set the outlines that everyone had to accept, and science then had to conform. Irenics in this older mode required that the principles and

[96] For further details: *The Last Stand of William Jennings Bryan* by William Shepherd (1990). [Ed]

[97] The rest is history, as filtered and distorted for most Americans, through the fictionalized account in a wonderful play, *Inherit the Wind*, written in 1955 by Jerome Lawrence and Robert Edwin Lee. Two film versions featured Spencer Tracy playing Clarence Darrow and Fredric Marsh as William Jennings Bryan in the first, and Kirk Douglas as Darrow and Jason Robards as Bryan in the later remake for television. [Ed]

findings of science yield religious results known in advance to be true. Indeed such conformity represented the primary test of science's power and validity.

The Reverend Thomas Burnet (1635-1715),[98] a close friend and colleague of Isaac Newton, did not doubt that the biblical narrative recorded the earth's actual history; his scientific job, by his lights, required validation of this known history in terms of causation by invariant natural laws rather than miracles.

But the spectacular growth and success of science has turned the tables. Now the conclusions of science must be accepted *a priori*, and religious interpretations must be finessed and adjusted to match unimpeachable results from the magesterium of natural knowledge! The *Big Bang* happened, and we must now find God at this tumultuous origin. I also feel particularly sensitive about this issue because, as I wrote this book in the summer of 1998, a deluge of media hype enveloped the syncretist [99] position, as though some startlingly new and persuasive argument had been formulated, or some equally exciting and transforming discovery had been made.

In fact, absolutely nothing of intellectual novelty had been added, as the same bad arguments surfaced into a glare of publicity because the *J.M. Templeton Foundation*, established by its fabulously wealthy eponym to advance the syncretist program under the guise of more general and catholic (small c) discussion about science and religion, garnered a splash of media attention by spending 1.4 million bucks to hold a conference in Berkeley on '*Science and the spiritual quest.*'

In a genuine example of true creation *ex nihilo* - that is, the invention of an issue by fiat of media reports, rather than by force of argument or content of material - at least three major sources preached the syncretist gospel in their headlines and vapidly uncritical reports: '*Faith and reason, Together Again*' (*The Wall Street Journal*, June 12); '*Science and religion: bridging the Great Divide*' (*The New York Times*, June 30); and a cover story in *Newsweek* (July 20) simply titled '*Science Finds God*'. Scientists could only be mystified by this last claim, but at least we can now be certain about one of God's attributes: he sells newspapers and magazines.

The *Times* article admitted the intellectual torpor of the proceedings: 'A kind of Sunday school politeness pervaded the meeting, with none of the impassioned confrontations expected from such an emotionally charged subject…the audience politely applauded after each presentation. But there was little sense of intellectual excitement.'

But from whence could such excitement arise in principle? If the *Doctrine of Non-Overlapping Magisteria* holds, then facts and explanations developed under the magesterium of science cannot validate (or deny) the precepts of religion. Indeed, if we look at the so-called arguments for syncretism, as described in these reports, they all devolve into a series of fuzzy statements awash in metaphor and illogic.

Darwin has been read as something of a moral dolt, or at least as a slacker on the subject, for his frequent disclaimers about drawing lessons for the meaning of human life from his revolutionary reorganization of biological knowledge. Shouldn't such a radical reinterpretation of nature offer us some guidance for the biggest questions of the ages: Why are we here, and what does it all mean?

How could anyone look so deeply into the heart of biological causality and the history of life, and then offer us so little on the meaning of life and the ultimate order of things. To which Darwin responded: 'I feel deeply that the whole subject is too profound for the human intellect. A dog might as well speculate on the mind of Newton.'

Was Darwin just a coward? A desiccated intellect? A small-minded man? The very stereotype of a scientist who can describe a tree and ignore the forest, or analyze the notes and not hear the symphony?

I view Darwin in an entirely opposite manner. He maintained, throughout his life, a basic human fascination for the great questions of morals and meanings, and he recognized the transcendent importance of such inquiry. But he knew both the strengths and the limitations of his chosen profession, and he understood that the power of science could only be advanced and consolidated on the fertile ground of its own magesterium. In short, Darwin rooted his views about science and morality in the principle of *Non-Overlapping Magisteria*.

Darwin did not use evolution to promote atheism, or to maintain that no concept of God could ever be squared with the structure of nature. Rather, he argued that nature's factuality, as read within the magesterium of science, could not resolve, or even specify, the existence or character of God, the ultimate meaning of life, the proper foundations of morality, or any other question within the different magesterium of religion.

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[98] Burnet wrote one of the most influential books of the late seventeenth century - *Telluris theoria sacra*, or *The Sacred Theory of the Earth*, a work in four sections: (1) on the deluge of Noah; (2) on the preceding paradise; (3) on the forthcoming 'burning of the world'; and (4) 'concerning the new heavens and new earth', or paradise regained after the conflagration. This book not only became a 'bestseller' in its own generation, but gained lasting fame as a primary inspiration for Giambattista Vico's *Scienza nuova* or *New Science* (1725) and George Buffon's *Histoire naturelle* or *Natural History* (1749). [Ed]

[99] The word *syncretic* includes both admirable and unfavorable meanings but the *Syncretic School* Gould takes issue with here is the *'Burnet School'* which claims that science and religion should fuse to become one big happy family where the facts of science validate religious dogma. [Ed]

William Shepherd - Useful Links

The Private Papers of William Shepherd	http://cesc.net/passagen/
T.C. Lethbridge Online	http://tclethbridge.blog.co.uk
The Private Papers of Crocodile Uppsala	http://crocodileuppsala.blog.co.uk
Lethbridge Pendulum Rate Diagrams (Page 33)	http://cesc.net/adobeweb/scholars/lethbridge/
Megaliths, Meis & Miners (Page 6)	http://cesc.net/adobeweb/scholars/shepherd/fengshui.pdf
The Last Stand of William Jennings Bryan (Page 84)	http://cesc.net/adobeweb/scholars/shepherd/laststand.pdf

A Few Words on the Illustrations

Pen & Ink Diagrams © T.C. Lethbridge
Pen & Ink Illustrations by Connie Lindqvist for
The Private Papers of Crocodile Uppsala by William Shepherd (1993)

A Rate Table for the Long Pendulum					*Pendulum Rates in inches*		*Tom & Mina Lethbridge*
1							Congo
1½							Zambia
2							
3				rosemary			
3½				lavender			
4				currant			
4½				bramble			
5				rose			India, Nigeria
5½				may		phosphorus	
6			ash				Persia
7		**brown**			**memory**	sulphur, scent	Egypt
8						carrion, flesh	Libya, Morocco
9		**purple**	elder		**safety**	chlorine	Israel
9½					**psi**	nitrogen	
10	**EAST**	**fire**	**red**			**sun, youth**	man, light, graphite, distance	Bulgaria, Italy
10½				walnut	ivy		
11				oak			Spain, Portugal
11½						hair	
12			**orange**	cherry		**pride**	carbon, disease	
12½						mercury	
13				rowan			Greece
13⅓						length	
13½						**voice**	
14						silica	Russia, Hungary
15							Poland
16						**sex**	grass, dung, scarabs	Austria, E. Germany
17				beech			Finland, W. Germany
18				apple			China
19½						**blood**		Denmark
20	**SOUTH**	**earth**	**white**			**life, love**	heat, electricity	Holland, Belgium
20¼						**magnetism**		
20½				hazel				N. Ireland
21							potassium	France, Switzerland
21½								Scotland, Ireland
22			**grey**				silver, lead, sodium, calcium	England, Wales
22½							magnesium	
23				elm				Sweden, Norway
24						**male**	diamond	
25							aluminium	
26							alcohol	
26½							oxygen	Canada, S. Africa
26⅔							thickness	
27					garlic	**thought**	stench	USA
28				yew			tin	
29			**yellow**			**female**	gold, danger	
29½						**minus psi**		Australia
30	**WEST**	**water**	**green**			**moon, age**	sound	
30½			**blue**				copper, cobalt	
31				pine				
32			**violet**			**health**	iron, aspirin	
32½							nickel	
33½								New Zealand
34				cypress				
35								
36						**evolution**		
37								
38					tomato			
39					potato			
40	**NORTH**	**air**	**black**			**death, anger**	cold, sleep, deceit	

 Source: The Monkey's Tail by T.C.Lethbridge (1969)

The World of
T.C. Lethbridge

'What is magic today will be science tomorrow'

List of Contents