

Cosmology, Culture and Appropriation

Nick Campion's Notes

There are two threads running through these notes: the cultural background and cultural consequences of cosmological theories.

- What is cosmology?
- What is the nature of modern cosmology?
- Does modern cosmology have links to pre-modern cosmology?
- How does it tell stories?
- How does it assign meaning?
- How is it appropriated by astrologers?

Cosmology is 'the science, theory or study of the universe as an orderly system, and of the laws that govern it; in particular, a branch of astronomy that deals with the structure and evolution of the universe'.¹ Crucial to a cultural application of cosmology is the understanding that the Earth, humanity and society are an integral part of the cosmos.

'Celestial navigation is based on the premise that the Earth is the center of the universe. The premise is wrong, but the navigation works. An incorrect model can be a useful tool'. Kelvin Throop III (I like this quote, but cannot locate a source).

- Cosmology: premodern – the intelligible order
 - (Greek *kosmos* = order, harmony = root of cosmetic)
- Cosmology: modern – 'anything that's out there'.
- That is, the traditional meaning of cosmos is everything, including us. We in our turn are an integral part of the 'everything'.
- In the modern sense cosmos, as a 'meaning-ful' concept, has been replaced by universe as a 'meaning-less' arena.
- Strictly, the universe contains everything that exists, so it should include the inner world. However, in terms of common usage whereas cosmos, in the traditional sense, included inner space, the human psyche, now the universe is confined to outer space, for which it is sometimes a synonym.

(*Universus* is the primary Latin word, which replaced the Greek *Kosmos* for Latin writers. *Unus verito* - is literally 'changing into one'. It is closer to the Greek *panta* - everything - than cosmos. Given Latin's legalistic nature (it was the language law and civic matters) as opposed to Greek's continued use as the language of philosophy, *universus* probably this word represents the Roman view of the world - as a unified collection of people subject to Roman law. The Greeks, however, were thinking in terms of metaphysics including all 'worlds' or realms of beings celestial and terrestrial -not that metaphysics doesn't often cross into the social - it particularly does so in Stoicism.)

There are therefore two definitions of cosmology as an academic study.

As defined by the Traditional Cosmology society cosmology deals with the way in which humans orient their culture, their buildings and rituals, for example, to the cosmos.

¹ Hetherington, Norris D., *The Encyclopaedia of Cosmology: Historical, Philosophical and Scientific Foundations of Modern Cosmology*, New York 1993, p. 116.

By a long tradition this term [cosmos] had to the Greek mind become invested with the highest religious dignity. The very word by its literal meaning expresses a positive evaluation of the object - any object - to which it is accorded as a descriptive term. For *cosmos* means "order" in general, whether of the world or a household, of a commonwealth, of a life: it is a term of praise and even admiration.²

As astrophysicists define it, it is the study of deep space, often from a theoretical, non-empirical, non experimental perspective (although experimental evidence is sometimes found to support modern cosmological theories (such as the warping of space by mass in Relativity), some theories (such as the Big Band) are subject to heavy criticism from astronomers (in this case, a minority).³

The twentieth-century saw a revolution in our understanding of cosmology comparable to that which took place between Copernicus and Galileo, although it may be too early to say what the political and social consequences might be. The first photographs of the earth from the moon, for example, are often said to be partly responsible for the idea that we are all members of a single 'global village', an idea which in turn has had a large impact on the environmental movement. In many ways the cultural implications are as yet unclear, though: many astronomers believe that cosmology's automatic conclusion is atheism - the non existence of God - but some astronauts experienced profound religious experiences as a result of their space flights.

Modern cosmology can include divine intervention - obviously Christian cosmologists must reserve a place for God in their thinking. Generally, if cosmologists believe in a God, then he's the God of Aristotle who sets the universe in motion and then lets mathematics control the rest. Due to the strength of fundamentalist Christianity in the USA we have seen the rise of a fusion of modern astronomy and belief in the literal truth of Genesis known as 'creationist science'. This, though is almost uniquely an American phenomenon: far more people attend church in the USA than in other western countries, e.g. 60% in the US compared to around 5% in the UK. 'Intelligent Design' is an attempt by Creationists to challenge Darwinianism from an apparently scientific rather than scriptural basis. Intelligent Design's critics regard it as a new phenomenon, when it has had a consistent role as a central part of western philosophy in Neoplatonism.

Such considerations aside modern cosmology requires only mathematics (plus metaphors such as Big Bang to communicate). Indeed much of it exists as mathematical theory with no experimental proof. In many instances cosmology challenges many of the accepted principles of modern science. For example, that the universe may have begun with a 'Big Bang' is a hypothesis which fits some of our observations about the universe, such as the speed at which distant galaxies are moving away from us, but it can never be proved experimentally: we can never recreate the conditions of the Big Bang in a laboratory and check the results. Instead cosmologists are obliged to operate like historians, selecting the evidence which suits their theories. Even though most cosmologists would probably insist that they are scientists they are probably closer to social scientists in that they construct mathematical models but are dependent on the interpretation of evidence which may constitute but a tiny fragment of the whole.

The term **New Physics** (see below), has been coined to combine the two theories which are central to modern cosmology, Relativity and Quantum Mechanics. For definitions of each see below.

² Jonas, Hans, *The Gnostic Religion: The Message of the Alien God and the Beginnings of Christianity*, 2nd ed., Boston: Beacon Press 1963, p. 241

³ *New Scientist* 22 May 2004

The participatory cosmos

The system of shared experience that we call the world is viewed as building itself out of elementary quantum phenomena, elementary acts of observer-participancy. In other words, the questions that the participants put – and the answers they get – by their observing devices, plus their communication of their findings, take part in creating the impressions which we call the system: that whole great system which to a superficial look is time and space, particles and fields.⁴

Not really participatory, but....

Something in us recognises the Cosmos as home. We are made of stellar ash...We are children equally of the sky and the earth.⁵

Does the Universe have Purpose?

In looking at the way people have expressed themselves in the course of these attempts [to replace religion with science], I am struck by the strong intellectual need there is to have some view of the cosmos as a whole. It does seem to me that the prospect of entirely depersonalising this view may not be a possible one. Possibly, for human beings, the only alternative to thinking of the universe as, in some vast and remote way, purposive and benign, is to think of it as purposive and radically malignant. It may simply not be in our capacity – except of course, by just avoiding thought – to think of it as having no sort of purpose or direction whatsoever. And since the notion that it is radically malignant is a crazy one, benignity seems to be the only usable option.⁶

Cosmology and Culture

‘The culture of a people, the totality of their creativity and intellect has many components...

At the peak of our culture is our science. Its nature and content, when we think about them at all, presumably are dictated by an underlying factual universe increasingly discoverable by experiment and observation. In such a universe, an account of our cosmology – our understanding of the organisation and evolution of the universe – would consist of little more than a straightforward listing of known facts.

Yet we are not entirely unaware that we, too, have a culture, just as other people have, correspondingly, our science, although more subject to empirical test than are many of our other intellectual creations, must also be recognised as part of our culture, and as an intellectual creation worthy of study as such. Once cosmology

4 Wheeler, John, quoted in Rees, Martin, *Before the Beginning* (London: The Free Press, 2002 [1997], p.257.

5 Sagan, Carl, *Cosmos*, PLACE: Wings Books 1995, p. 318. NB. Be cautious with this quote, It is not on p. 318

6 Midgley, Mary, *Evolution as Religion*, London: Routledge 2002 [1985], pp. 159-60.

is thought of in this manner, we have opened one of the greatest of human achievements to analysis and to an increased appreciation'.⁷

The dramatic implications of the New Physics for humanity's relationship with the cosmos are widely recognised. For example, Heisenberg's Uncertainty Principle (see below) and the evidence that, at the sub-atomic level, certain phenomena only occur when there is an observer to observe them, is widely taken as evidence that all scientific observations require an observer, and hence that what is being observed has no independent existence.

This point of view would be regarded by sceptics as 'anti-science' and the existence of an 'anti-science movement' is taken for granted in the sceptical literature. However, if 'New Age' literature, for example, is examined, it is clear that a paradoxical attitude to science can be identified. There is often strong condemnation of contemporary mainstream science combined with an equally strong appeal to the science of the new physics which, it is argued, will replace the now outmoded old-fashioned mainstream science with its supposedly spurious divide between objectivity and subjectivity.

Such attitudes are discussed in Hanegraaff, Wouter J., *New Age Religion and Western Culture*, Leiden, New York: E.J. Brill 1996.

Also to be considered is the social impact of the new science, explored in terms of quantum physics by Danah Zohar and Ian Marshall in *The Quantum Society*, (Bloomsbury Publishing, London 1993) (see below), a discussion which follows from previous debates on the possible impact of Copernican theory on models of absolute monarchy (the sun is the centre of the universe, the sun is the king, therefore the king is the centre of his society) or Newtonian mechanics on 'natural rights theory' (all bodies in the universe are regulated by a single set of physical laws, therefore kings are regulated by the same law as commoners, therefore all people are equal).

The Search for Everything

Questions: Is dark matter just another word for ether?
Is the vibrational nature of superstring theory just an updating of the harmony of the spheres?
Is the struggle between steady state and black hole supporters just a variant of the debate between gradualists and catastrophists?

The New Physics and the 'New Age'

Fritjof Capra was the seminal figure in the idea, highly influential in New Age circles, that the erosion of scientific certainty by Relativity and Quantum Mechanics is leading science to the same conclusions as eastern philosophies of uncertainty, especially Buddhism. The simple argument links the modern scientific theory that most of what appears to be solid matter is in fact empty space to eastern notions that the material world is an illusion.

Capra, Fritjof, *The Tao of Physics*, London: Fontana 1976.

Capra, Fritjof, *The Turning Point*, London, New York, 1982

From an early draft of Nick's PhD:

A symbiotic relationship between modern cosmology and belief in astrology is suggested by Wayne R. Anderson (1998). He argues that if cosmologists talk about far-fetched ideas such as backward time travel, it is only natural to expect the public

⁷ 'Preface', Hetherington, Norris, (ed.), *Encyclopaedia of Cosmology*, New York and London, Garland Publishing 1993, p. ix.

to accept paranormal beliefs which may actually seem less far-fetched (p 62). He writes that 'much of twentieth century physics sound far less reasonable than many New Age beliefs' (p 44). On astrology he wrote that 'In general terms astrology is the belief that, in some mysterious way, the state of the universe affects us. This belief is not so different from the quantum mechanical notion that our observation of an electron causes its wave function to collapse and therefore forces the electron to be in one particular state. Instead of the universe affecting us, our observations give reality the to universe' (p 45, 62). Anderson also makes the point that public images of science are more important than scientific evidence in influencing public belief in the paranormal (p 62).

The public is bound to make a connection between astrology and astronomy for the simple reason that they use the same terminology - especially the names of the planets. Carl Sagan made the point that they are linked in the public mind (1997: 43-4):

'Astronomy has as its most prominent pseudoscience, astrology - the discipline out of which it emerged. The pseudosciences sometimes intersect, compounding the confusion - as in telepathic searches for buried treasures from Atlantis, or, astrological economic forecasting. But because I work mainly with planets, and because I've been interested in the possibility of extraterrestrial life, the pseudosciences that most often park themselves on my doorstep involve other words, and what we have come so easily in our time to call "aliens"'

The appeal by New Agers to science:

'Most children are aware of their guides and they talk to them and play as imaginary friends. As they grow older and more aware of the physical 3rd dimensional world in which they live within their body they tend to let go of what is perceived to be the imaginary 4th dimensional world where spirit live. The 4th dimension is all around us it is just that it vibrates at a higher level and we can only perceive it within our senses and our awareness. I do not intend to go into long explanations of quantum physics in this article but there is more and more scientific evidence of how we can physically change things via focusing our awareness and thoughts at a quantum level.'⁸

(NB: the missing punctuation is in the original)

Yet, following Einstein, in physics, the fourth dimension is time.

On the other hand see:

Scientists Predict How to Detect a Fourth Dimension of Space
<http://www.physorg.com/news67773542.html> (accessed 24 November 2007)

Scientists at Duke and Rutgers universities have developed a mathematical framework they say will enable astronomers to test a new five-dimensional theory of gravity that competes with Einstein's General Theory of Relativity.

Charles R. Keeton of Rutgers and Arlie O. Petters of Duke base their work on a recent theory called the type II Randall-Sundrum braneworld gravity model. The theory holds that the visible universe is a membrane (hence "braneworld") embedded within a larger universe, much like a strand of filmy seaweed floating in the ocean.

⁸ Goodings, Joylina, 'Spirit Guides and Angels', *Highspirit*, Nov 2007, p. 72.

The "braneworld universe" has five dimensions -- four spatial dimensions plus time -- compared with the four dimensions -- three spatial, plus time -- laid out in the General Theory of Relativity.

The framework Keeton and Petters developed predicts certain cosmological effects that, if observed, should help scientists validate the braneworld theory. The observations, they said, should be possible with satellites scheduled to launch in the next few years.

If the braneworld theory proves to be true, "this would upset the applecart," Petters said. "It would confirm that there is a fourth dimension to space, which would create a philosophical shift in our understanding of the natural world."

The scientists' findings appeared May 24, 2006, in the online edition of the journal *Physical Review D*. Keeton is an astronomy and physics professor at Rutgers, and Petters is a mathematics and physics professor at Duke. Their research is funded by the National Science Foundation.

The Randall-Sundrum braneworld model -- named for its originators, physicists Lisa Randall of Harvard University and Raman Sundrum of Johns Hopkins University -- provides a mathematical description of how gravity shapes the universe that differs from the description offered by the General Theory of Relativity.

Keeton and Petters focused on one particular gravitational consequence of the braneworld theory that distinguishes it from Einstein's theory.

The braneworld theory predicts that relatively small "black holes" created in the early universe have survived to the present. The black holes, with mass similar to a tiny asteroid, would be part of the "dark matter" in the universe. As the name suggests, dark matter does not emit or reflect light, but does exert a gravitational force.

...

...

"If the braneworld theory is correct," they said, "there should be many, many more braneworld black holes throughout the universe, each carrying the signature of a fourth dimension of space."

Source: Duke University

Astrologers and the New Physics

One major characteristic of twentieth-century astrology was the use of the new physics as a rationale, justification or role model for developments in astrology.

The work of Einstein has shown the closeness of every part of the Universe and all that is in it. It is for astrologers to control and clarify their work so that they may have a workable tool to offer if ever its value is to be properly appreciated by those studying on other lines.

Hone, Margaret, *The Modern Textbook of Astrology*, London: L.N. Fowler, 1951, fourth edition reprinted 1973, p. 287.

The human being takes part in the universe as well as observing it and parallels to this fundamental unity of all things have been reflected in the concepts of modern physicists since the turn of the century. To pursue these lines of thought further, the reader is particularly referred to *The Tao of Physics* by Fritjof Capra...

Rose, Christina, *Astrological Counselling: A basic guide to astrological themes in person to person relationships*, Wellingborough: Aquarian Press 1982, p. 20.

Rose goes on also to recommend Jung's work on synchronicity

Another common attitude to science amongst astrologers is that contemporary scientists lack wisdom and understanding. Oken argues that such understanding will come with the advent of the Age of Aquarius. Science and astrology will then be in agreement.

Oken, Alan, *The Horoscope, the Road and its Travellers*, New York: Bantam 1974, pp. 9-13

The Einstein Papers Project.

As of October 2004 9 volumes had been published. Another 28 are planned. The overall project requires research into more than 60,000 documents, including correspondence, scientific writings, speeches on science and social issues, notebooks, diagrams, photos, as well as various contemporary materials and letters about Einstein penned by family members, colleagues, and the press. The collection of photocopies is housed in seven large, fireproof filing cabinets, each the weight of a baby grand piano. (Most of the originals are located at the Hebrew University of Jerusalem, the beneficiary of Einstein's literary estate.)

www.einstein.caltech.edu

www.alberteinstein.info

Stephen Hawking on Astrology

Universe in a Nutshell, London: Bantam Press 2001, p 103.

'Why should the positions of other planets against the background sky as seen from the earth have any correlation with the macromolecules on a minor planet that call themselves intelligent life? Yet this is what (the music of the spheres) astrology would have us believe. There is no more experimental evidence for some of the theories described in this book than there is for astrology, but we believe them because they are consistent with theories that have survived testing...

The real reason most scientists don't believe in astrology is not scientific evidence or the lack of it but because it is not consistent with other theories that have been tested by experiment.

Relativity

*Three wonderful people called -stein
There's Gert and there's Ep and there's Ein
Ep's sculpture's perverse
Gert's poems are worse
And nobody understands Ein !!*

"The most beautiful experience we can have is the mysterious. It is the fundamental emotion that stands at the cradle of true art and true science."

Albert Einstein, *The World as I See It*, 1931

<http://www.westegg.com/einstein/> <<http://www.westegg.com/einstein/>>

'Religion without Science is lame. Science without Religion is blind'

Einstein, *The World as I See It* (1934) quoted in Seldes, George, *The Great Thoughts*, Ballantine Books 1985

Albert Einstein (1879-1955) is the most famous scientist of all time, with his famous shock of white hair he was the very archetype of the mad professor. He was born at Ulm in Germany on 14 March 1879 and, as a child, showed no interest at all in academic work. He acquired a

reputation for laziness and, after temporary work as a teacher, settled into a junior post at the Patent Office in Bern in 1902. While there he completed his PhD in 1905. Also in 1905 he published three major scientific papers, one proposing the **special theory of relativity**, another explaining the photoelectric effect (by which light falling onto a metal surface produces an electric current) by proposing the existence of units known as quanta (later changed to photons) and a third explaining how tiny particles in the air or liquids are buffeted by atoms.

In 1909 he was appointed a professor at the University of Zurich and also worked in Prague before settling at the Kaiser Wilhelm Institute in Berlin in 1914. It was there that he worked on the **general theory of relativity**, presented to the Prussian Academy of Sciences in 1915 and published in 1916, which included the proposition that light would be bent by gravity. An expedition was led by Sir Arthur Eddington to Sobral in north-east Brazil, to observe the solar eclipse of 29 May 1919 and test Einstein's theory. The experiment was successful and Einstein became world famous. He was awarded the Nobel Prize for physics in 1921, fled the Nazis and escaped to the USA in 1933, and worked at Princeton from then until his death in 1955.

Special Theory of Relativity

This is the theory that states that mass and energy can be interchanged, a process described in the famous equation $E=mc^2$ (E = energy, m = mass, c = the speed of light). The key features of the theory are that, from the point of view of an observer who is stationary (none of us is really stationary so the phrase used is in 'their own inertial frame') time recorded on a moving clock will run slow while an object moving in the direction of motion will both shrink and gain mass. The practical implication is that the faster we move in relation to other objects, the slower time passes. Thus an astronaut embarking on a long journey at high speeds might return to earth after fifty years but have aged only slightly. The theory is known as 'special' because it applies only to the special case of objects moving at constant speeds in straight lines.

General Theory of Relativity

For ten years Einstein laboured to find a way to expand the special theory to account for general behaviour in the universe - i.e., the general theory. His work was in many ways an extension of Newton's. Newton had discovered the inverse square law of gravity and suggested that gravity might deflect light. Einstein explained the inverse square law and predicted that the effect of light on gravity was twice as great as Newton thought. The implication of the theory is that 'space-time' as a whole is curved so that everything that travels through space follows a course set by this curvature.

Einstein also realised that general relativity predicted that the universe must be expanding rather than static in size, as had long been assumed. To cope with this, and keep the universe's size constant, he introduced another equation known as the **cosmological constant**. However, when Hubble later discovered that the universe really is expanding. This has since been known as 'Einstein's biggest blunder'.

Einstein and Astrology

The following quote attributed to Einstein was published in *Astrology* by Solange de Mailly Nesle (Inner Traditions, Intl., Pub 1985 - ISBN 0-89281-105-6) p 107.

'Astrology is a science in itself and contains an illuminating body of knowledge. It taught me many things and I am greatly indebted to it. Geophysical evidence reveals the power of the stars and the planets in relation to the terrestrial. In turn, astrology reinforces this power to some extent. This is why astrology is like a life-giving elixir to mankind'.

Since then it has been reproduced in other publications including Tad Mann's *The Future of Astrology* (1987), the *AFAN Newsletter* (1990) and the first edition of Percy Seymour's *Astrology: The Evidence of Science* (1990). It recently turned up in an academic paper I read. However, there is absolutely no evidence that Einstein ever said or wrote this. There is no source for the quote and on no other occasion did he ever express any interest whatsoever in astrology. As far as we can tell the quote first appears in Werner Hirsig's *Manuel d'astrologie*.

Dean, Geoff, 'Einstein's Testimonial to Astrology', *Correlation*, Vol.. 11 no 1, June 1991, pp 35-6.

In his diary, Count Kessler tells of a dinner that took place at publisher Samuel Fischer's home in Berlin February 14 1927. Apart from Einstein and Kessler, the famous novelist Gerhart Hauptmann and the well-known Berlin critic Alfred Kerr were guests. Pretending to be a firm believer in astrology, Hauptmann asked Einstein whether he shared this belief. Einstein, who had just read Lucien Levy-Bruhl's book *Die geistige Welt der Primitiven* about the demonology of early cultural levels and its effects on ancient religious beliefs, told Hauptmann that faith in astrology evolved from an ancient belief in demons. Einstein, who did not believe in such supernatural beings, strongly condemned astrology as superstition.

Jammer, Max, *Einstein and Religion*, Princeton: Princeton University Press 1999, p. 39.

Most remarkably, in 1601 Johann Kepler anticipated one of the central ideas of Einstein's general theory of relativity. At that time, alchemistic and astrological ideas, inspired by religious considerations, played an important role in astronomical investigations. In this context, Kepler, in a study of the foundations of astrology, made the statement "ubi material, ibi geometria" ("where matter is, there is geometry"). This statement may be interpreted as an ingenious epigram of the physical contents of the field equations of general relativity, which relate the geometrical structure of space-time to the mass-energy (or momentum) density of the universe

Jammer, Max, *Einstein and Religion*, Princeton: Princeton University Press 1999, p. 216-7

*Kepler Joann, *De fundamentis astrologiae certioribus*, thesis XX.

Einstein and Jung.

Around 1909 (McGillion and Vries-Ek 1995: 16) or 1911 (Strimer 2000/2001: 50), Einstein visited Jung's house in Zurich on a number of occasions. This was when Jung was deep in his studies of astrology although neither he nor Einstein mentions that they ever talked about the subject. However, Jung was influenced by relativity. In a letter to Carl Seelig dated 23 Feb, 1954 (Letters Vol. 2, p. 109) Jung wrote:

'It was Einstein who first started me off thinking about a possible relativity of time as well as space, and their psychic conditionality. More than thirty years later this stimulus led to my relation with the physicist Professor W. Pauli* and to my thesis of psychic synchronicity. With Einstein's departure from Zurich my relation with him ceased, and I hardly think he has any recollection of me. One can scarcely imagine a greater contrast between the mathematical and the psychological mentality. One is extremely quantitative and the other just as extremely qualitative'.

*Wolfgang Pauli (1900-1958) was one of the founders of quantum theory. He was in analysis with Jung and contributed to the theory of synchronicity (McGillion and Vries-Ek 1995: 17).

Dean, Geoffrey, 'A Reassessment of Jung's Astrological Experiment', *Correlation*, Vol. 14 no 2., Northern Winter 1995, pp 12-22.

McGillion, Frank and Vries-Ek, Pety de, 'A Further Look at Jung's Astrological Experiment in the Context of the Theory of Synchronicity', *Correlation*, Vol. 14 no 1., Northern Summer 1995, pp 15-25.

Strimer, Steve, 'Synchronicity and Jung's Astrological Experiment', *NCGR Journal*, Winter 2000/2001, pp. 45-53.

The Pink Floyd:

*So you run and run to catch up with the sun but it's sinking
Racing around to come up behind you again.
The sun is the same in a relative way but you're older,
Shorter of breath and closer to death.
('Time' from The Dark Side of the Moon)*

Cultural Relativity

What exactly are the implications of Einstein's work? At present it is of marginal significance in the space programme, for Newton's laws are sufficient to send probes to other planets, although the measurement of the curvature of light has proved helpful in deep space observation, as in the discovery of planets around other suns in the 1990s. Culturally, though, we may suspect that the existence of 'cultural relativity', the opinion that no one culture is inherently superior to any other, in other words that there is no absolute cultural centre, is provided with scientific justification by the idea that the universe has no absolute centre.

A move towards such an analysis was made by the French post-modern philosopher Bruno Latour. Latour is interested to use Einstein's work as a methodology. In Latour's analysis 'Einstein's text is read as a contribution to the sociology of delegation' (Latour 1988: 3, cited in Sokal and Bricmont 1997: 115), in other words to social relationships. He states his purpose as to ascertain 'in what ways can we, by reformulating the concept of society, see Einstein's work as explicitly social? A related question is: how can we learn from society how to study society' (Latour 1988: 5, also 35-6, cited in Sokal and Bricmont 1997:122).

Latour's work was ridiculed by the physicists Sokal and Bricmont in their *Intellectual Impostures*. They criticise his supposed misunderstandings of Einstein's work claiming, for example, that he argues that Relativity is concerned with relative location whereas for Einstein it was about relative motion (117). They also mock his impenetrable language, which is characteristic of post-modern writing. Sokal and Bricmont's book was greeted with wide acclaim by scientists, but misses the point that cosmology has always been applied to social analysis and organisation.

Latour, Bruno, *Science in Action: How to Follow Scientists and Engineers Through Society*, Cambridge Mass.: Harvard University Press 1987.

Sokal, Alan and Bricmont, Jean, *Intellectual Impostures*, London: Profile Books 1998.

Einstein and historical theory

'Einstein's General Theory of Relativity (1913), widely popularized after it was confirmed by astronomical observations in 1919, helped create an intellectual climate in which it was

thought that the "aspect of things" changed with the position of the observer. The idea of the relativity of observer and fact was applied to history by a number of inter-war philosophers as well, in particular by the liberal Italian thinker Benedetto Croce and his English counterpart R.G. Collingwood. In doing so they were echoing pre-war German philosophers such as Wilhelm Dilthey, who had begun to take a sceptical view of the possibility of objective knowledge about the past. And they paralleled the much more far-reaching doubts of cultural pessimists in Germany under the Weimar Republic, for whom Germany's defeat in the First World War had rendered history largely meaningless. Croce argued that historians were guided in their judgement as to what documents and events were important in the past, and what were unimportant, by their present concerns. All history was thus written, consciously or unconsciously, from the perspective of the present. "All history," in Croce's famous phrase, is contemporary history." Collingwood went even further by arguing that "all history is the history of thought," because the documents left to this historian by the past were meaningless unless the historian reconstituted the thought that they expressed. "History," Collingwood concluded, "is the re-enactment in the historian's mind of the thought whose history he is studying".⁹

Einstein archives on line

<http://www.alberteinstein.info>

The new website is the result of an ambitious cooperative effort between the Albert Einstein Archives at the Hebrew University of Jerusalem and the Einstein Papers Project at the California Institute of Technology. It will enable access to some 3,000 high-quality digitized images. Thirty-nine documents will also be provided (in PDF format) as they appear in *The Collected Papers of Albert Einstein*, published in German by Princeton University Press, with historical and scientific annotations in English; some of the documents are accompanied by English translations.

An extensive archival database and finding aid will allow for the direct searching and browsing of more than 40,000 records of Einstein and Einstein-related documents. These concern his scientific and nonscientific writings, his professional and personal correspondence, notebooks, travel diaries, personal documents, and third-party items.

The Expanding Universe

Einstein's general theory of relativity, published in 1916 (see below) predicted that the universe is expanding, a conclusion Einstein tried to cancel by adding a 'cosmological constant' to this equations. However, in the 1920s Edwin Hubble (1889-1953), working at the Mount Wilson Observatory, made some remarkable discoveries. Initially he found that the Andromeda Nebula is a cluster of stars similar to the Milky Way. Between 1925 and 1929 he then discovered that the 'spiral nebulae' which appear like faint blurs even to quite powerful telescopes, are in fact other galaxies. He therefore established that the Milky Way is one of many galaxies and hence that the universe is much larger than astronomers previously thought. He was also concerned with 'redshift', the phenomenon by which the wavelength of light arriving from stars moving away from our solar system stretches making the light appear red. In 1929 he demonstrated that the universe is expanding, as predicted by general relativity, and must therefore have had a definite origin.

⁹ Evans, Richard J., *In Defence of History*, Cambridge: Granta, 1997, p. 30.

Holly Henry has shown how Hubble's discovery that the universe is not only huge, but expanding, and that earth is correspondingly insignificant, became a metaphor for political and social insecurity in the 1930s, in the wake of political revolution, economic depression and the rise of fascism.

Henry, Holly, 'From Galactic Expanses to Earth: Virginia Woolf and Olaf Stapledon Envision New Worlds', paper delivered to the INSAP II conference, Malta, January 1999.

The Big Bang

Following the implication of Hubble's discoveries - that the universe must have had a definite origin - most astronomers now believe that the universe came into existence at a precise moment around 15 billion years ago, beginning as a super-hot ball the size, perhaps, of an apple: others say it was a million-millionth the size of a single proton. The name Big-Bang was coined by Fred Hoyle, a supporter of the Steady State theory, in the 1940s, and was intended to be derisory. Big-Bang supporters prefer the word 'singularity' to describe the universe's initial state and talk of the following event as being an 'inflation' rather than the explosion suggested by the term Big-Bang. Following Hubble's work, the first person to propose the idea was the Belgian astronomer (and Catholic priest) Georges Lemaitre (1894-1966) in 1927. He proposed that what he called the 'primeval atom' had been about thirty times the size of our sun.

It was George Gamow (1904-1968) who took the idea closer to its modern form in the 1940s, exploring the nature of the nuclear reactions which would have taken place in the singularity. Following further work by Stephen Hawking (1942-) physicists have now calculated the physical properties of the universe back to 0.0001 of a second after the moment of creation when the temperature of the universe was a thousand billion degrees Kelvin and its density was 10^{14} grams per cubic centimetre (the density of water is 1 gram per cubic centimetre).

Big-Bang theory contains a number of difficult questions. One is, if the universe is of finite size, then what is outside it? There are a number of answers to this. One is that the universe consists of the totality of space-time, so nothing can be outside. (To the question, does the universe have an edge, the conventional answer is that it has an 'event horizon'.) Another is that, as space-time is curved (see **Relativity**, below), it is impossible ever to reach the edge of the universe because we would always end up back where we began, so there can, in effect, be no outside. Such answers are as unsatisfactory as those which medieval cosmologists used to justify the geocentric universe.

Another important point is that as the universe expands distant galaxies are not actually travelling away from each other: rather the space between them is expanding. A common metaphor uses a balloon with spots on it or a loaf of bread with raisins in it. As the balloon is blown up or the bread rises, the distance between the spots or raisins increases, but they're not actually travelling through space.

The strongest evidence for the Big-Bang is the existence of the 'Cosmic Background Radiation' (CBR), the radiation which it is thought is its residue. This radiation, which is fairly uniform across the universe and comes from no particular source, was discovered in the 1940s, and in 1965 Arno Penzias and Robert Wilson made the connection with the Big Bang.

Big-Bang theory implies three variations for the universe's long-term history.

Open Universe: after a once-only creation the universe expands for ever.

Closed Universe: the universe will gradually run out of energy and will eventually collapse in on itself in a 'Big Crunch'.

Oscillating Universe: After every Big Crunch there is another Big Bang - and then another Big Crunch.

Current theory holds that the universe is '**Flat**' - i.e. just on the 'Open' side of 'Closed'.

Criticism of Big Bang Theory

Although Big Bang theory is the currently the orthodox scientific theory of creation, it does have its critics. For example, the science historian David Berlinski writes 'the image of the fundamental laws of physics zestfully wrestling with the void to bring the universe into being is one that suggests very little improvements over the accounts given by the ancient Norse in which the world is revealed to be balanced on the back of a gigantic ox'. He compares the state of affairs before the Big Bang to the statement in Genesis, 'Darkness was upon the face of the deep'.

Berlinski argues that many of the lines of argument in Big Bang theory are inferences which cannot be sustained under critical examination. For example, there is no proof that the Cosmic Background Radiation observed by Penzias and Wilson is remains of the Big Bang. This inference is made by theoreticians like Robert Dicke. Further, the CBR filled the universe 400,000 years after the Big Bang when the universe was at a diameter of 90 million light-years. So, as the Universe was expanding faster than the speed of light years, and nothing can travel faster than light, it is impossible for the entire universe to be filled with the radiation which began to travel at the time of the Big Bang.

Berlinski also challenges the conventional interpretation of red shift - that the universe is expanding.

Berlinski, David, 'Was There a Big Bang?', *Commentary*, 105.2, February 1998.

Criticisms of Big Bang

<http://www.metaresearch.org/cosmology/BB-top-30.asp>

Steady State

Steady State Theory, an alternative to Big-Bang, was proposed by Herman Bondi (1919-), Tommy Gold (1920-) and Fred Hoyle (1915-2001) in the 1940s, supposedly after they'd watched a film called *Dead of Night*, a set of four linked ghost stories in which the end of the last story looped back to repeat the beginning of the first. The theory rests on the 'cosmological principle' (the idea that the overall features of the universe will look the same wherever you are located) and the 'perfect cosmological principle' (the idea that the universe should look the same not only from any place but in any time). Steady State accounts for the expansion of the universe by arguing that new matter is being constantly created by this was undermined by Big-bang theory's argument that the universe had changed dramatically. Although most astronomers have abandoned Steady State in favour of Big-Bang, recent theories of inflation which see 'the entire visible Universe as just one bubble in an eternally expanding, self-replicating foam' (John Gribbin, *Companion to the Cosmos*, London: Orion 1996, p. 383) suggest that our universe, with its Big-Bang, might be just one universe in an infinity of universes which are constantly being created.

The Anthropic Principle

The idea, developed by John Barrow and Frank Tipler, that the existence of life in the universe (Particularly human life) can set constraints on the way the universe is now, and how

particles (protons, neutrons, electrons, neutrinos) are so unlikely that they suggest that the chances of the universe actually containing stars are one chance per 10^{229} . He suggests three possible explanations which he then rules out:

1. An Anthropic Principle in which God creates a universe structured so that rational creatures will evolve who will love him. However, this takes the answer to a scientific question outside the domain of science.
2. An Anthropic Principle in which there are multiple universes, so many that one must by chance contain stars. There would have to be about 10^{229} universes. However, this explanation can explain anything.
3. There is as yet undiscovered single mathematically consistent law of the whole universe. However, the chances against this being so are so great that to believe it we would have to become mystics.

His favoured explanation though is:

4. The mathematical parameters which regulate the universe may change in time according to as yet unknown physical processes. The values (i.e. mass of particles, strength of forces) which they take may therefore be the result of real physical processes which happened in the past.

Smollin concludes that a process to Darwinian evolution regulates the development of 'species' of universes, and that Black Holes may be the locations for new Big Bangs.

Smollin, Lee, *The Life of the Cosmos*, New York: Oxford University Press 1997.

Quantum Theory

Also known as quantum mechanics or quantum physics (after *quanta*, a very small object), quantum theory is the set of physical laws which deals with the behaviour of matter and energy on a very small scale, dealing with entities the size of an atom or smaller. There are two central features of quantum theory.

The first is that at such small scales entities **may behave either as waves or particles**. This is demonstrated by the classic experiment in which light is passed through a hole in a screen and then through two holes in a second screen. They then fall on to a third screen making a pattern of light and dark as the two waves overlap. When individual particles are then fired through a single slit something strange happens: as the particles land on the final screen they make a pattern similar to that made by the waves passed through the two slits. This suggests that light departs as a particle, travels as a wave and then arrives as a particle. John Gribbin writes that

'The great physicist Richard Feynman (1918-1988) said that the experiment with two holes encapsulates the "central mystery" of quantum mechanics, and that nobody understands what is going on in it. It isn't just that quantum entities seem to travel as waves but arrive and depart as particles, but that they seem to know about the past and future as well'. (John Gribbin, *Companion to the Cosmos*, London: Orion 1996, p. 333).

The standard interpretation of this, the Copenhagen Interpretation, explains the phenomenon in terms of probabilities, but still leaves a great deal unexplained.

The most important overlap between quantum theory and cosmology is the **uncertainty principle**, developed by Werner Heisenberg (1901-1976) in the 1920s. Moving on from the problem of wave-particle duality, the uncertainty principle states that it is impossible to measure both the position and momentum (i.e. direction of

travel) of a sub-atomic particle at the same time. The problem is compounded by the fact that, when we try to measure an entity's momentum, 'this has the effect of enhancing the "waviness" and making it spread out so its position is uncertain'. If we try to measure its position precisely, 'this creates uncertainty in its waviness so it is not sure where exactly it is going' (John Gribbin, *Companion to the Cosmos*, London: Orion 1996, p. 334).

The uncertainty principle figures strongly in the literature on the 'new physics' and mysticism. It's possible that there may be a physical cause in that, during the act of observing sub-atomic particles, photons emitted during the act of observation disrupt the particles.

In *Star Trek* transporter technology has to cope with the fact that current technology has no idea how to reassemble an individual's atoms in the same state at the end of the transport as at the beginning. The script writers therefore inserted a 'Heisenberg compensator' into the machinery to counter the uncertainty principle.

Quantum entanglement: two particles, or quantum systems, which were once linked, remain connected however far apart they are. Therefore when one is affected the other responds, regardless of distance. The connection may be instantaneous, regardless of the speed of light. Bell's theorem (John Bell 1964), Simon Blackburn, *The Oxford Dictionary of Philosophy*, Oxford: Oxford University Press 1994, p. 40-1). Einstein-Podolsky-Rosen thought experiment, (Blackburn, p. 116).

Bell's theorem is used as a rationale for astrology by Dennis Ewell, *Cosmic Loom*, London: Urania Trust 2nd ed. 1999, p. 7.

The Quantum Society

Zohar, Danah and Marshall, Ian, *The Quantum Society*, London: Bloomsbury 1993. (Zohar was a physics undergraduate, a religion and philosophy graduate, Marshall is a psychotherapist, and psychology and philosophy graduate).

From the jacket blurb: 'Drawing on the many uncanny analogies between quantum reality and the dynamics of self and society. Zohar and Marshall argue that we can change our social perceptions, values and behaviour by drawing our deepest images and metaphors from the nature of the mind and the wider nature of the physical universe itself. They offer a new theory of cosmic and social evolution that allows us to rediscover the meaning and purpose of society, and that calls upon us to reinvent ourselves, our relationships, our families and our communities. The precedent of how different quantum possibilities meet and evolve together offers us a radically new vision of how we might, through dialogue, arrive at a new consensus that is itself a rich celebration of diversity'.

As an example (p. 123) Quantum Mechanics reveals that there are no absolute truths, only partial ones. Thus Zohar's commitment to her husband is made more mature by understanding that her absolute commitment to him is made in the knowledge that all other wives have separate commitments to their husbands. Thus there is no one single absolute wife-husband commitment, only many different commitments. By understanding that her commitment is not based on some external absolute, Zohar's absolute commitment is made on the basis of her own self-understanding and love of her husband.

Black Holes

Black Holes are super dense objects whose mass is so great that their gravity sucks in all the surrounding matter they contact. They are apparently formed when huge stars explode and

form super novae, but contain so much matter that they collapse on themselves and become super-dense. A star a hundred times as large as our sun might collapse into a black hole the size of a pea. Such a black hole might begin to suck matter out of a star when it is about a hundred thousand kilometres away. Black holes cannot be seen directly because they send out no radiation, including light, and their existence can only be inferred from the phenomena they cause. Black holes do, though, appear to expel immensely long thin jets of material which can extend right across an entire galaxy. The simplest way is to look for stars that are being distorted by a nearby black hole. Another way is to look for stars that suddenly increase in brightness then return to normal. This effect could be caused by the gravity of a black hole passing in front of the star magnifying the star's light by a 'lensing' effect. It took Tim Axelrod of the Mount Stromla Observatory eight years of studying a patch of sky containing 200 million stars to find one such effect. Evidence in the Milky Way suggests that one black hole is formed every thousand years, in which case there must be ten million in our galaxy, a number which always increases because there is no known way for them to die. It appears that there is a black hole at the centre of our galaxy which is two million times as heavy as the sun, though much, much smaller, and which is causing stars to spin around it at a thousand kilometres per second.

The discovery of Black Holes is attributed to John Wheeler (1911-)

Parallel Universes

The notion of parallel universes existing in different dimensions is, for some physicists, a logical outcome of contemporary cosmology, but for others an unprovable proposition which has no place in science. John Gribbin (*Companion to the Cosmos*, p. 412), redefines the term universe to take the theory into account: 'We suggest the term "Cosmos" can be used to refer to the entirety of space and time, within which (if the inflationary scenario is correct) there may be an indefinitely large number of other expanding bubbles of space time, other **universes** with which we can never communicate'.

An extreme version of the theory states that a new universe is created every time an individual makes a choice. Each option is then pursued in a different universe.

The theory is strongly associated with Roger Penrose, Stephen Hawking's teacher.

Penrose, Roger, *The Emperor's New Mind: Concerning Computers, Minds and the Laws of Physics*, Oxford: New York University Press 1990.

*

Lewis, C.S., *The Magician's Nephew*, Harmondsworth: Penguin 1955

'The Atlantean box contained something that had been brought from another world when our world was just beginning'

'What?' asked Digory, who was now interested in spite of himself.

'Only dust,' said Uncle Andrew. 'Fine, dry dust. Nothing much to look at. Not much to show for a lifetime of toil, you might say. Ah, but when I looked at that dust (I took jolly good care not to touch it) and thought that every grain had once been in another world - I don't mean another planet, you know; they're part of our world and you could get to them if you went far enough - but a really Other World - another Nature - another universe - somewhere you would never reach even if you travelled through the space of this universe for ever and ever - a world that could be reached only by Magic - well!'¹¹

¹¹ Lewis, C.S., *The Magician's Nephew*, Harmondsworth: Penguin 1955, p. 25.

'What's the matter?' said Polly.

'I've just had a really wonderful idea,' said Digory. 'What are all the other pools?'

'How do you mean?'

Why, if we can get back to our own world by jumping into this pool, mightn't we get somewhere else by jumping into one of the others? Supposing there was a world at the bottom of every pool!...Think of our tunnel under the slates at home. It isn't a room in any of the houses. In a way, it isn't really part of any of the houses. But once you're in the tunnel you can go along it and come out into any of the houses in the row. Mightn't this wood be the same? - a place that isn't in any of the worlds, but once you've found that place you can get into them all.¹²

*

See the news report and discussion at

http://comments.breitbart.com/pauniverse_sun14_parallel_universes/

The Search for a Universal Theory - or Theory of Everything (TOE)

Since God was replaced as the source of everything, the search has begun for a single explanatory theory or fundamental particle to explain everything.

Unified Field Theory

Prior to 1831, when Michael Faraday observed that magnetic fields could include electric currents, magnetism and electricity had been thought of as unrelated phenomena. (Of course, until the 17th c they were related in the sense that all things were related). In 1864 James Clerk Maxwell published his paper on electromagnetism, encompassing both phenomena. However, the arrival of quantum mechanics demonstrated that the theory breaks down at the quantum level. Since then attempts have focused on the unification of

1. The strong force, which holds quarks together to form neutrons and protons and neutrons and protons together to form nuclei; facilitated by gluons.
2. The weak force, short-range, responsible for radioactivity; facilitated by the W boson.
3. Electromagnetism, acts on electrically charged particles, facilitated by the photon.
4. Gravity, long range, acts on all particles, facilitated by gravitons.

Superstring Theory

The fundamental constituents of the universe are vibrating strings of 10^{-33} cm. The hypothetical graviton (see above) is supposed to be such a string with a wave amplitude of zero. The theory suggests a universe which has up to 26 dimensions.

Platonism

The sceptic might wonder whether such theories are variations on the Pythagorean/Platonic tradition. There is evidence that they are right:

'...in order to convey a mathematical idea (usually in verbal descriptions), such precision may sometimes have an inhibiting effect at first, and a more vague and descriptive form of communication may be needed. Once the idea has been grasped in essence, then the details may be examined afterwards.

¹² Lewis, C.S., *The Magician's Nephew*, Harmondsworth: Penguin 1955, p. 36.

How is it that mathematical ideas can be communicate in this way? I imagine that whenever the mind perceives a mathematical idea, it makes contact with Plato's world of mathematical concepts...when one 'sees' a mathematical truth, ones; consciousness breaks through into this world of ideas, and makes direct contact with it ('accessible via the intellect'). I have described this 'seeing' in relation to Gödel's theorem, but it is the essence of mathematical understanding. When mathematicians communicate, this is made possible by each one having a *direct route to truth*, the consciousness of each being in a position to perceive mathematical truths directly, through this process of 'seeing'. (Indeed, often this act of perception is accompanied by words like 'Oh, I see'!) Since each can make contact with Plato's world directly, they can more readily communicate with each other than one might have expected. The mental images that each one has, when making this Platonic contact, might be rather different in each case, but communication is possible because each is directly in contact with the *same* externally existing Platonic world!

According to this view, the mind is always capable of this direct contact. But only a little may come through at a time. Mathematical discovery consists of broadening the area of contact. Because of the fact that mathematical truths are necessarily truths. No actual 'information', in the technical sense, passes to the discoverer. All the information is there all the time. It was just a matter of putting things together and 'seeing' the answer! This is very much in accordance with Plato's own idea that (say mathematical) discovery is just a form of *remembering*! Indeed, I have often been struck by the similarity between just not being able to remember someone's name, and just not being able to find right mathematical concept. In each case, the sought-for concept is in a sense already present in the mind...¹³

The Assignment of Meaning

We might, then, begin to consider whether modern cosmology should be considered as a 'meaning system'? If so, does it have values?

Complexity Theory

Simply Complexity Theory holds that large complex systems may be regulated by laws which Only arise in those complex systems and cannot be satisfactorily understood by laws identified by identifying simple systems. In other words, scientific reductionism, which tries to reduce human understanding of the world to simple laws may be misleading.

As Waldrop (below) tells the story (p. 81), Complexity Theory emerged largely because the physicist Philip Anderson became frustrated with the reductionism of modern physics and the arrogance which not only dismisses any non-orthodox-scientific modes of inquiry, but also allows individual scientists to dismiss theories with which they disagree without real argument. In 1972 Anderson write 'The ability to reduce everything to simple fundamental laws does not imply the ability to start from those laws and reconstruct the universe. In fact, the more the elementary particle physicists tell us about the nature of the fundamental laws, the less relevance they seem to have to the very real problems of the rest of science, much less society' ('More is Different, *Science*, 1972).

Further while the belief in the existence of universal natural laws which operate equally in all parts of the universe is necessary to the modern scientific mode of inquiry, Anderson was critical of the consequent belief that therefore natural laws are the only things worth studying.

¹³. Penrose, Roger, *The Emperor's New Mind: concerning computers, minds and the laws of physics*, London: Vintage 1991, p.554-5.

Waldrop, M. Mitchell, *Complexity: The Emerging Order at the Edge of Order and Chaos*, London: Simon and Schuster 1993

Paul Davies has also written on Complexity Theory: He argues (1987: 4) that 'the modern picture is of a cosmos starting out in an utterly featureless state, and then progressing step by step - one may say unfolding - to the present kaleidoscope of organized activity'. Davis argues that it is possible to identify the common principles of complex organisation in chemical reactions, biological processes and artificial intelligence.

Davies, Paul, *The Cosmic Blueprint: Order and Complexity at the Edge of Chaos*, London: Penguin 1987.

James Gleick: 'No matter what the medium, the behaviour obeys the same newly discovered laws. That realisation has begun to change the way business executives make decisions about insurance, the way astronomers look at the solar system, the way political theorists talk about the stresses leading to armed conflict'.¹⁴

Gleick discusses the apparent mathematical precision of the forecasts of planetary motion but reminds us that these can never be perfect. There will always be a small margin of were, no matter how miniscule. Hence these forecasts are really prophecies.¹⁵

Cosmic Order: An Article from the Web and a Response

Galaxies Trapped in the Universe's Web

http://www.universetoday.com/am/publish/trapped_in_web.html?442006

Tue, 04 Apr 2006 - Although the galaxies we see in the night sky seem randomly strewn across the heavens, they're actually organized into large scale structures that look like cosmic filaments. These filaments and walls surround huge bubble-like voids that lack any large structures at all. European astronomers measured the orientation of thousands of galaxies, and found that many are oriented in the direction of these linear filaments.

Full article

Galaxies are not randomly distributed. Astronomers from the University of Nottingham, UK, and the Instituto de Astrofísica de Canarias (Spain), have found the first observational evidence that galaxies are not randomly oriented.

Instead, they are aligned following a characteristic pattern dictated by the large-scale structure of the invisible dark matter that surrounds them.

This discovery confirms one of the fundamental aspects of galaxy formation theory and implies a direct link between the global properties of the Universe and the individual properties of galaxies.

Galaxy formation theories predicted such an effect, but its empirical verification has remained elusive until now. The results of this work were published the 1 April issue of *Astrophysical Journal Letters*.

¹⁴ Gleick, James, *Chaos: The Amazing Science of the Unpredictable*, London: Vintage 1998, p. 5.

¹⁵ Gleick, James, *Chaos: The Amazing Science of the Unpredictable*, London: Vintage 1998, p. 14.

Nowadays, matter is not distributed uniformly throughout space but is instead arranged in an intricate "cosmic web" of filaments and walls surrounding bubble-like voids. Regions with high galaxy concentrations are known as galaxy clusters whereas low density regions are termed voids.

This inhomogeneous distribution of matter is called the "Large-scale distribution of the Universe." When the Universe is considered as whole, this distribution has a similar appearance to a spider's web or the neural network of the brain. But it was not always like this.

After the Big Bang, when the Universe was much younger, matter was distributed homogeneously. As the Universe was evolving, gravitational pulls began to compress the matter in certain regions of space, forming the large-scale structure that we currently observe.

According to these models and theories a direct consequence of this process is that galaxies should be preferentially oriented perpendicularly to the direction of the linear filaments.

Several observational studies have looked for a preferential spatial orientation (or alignment) of galaxy rotation axes with respect to their surrounding large-scale structures. However, none of them have been successful, due to the difficulties associated with trying to characterise the filaments.

The research conducted by the astrophysical group formed by Ignacio Trujillo (University of Nottingham, UK), Conrado Carretero and Santiago G. Patiri, (both from the Instituto de Astrofísica de Canarias, Spain) has been able to measure this effect, confirming theoretical predictions.

To achieve this goal, they used a new technique based on the analysis of the huge voids that are found in the large-scale structure of the Universe. These voids have been detected by searching for large regions of space depleted of bright galaxies.

In addition, they took advantage of information provided by the two largest sky surveys yet undertaken: the Sloan Digital Sky Survey and the Two Degree Field Survey. These surveys contain positional information for more than half a million galaxies located within a distance of one billion light-years of the Earth.

Other parameters provided by the surveys, such as the position angle and the ellipticity of the objects, were used to estimate the orientation of the disk galaxies.

"We found that there is an excess of disk galaxies that are highly inclined relative to the plane defined by the large-scale structure surrounding them," explained Dr. Trujillo. "Their rotation axes are mainly oriented in the direction of the filaments.

"Our work provides important confirmation of the tidal torque theory which explains how galaxies have acquired their current spin," said Trujillo.

"The spin of the galaxies is believed to be intrinsically linked to their morphological shapes. So, this work is a step forward on our understanding of how galaxies have reached their current shapes."

Dr. Ignacio Trujillo has a research assistant position, funded by PPARC, in the School of Physics and Astronomy at the University of Nottingham.
An abstract of the paper is available on the web at:

<http://xxx.lanl.gov/abs/astro-ph/0511680>

Original Source: RAS News Release

Comment from Axel Harvey:

The Universe Today article shows the dangers of careless popularizing. Words are used so loosely (notably "direction") that I had no idea whether galaxies tend to be oriented one way or 90 degrees there from. Fortunately there was a link to the abstract,

<http://xxx.lanl.gov/abs/astro-ph/0511680>

which sets us right with a clear picture: "spiral galaxies located on the shells of the largest cosmic voids have rotation axes that lie preferentially on the void surface." Why couldn't they have said something simple like that?

Abstract

Detection of the effect of cosmological large-scale structure on the orientation of galaxies
<http://xxx.lanl.gov/abs/astro-ph/0511680>

Authors: [Ignacio Trujillo](#), [Conrado Carretero](#), [Santiago G. Patiri](#)

Comments: Accepted for publication in ApJ Letters; Face-on galaxies included and improved discussion on statistical methods; High resolution figures will be published in the Journal version

Galaxies are not distributed randomly throughout space but are instead arranged in an intricate "cosmic web" of filaments and walls surrounding bubble-like voids. There is still no compelling observational evidence of a link between the structure of the cosmic web and how galaxies form within it. However, such a connection is expected on the basis of our understanding of the origin of galaxy angular momentum: disk galaxies should be highly inclined relative to the plane defined by the large-scale structure surrounding them. Using the two largest galaxy redshift surveys currently in existence (2dFGRS and SDSS) we show at the 99.7% confident level that these alignments do indeed exist: spiral galaxies located on the shells of the largest cosmic voids have rotation axes that lie preferentially on the void surface.

I have reproduced the above (1) to show how cosmological ideas of order are (a) developing (b) may be reported and (c) to encourage thought as to how they might be adapted in 'New Age' cosmology.

Rupert Sheldrake - morphic fields

Rupert Sheldrake's radical model of the cosmos is based partly in Platonic and Aristotelian models, partly on modern field theory.

1. In modern physics fields are considered a standard organising principle: gravitational fields, electro-magnetic-magnetic fields.
2. Morphogenetic fields are used to explain why biological organisms grow into complex entities. DNA measures proteins, but it is not understood why or how a sperm and an egg grow into a human being. When a newt eye is cut it repairs itself in a different manner to the way in which the eye develops in the embryo - suggests a different model.

3. There can be different fields at different levels of complexity.
4. Fields operate in different ways. Electromagnetic fields weaken over distance. Quantum fields do not
5. Sheldrake postulates morphic fields which organise animal behaviour - as evident in the rapid changes of direction by a swooping flock of birds.
6. Such fields contain the organising fields for behaviour (= Platonic antecedents).
7. Sheldrake argues that these work according to the model of the 'extended mind': rather than experiencing the world only as a series of images inside our head, he argues that our mind expands to encompass the objects we see, including stars. (With Descartes the mind shrank to within the head - Cogito ergo sum.)

Sheldrake also argues that the notion of immutable physical laws is essentially anthropomorphic and imperialistic - an extension into the universe of the notion that all human society must be governed by laws. The comparison is with Hobbes, in whose mechanical universe people became atomised individuals instead of members of a collective, and the need for law to restrain them became even more urgent.

The Politics of the Space Race

If contemporary astrology exists within a cultural context, how might that be related to other aspects of our relationship with the stars? Has the space race influenced the way we see astrology?

For political imperatives influencing President Kennedy's decision to race the USSR to land a man on the moon see:

<http://history.nasa.gov/moondec.html>
<http://www.wamu.org/special/moon.html>

The Influence of the Space Race on Politics

Apart from the Cold War rivalry between the USA and Soviet Union which fuelled the space race, it is generally agreed that the first photographs of the earth as a sphere from space influenced concepts of what it is to (a) live on one planet rather than a mosaic of countries and cultures and (b) be so alone in space, the consequence of which is that humanity should cooperate rather than compete. The use of one of these images on the cover of the Whole Earth Catalogue graphically makes the connection between the realisation that the earth is a single organism and the growth of environmental politics.

Cosgrove's book (see Further Reading) covers images of the earth from the classical period and includes discussion of the modern photographs of earth from space.

Fiction: *Contact* by Carl Sagan (1985)

"You're telling me there's a message in eleven dimensions hidden deep inside the number pi? Someone in the universe communicates by ... mathematics? But ... help me, I'm really having trouble understanding you. Mathematics isn't arbitrary. I mean pi has to have the same value everywhere. How can you hide a message inside pi? It's built into the fabric of the universe."

"Exactly." She stared at him.

"It's even better than that," he continued. "Let's assume that only in base-ten arithmetic does the sequence of zeros and ones show up, although you'd recognize that something funny's going on in any other arithmetic. Let's also assume that the beings who first made this discovery had ten fingers. You see how it looks? It's as if pi has been waiting for billions of years for ten-fingered mathematicians

with fast computers to come along. You see, the Message was kind of addressed to us."

A typical discussion from the web: Scientific Law?

To Infinity ... and Beyond! (continued)

By Jeff Greenwald

http://www.wired.com/wired/archive/6.07/es_warp.html?pg=2

Do the math. Even if we had a spaceship that could cruise 50 times faster than the fastest speed ever attained by a human-made object (37,000 miles per hour, the speed of the interplanetary probe Voyager as it left our solar system), a trip to Barnard's star would take more than 2,000 years - one way.

"Sagan-type questions"

*In his book *Black Holes & Time Warps*, physics luminary Kip Thorne recalls the time when astronomer Carl Sagan asked him for advice. Sagan was working on a novel - *Contact* - and wanted a character to be able to travel from Earth to the Vega system in no time flat.*

Sagan's call motivated Thorne to think about wormholes (which we'll get to later). It also inspired Thorne to broaden his style of thinking in general, and consider what he now calls a "Sagan-type question": What things do the laws of physics permit an infinitely advanced civilization to do, and what things do those laws forbid?

By "infinitely advanced," Thorne imagined a civilization for which no amount of energy or know-how is out of reach. The only obstacles are those dictated, irrevocably, by the laws of physics themselves.

"We physicists," Thorne writes, "have tended to avoid such questions because they are so close to science fiction. While many of us may enjoy reading or even write some, we fear ridicule from our colleagues for working on research close to the science fiction fringe."

A number of the papers presented at Millis's BPP workshop certainly walked that line. Research into time travel and infinite-energy sources would be a deadly career move for most scientists. But if there was one thing the presenters at the workshop had in common, it was a willingness to take our most basic preconceptions about space travel - and physics itself - by the horns.

Such out-of-the-box thinking can pay dividends. Fifty years ago, the transistor - a stunning breakthrough in electronics - was invented at Bell Labs. Today, we sneer at the memory of house-sized mainframes and bark into digital cell phones without a second thought. What Millis and his loosely knit think tank hope to do is launch a similar revolution in the field of propulsion. The three goals of the BPP program, he declares, point to the major breakthroughs needed if we hope to reach the stars.

"Goal one," Millis states, "is finding a way to fly a spacecraft without using vast amounts of propellant. This means discovering fundamentally new ways to create motion, possibly by manipulating space-time itself." Goal two is achieving the

ultimate transit speed. This means travel up to or beyond the speed of light, if possible - and Millis would like to believe that it is. "Goal three," he concludes, "is finding new methods of generating energy, so that we can meet the power requirements of the first two goals."

All three goals are daunting, but goal two may prove the most formidable of all.

Up against the law

For decades, the speed of light itself - 186,000 miles per second - has been the Holy Grail of sci-fi spaceships, and like the Grail, it is unattainable. No matter what miracles we humans may achieve - peace on Earth, artificial intelligence, or a Cubs World Series victory - we will never ,ever accelerate a vehicle to light speed.

Why not? Because special relativity, formulated by Albert Einstein in 1905, forbids it.

Einstein discovered that the speed of light, like a fine scotch, never varies. It is absolute for an observer, whether that observer is moving or still. As we approach that velocity, we enter a very different world from the one we're used to. Driving through Baja California, for instance, we constantly modify our speed. Time flows at a constant pace, and the distance between Tijuana and Cabo San Lucas holds steady. As we approach the velocity of light, however, all that changes. With speed locked down, space and time become malleable, bending and stretching like Silly Putty.

No one denies how wacky this seems, or how unfair this speed limit is to Han Solo wannabes. If special relativity were a religion, we could argue with it, we could contest the arrogant notion that Einstein's opinion is a universal truth.

But special relativity is not a religion, or a matter of faith at all. It's the law - for humble earthlings and infinitely advanced civilizations alike. Every one of Einstein's predictions about the seemingly absurd relationship between velocity, time, and mass have proven true - not just on Earth, but as deep into space as we can see.

An example of 'New Age' Cosmology

Gatekeeper Trust Spring Conference 14th and 15th April 2007

Colet House, 151 Talgarth Road, London W14 9DA

Song of the Universe

Dr Jude Currivan PhD and John Reid with Charlotte Yonge and Lynne Watson

A revolutionary new vision of the world is emerging that reconciles science, consciousness and the spiritual insights of all traditions. This vision is of an inter-related and conscious Cosmos where all that we term reality is an integrated whole.

Like the ancient sages, science is now describing this vision in the language of music – a co-creative cosmic symphony of harmonic energies. But even more fundamental than the energetic 'notes' of this universal symphony is the information – the song – that is its purpose and meaning.

This weekend, we will discover and explore together the song of the universe.

Jude's keynote talk will introduce this emergent and empowering new vision and what she feels it means for each and every one of us in these momentous times.

In the first of two experiential workshops, Jude will share how to access newly available energies to attune to our own higher awareness for healing and wholeness and to become aware of our soul purpose. We will also explore how to become more coherent in our intentions and how to co-create from the highest purpose.

In the second of her two workshops Jude will share we can now access these newly available energies to attune ourselves more profoundly to the Cosmos than ever before. And as we journey together towards 2012 and beyond to hear, dance and co-create the song of the universe at planetary and cosmic levels.

John Stuart Reid's Secrets of Sound workshop will include live demonstrations of his Cymascope and participants will be able to see their own voice patterns in addition to those of birds, whales, dolphins and even the planets. John will share many of the mysteries of sound that science is now revealing, including how sound heals. We will also participate in creative rhythm and sound sessions each day to harmonise and attune ourselves to the song of the universe, led by Charlotte Yonge and Lynne Watson.

Combining two two-part workshops by leaders in their respective fields, this conference will help us move to a higher understanding of our role in the co-creation of the Universe.

Saturday 14th April 10am to 5pm, Sunday 15th April 10am to 4.30pm
Cost: £80 for full weekend, £40 each day (please make cheques out to Gatekeeper Trust).

For more details and to book, please contact Gatekeeper Secretary
Richard Douglas

Tel: 01803 864 680 Email: secretary@gatekeeper.org.uk

Further Reading

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An excellent account of pattern and harmony in the universe by the Professor of Astronomy at the University of Sussex in England.

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Murdin, Paul (ed.), *Encyclopaedia of Astronomy and Astrophysics*, Institute of Physics Publishing 2001.

An expensive work (£450 in print or £300 on line at www.ency-astro.com), this is a comprehensive and essential reference.

North, John, *The Fontana History of Astronomy and Cosmology*, London: Fontana 1994.

Pasachoff, Jay M., *Astronomy: From the Earth to the Universe*, New York: Saunders College Publishing, 4th edn., 1993.

An illustrated astronomy text book aimed at undergraduates and a general market. Well illustrated and fairly easy to understand.

Time

Raju, C.K., *The Eleven Pictures of Time: The Physics, Philosophy and Politics of Time Beliefs*, London: Sage Publications 2003.

Space Flight:

NASA's History Office: <http://history.nasa.gov/>

NASA Histories On-Line: <http://www.hq.nasa.gov/office/pao/History/on-line.html>