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# JEWISH MYSTICISM AND MODERN COSMOLOGY

Paul Marshall

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## Abstract

Parallels have sometimes been drawn between the theories of modern physics and the teachings of Eastern mystical philosophy. More recently, Jewish mysticism – which has much to say about ‘beginnings’ – has been linked with modern cosmology, in particular with the widely accepted cosmological model that traces the origin of the universe to a primordial Big Bang. How seriously should we take comparisons between such disparate bodies of thought, and what contributions might the comparisons make to the broader field of science–religion relations?

## Introduction

It is no exaggeration to say that cosmologies – accounts of the origin, destiny, and structure of the universe – have been a central component of most religions, and Judaism is no exception. Indeed, by opening with an account of God’s act of creation, the Hebrew Scriptures gave special prominence to the idea of a creator God and a created world. Norbert M. Samuelson, Professor of Religious Studies at Arizona State University, has written extensively on the Creation in Jewish thought, and claims that ‘no topic ... is more fundamental to Judaism than the question of the creation of the universe’. He points out that nearly all Jewish thinkers before the modern period viewed the doctrine of ‘God as creator’ as *the* fundamental belief, or at least as one of the defining, basic beliefs of Judaism.<sup>1</sup> In fact, Samuelson maintains that the task of finding a cosmological scheme that will aid the interpretation of the scriptural account of creation is as much a religious duty as legislating civil laws or establishing exactly when a festival begins and ends. But why a religious duty? To learn as much as one can in one’s life is to come to know God through his acts. The cosmos is God’s creation, and so to study the world is to come to know God.<sup>2</sup> It is also the case that in recent centuries, new scientific cosmological accounts have emerged, and religious believers of all faiths are challenged to consider whether their traditional cosmologies agree or conflict with the discoveries of modern astronomy and physics. Does modern science support, contradict or have no relevance at all to religious teachings on

the nature and origins of the universe? A steady stream of books and conferences, most often from a Christian perspective, explores the interface between religion and cosmology.<sup>3</sup>

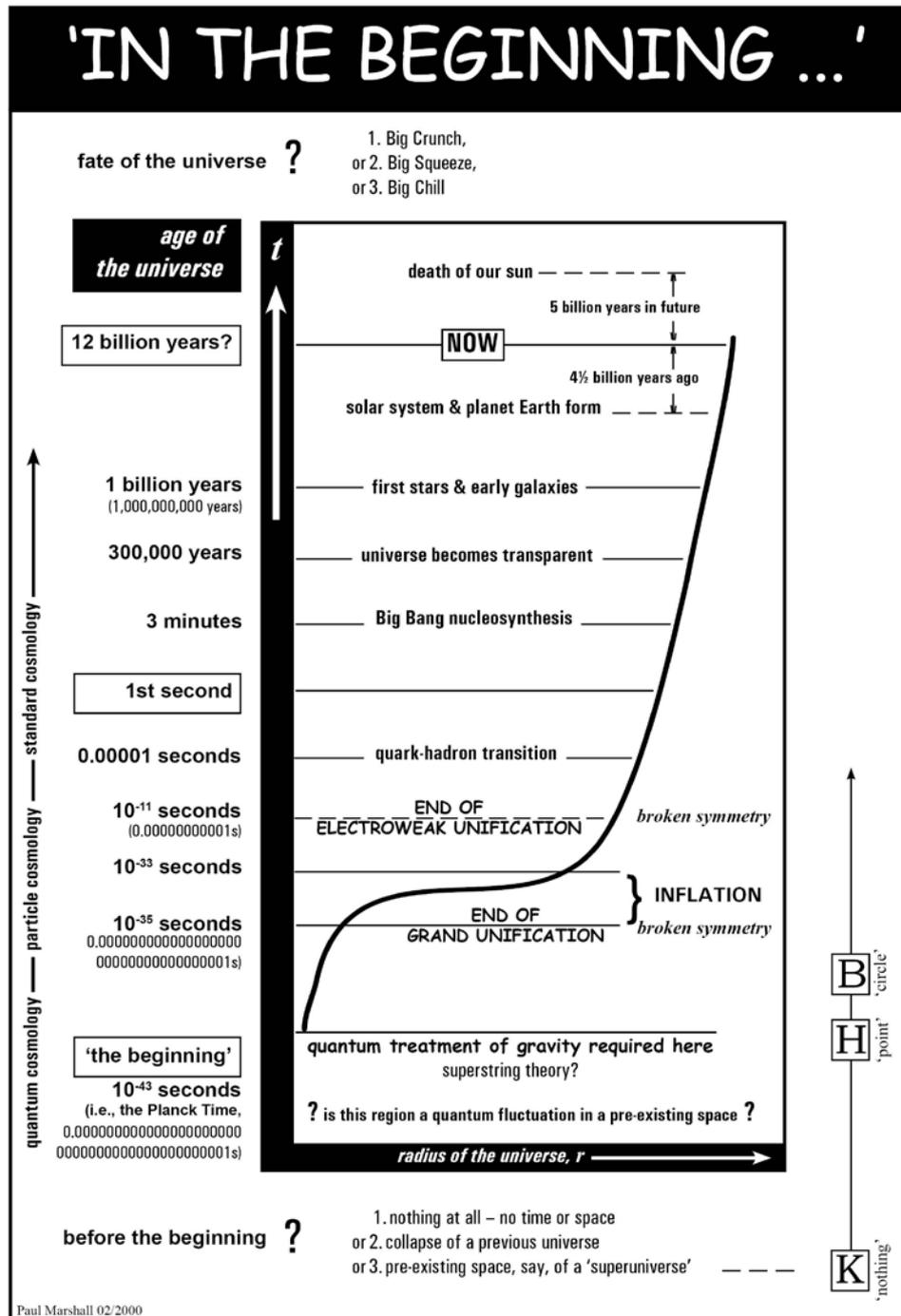
In this talk, I shall be looking at a contemporary move to forge links between religious and scientific cosmologies, an attempt of interest to us here because it brings together Jewish mystical thought and the currently popular Big Bang theory of cosmic evolution. I should say straight away that I'm not a specialist on modern cosmology or Jewish mysticism. However, I shall try to give some sense of the links that have been made between these two apparently disparate fields of endeavour. Before I look specifically at the supposed connections, I'll say something about how religion, cosmology, and Big Bang theory come together, and this will include a little information on selected features of the current scientific picture of the universe and its evolution. I'll then proceed to the links that have been drawn between modern cosmology and Kabbalistic forms of Jewish mysticism, and I'll conclude by taking a look at the reasons why those who have made the links think it is a worthwhile pursuit.

## **Religion, Cosmology and the Big Bang**

Religions offer answers to the big questions, to questions about meaning and purpose: who are we? why are we here? how should we live our lives? It is not surprising, then, that religions should pay a great deal of attention to that mysterious stage on which the human drama unfolds – the world at large, the universe. Self-understanding calls for some degree of insight into the bigger picture: seeking to know where we come from and where we are going, we also seek to know something about the nature of the world. The nature and destiny of humankind cannot be extricated from the nature and destiny of the world.

Religions have drawn upon the sciences of their day for cosmic orientation. Medieval Jewish, Islamic and Christian cosmologies adapted Greek astronomy and philosophy. But scientific pictures of the cosmos change. The small, stable, enclosed medieval universe of nested planetary spheres revolving about the fixed Earth has given way, through a series of steps, to the much larger universe of modern cosmology in which the Earth is no longer central nor immobile. Religion, by incorporating pictures of the world that have become redundant or by claiming divine revelation on cosmological matters, has inevitably been confronted by scientific discoveries. The modern Earth-dweller peers out at a dynamic, sometimes extremely violent, universe of impressive age and size. In our galaxy alone, the Milky Way, there are estimated to be several 100 billion stars. Beyond the Milky Way are numerous other galaxies, say 100 billion in the observable universe. These are clumped into clusters, and the clusters in turn are gathered into enormous superclusters. On the very large scale, the universe has a sponge-like structure, with large voids bounded by superclusters, sheets and filaments of galaxies. Since the work of the astronomer Edwin Hubble in the late 1920s, it

has generally been accepted that the universe is expanding, with galaxies moving away from one another. One explanation for this observed expansion comes from so-called Big Bang theory, developed from the 1930s and 1940s, and stemming from the application of Albert Einstein's general theory of relativity to the cosmos as a whole. The universe, it seems, started off – at current estimates – about 12 billion years ago in an extremely small, dense, and hot condition, but expanded and cooled to its present state, passing through various stages of development, as illustrated here.



It is important to note that the Big Bang is not understood to be an ordinary explosion in which fragments fly apart *through* space; rather it's a case of space itself expanding *between* objects. This is obviously very strange if we are in the habit of thinking of space as sheer emptiness or nothingness. How can nothingness expand, we may ask? Space, as we appreciate today, isn't some container in which matter and radiation move around, as in the older physics, and it almost seems to have a substantial reality of its own – expanding, curving, rippling. Clearly, there are deep philosophical questions surrounding the treatment of space or vacuum in current physics, but leaving these aside, and assuming that it makes sense to talk about an expansion of space, we can use simple analogies to convey Big Bang expansion. One is the analogy of baking a raisin cake. As the cake bakes, the mix expands and carries the raisins apart. If you took the vantage point of any of the raisins, you would see the other raisins moving away from you. Likewise, in our cosmic cake, space expands and the galaxies are carried away from one another. Alternatively, one can imagine a rubber sheet with buttons attached – as the sheet is stretched, the buttons move apart. Space is like the stretching rubber sheet, and the galaxies correspond to the buttons.

I've summarized a few key moments in the long history of the expanding universe in the diagram. In fact, it's only events well within the first second of the universe's existence that will interest us here. A great deal of complicated physics is presumed to happen during this first second, and the earlier versions of the Big Bang theory had nothing interesting to say about what happened before the first ten-thousandth of a second ( $10^{-4}$ s). We'll look at the very early period shortly, as it figures in the comparisons made with Jewish mysticism, but for the moment let's jump far ahead in time and note that at about the age of 300,000 years, the universe became transparent. What this means is that radiation was now able to move relatively unhindered by interaction with matter. The radiation from this period reaches us today, although much cooled, in the form of microwaves. It forms the 'cosmic background radiation' that comes to us from all directions, and was first detected in the 1960s. You may remember the big media fanfare in 1992 when minute temperature variations or 'wrinkles' in this cosmic background radiation were announced. The variations, shown in this picture [COBE image] as colour differences, indicate uneven structure in the early universe. A certain amount of religious language became attached to the discovery. A *Newsweek* headline called it 'The Handwriting of God'. George Smoot, a senior scientist on the project remarked: 'What we have found is evidence for the birth of the universe. It's like looking at God.'

About one billion (one hundred million) years after the Beginning, the first stars and earliest galaxies were forming, as were elements, such as carbon, inside the stars. The Earth is said to be about 4.5 billion years old, and life emerged fairly soon after, in the form of single-celled organisms. We human beings, of course, come on the scene much later, only a few hundred thousand years ago. It is thought that in about 5 billion years time, the ageing sun will become hotter and temporarily expand, evaporating the oceans and bringing life on Earth to an end.

How might religion accommodate this transformed vision of the cosmos? Since the idea of an expanding universe came on the scene about 70 years ago, a few Christian theologians and scientists with religious beliefs have occasionally suggested that the new cosmology offers support for the idea of a creator God. Indeed, Pope Pius XII went so far as to endorse Big Bang theory in 1951, arguing that the theory was compatible with the opening words of Genesis.<sup>4</sup> Science and religion were to be viewed as in *accord*, in agreement, at least over the creation of the universe. Others were not so impressed. Christian theologians have tended to be wary of taking the theory as evidence for the Creation, and some scientists have been positively hostile to the intrusion of religion into scientific matters. It is notable that the pioneers of the rival Steady State cosmology, Fred Hoyle, Thomas Gold and Herman Bondi, were all atheists, and Hoyle was particularly hostile to religion in his popular writings. Unlike the standard Big Bang theory, the Steady State theory advocated a continuous creation of matter, and so had no place for an original event and therefore, it seemed, no room for a creator God.

However, the question of whether a religious creation account is compatible with a scientific cosmology is not as straightforward as it might seem, and Big Bang cosmology has no unequivocal claim to be the scientific cosmology most compatible with Creation teachings. For one thing, a religious tradition is likely to contain more than one understanding of what creation means. Is creation about the production of the world at the start of cosmic history, or is it about a timeless, causal relation between God and the world, or about God as a continuous creator, acting from moment to moment? If eternal cause or continuous creator is stressed, then the Steady State theory could be considered just as compatible with the idea of a creator God as its more successful Big Bang rival. Another hotly debated science–religion issue is closely related to the question of the creation. There has been much discussion recently about design in the universe at large. The universe appears to be set up in just the right way for the emergence of life, an observation that can lead to the idea of a purposeful creation. Any slight deviations in the physical equations or constants, it is claimed, would have made life-as-we-know-it – and perhaps biological life in any form – impossible. It seems to some, then, that an intelligent, cosmic designer was at work, whilst others argue otherwise.

## **Links between Kabbalah and cosmology**

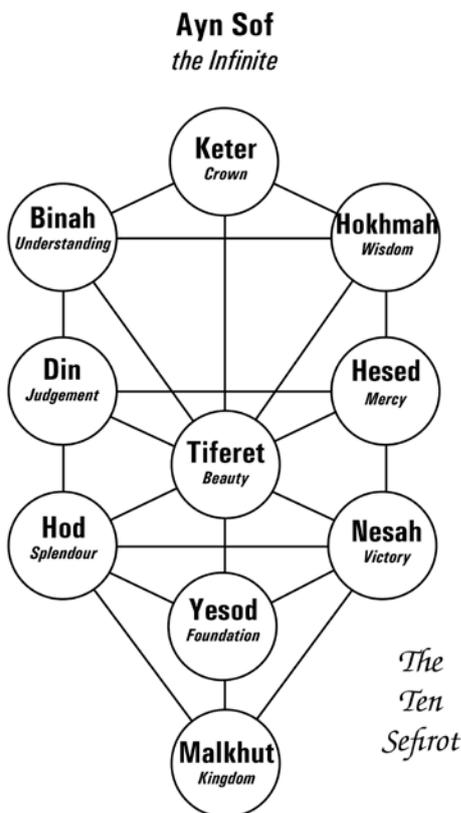
Let's turn now to our topic of special interest, Kabbalah and cosmology. Jewish mystical thought has found itself linked with modern cosmology primarily because both have much to say about beginnings. Gershom Scholem, whose work was so important for establishing Jewish mysticism as a subject of scholarly study, pointed out the significance of the creation for the Jewish mystical aspirant who goes in search of God. To probe into the spiritual dynamics of the creation is, in fact, to seek knowledge of the paths that lead back to God. To quote Scholem:

The consensus of Kabbalistic opinion regards the mystical way to God as a reversal of the procession by which we have emanated from God. To know the stages of the creative process is also to know the stages of one's own return to the root of all existence. In this sense, the interpretation of *Maaseh Bereshith* [the story of creation], the esoteric doctrine of creation, has always formed one the main preoccupations of Kabbalism.<sup>5</sup>

Not all Jewish mysticism focuses on the creation, but the creation does constitute one of its main themes and was a matter of interest well before the emergence of Kabbalistic forms of Jewish mysticism from the late twelfth century CE. In the theosophical stream of Kabbalah, prominence was given to the *sefirot*, the ten qualities of God or the ten divine emanations that lie between the infinite, ineffable Godhead and the created worlds of the angels, heavens, and earth. The sefirot are often depicted in a tree-of-life arrangement, in which the first *sefirah* – *Keter* or Crown – emerges from or is an aspect of *Ayn Sof*, the infinite Godhead that in itself is concealed, but which becomes revealed through the *sefirot*. As we'll see in a moment, it is the first three *sefirot* that particularly concern us, *Keter*, *Hokhmah* (wisdom) and *Binah* (understanding), not the 'lower' seven.

Several authors have made links between Jewish mysticism and modern science, sometimes in passing, with little or no elaboration and probably with no serious intent. For instance, Clifford

Pickover, in a popular book on concepts of higher-dimensional space,<sup>6</sup> remarks that whenever he reads about superstring theory he is reminded of the Jewish Kabbalah and its doctrine of the ten *sefirot*.<sup>7</sup> Superstring theory is the most ambitious and promising attempt to date to produce a unified theory of the forces of nature and the ultimate constituents of the physical world, and one of its peculiar features is that – in one version at least – it utilises a total of *ten* physical dimensions, not just the familiar time dimension and three space dimensions of everyday physics. In his book, Pickover includes two large illustrations of the *sefirot* arranged as the tree of life, but he doesn't explain just how seriously he takes the numerical correspondence to be between the ten physical dimensions and the ten *sefirot*.



More extended comparison and comment comes from other authors, and I shall draw upon

two cases here. One is an article entitled “‘In a Beginning ...’ Quantum Cosmology and Kabbalah’ by husband and wife Joel R. Primack and Nancy Abrams.<sup>8</sup> Primack is Professor of Physics at the University of California at Santa Cruz and is known for his work on ‘cold dark matter theory’ (CDM), which concerns a special type of matter that may help to explain the gravitational behaviour of galaxies and larger structures. My other source is a book entitled *God and the Big Bang* by Primack’s friend Daniel C. Matt, Professor of Jewish Spirituality at the Graduate Theological Union, Berkeley, California.<sup>9</sup> Primack, Abrams, and Matt are primarily concerned with cosmology, specifically with questions about the very early origins of the universe. It is links between modern cosmology and Kabbalistic insight into the divine creation that draw their attention. In their paper, Primack and Abrams link Kabbalah to some recent developments in Big Bang theory, dating from the 1970s and 80s, concerning the very early stages of the cosmic expansion.

As I noted before, the classic Big Bang theory says nothing useful about the very early stages, before the first ten thousandth of a second. The application of particle physics to cosmology, however, has pushed back the limits to an earlier period, described as ‘particle cosmology’, and some cosmologists press on to an even earlier time for which a quantum theory of gravity is needed, but has so far has proved largely elusive. The more cautious and conservative physicists are reluctant to speculate about this very early period of ‘quantum cosmology’. However, we need to look into these very early stages to understand the connections made with the Kabbalah.

According to one idea, the universe may, in some sense, appear out of ‘nothing’. According to quantum physics, particles can temporarily manifest out of apparently empty space – the vacuum – as energy fluctuations. It’s as if space is bubbling with short-lived particles, coming into and going out of existence. It’s even possible for a bubble to have an enormous mass-energy, equivalent to the universe, although it would exist for only an extremely short period, collapsing almost instantaneously.<sup>10</sup> So perhaps, it might be conjectured, the origin of the universe is to be explained in a similar way, as a *quantum fluctuation*. But a fluctuation of what? A pre-existing vacuum? One highly speculative idea locates the fluctuation in a tiny region of space that belongs to another universe. The very first moment, then, let’s say the first  $10^{-43}$  second – represented by this region of the diagram – is a fluctuation in the space of another universe. Alternatives to this proposition would be that there was nothing at all, no space, no time, before the beginning (No. 1), or that the Big Bang was preceded by the collapse of a previous universe, which then re-expands, the so-called oscillating or Phoenix model (No. 2). But returning to the fluctuation idea, No.3 here, a further highly speculative conjecture emerges, about a superuniverse in which new universes are continuously sprouting as buds or bubbles. Hence, Primack and Abrams call their paper ‘In a Beginning’ not ‘In the Beginning’, for there are many universes sprouting into existence, if this idea is to be believed. However, before any such ideas can be maintained, it’s necessary to explain why a bubble that is destined to become a universe doesn’t immediately collapse under the enormous gravitational force

associated with its huge amount of mass-energy. Here a second idea proves useful, the concept of *inflation*, introduced in the early 1980s. Inflation refers to a brief period of extraordinarily rapid expansion that extends the universe from an extremely small size – very much smaller than the size of an atom or the tiny nucleus of an atom – to roughly the size of a football. It's represented in the diagram by this 'Inflaton' region here, in which the diameter of the universe is shown to increase greatly in a very short time. The rapid expansion may account for the high level of evenness in the distribution of radiation and matter in the universe, whilst tiny quantum fluctuations that occur before inflation comes to an end could be ultimately responsible for the irregularities that we have already seen in the 'picture' of the universe at 300,000 years, and now in the large-scale structure of voids and superclusters. The inflationary phase is followed by the much more sedate expansion described in the standard Big Bang theory. Applied to the highly speculative idea of the superuniverse, the following scenario emerges. The space of the superuniverse is bubbling with quantum fluctuations, and some fluctuations are transient, arising and disappearing, whilst others are subject to inflation and become full-blown new universes, which in turn sprout new universes in the same way.

How, you may wonder, does all this abstruse and – as far as the superuniverse idea is concerned – extremely speculative, contemporary physical theory relate to the Kabbalah? Primack and Abrams suggest that the first three *sefirot*, the first three divine emanations, the starting point of the emanative process that eventually leads to the creation of all the worlds, correspond to specific aspects of the inflationary, superuniverse cosmology, this model in which new universes arise as fluctuations and are then stabilised by rapid, inflationary expansion. The first *sefirah*, *Keter*, symbolising 'the unknowable God's infinite potential to create', corresponds to the bubbling vacuum of the superuniverse, the source of further universes (marked 'K' in the diagram). The second *sefirah*, *Hokhmah* ('H'), or the divine Wisdom deployed in the creation of the world and represented as a creative point flashing forth from the darkness or nothingness of *Keter*, corresponds to any point in the superuniverse that becomes the source of a new universe. Finally, the third *sefirah*, *Binah* ('B') or Understanding – that which nurtures the spark of wisdom and thereby advances creation – corresponds to the subsequent expansion of the new universe from the point. The Big Bang, combining the initial fluctuation with the expansion that brings the fluctuation to fruition, is then appropriately called *Hokhmah–Binah*, declare Primack and Abrams.

Daniel Matt makes similar correspondences with the first three *sefirot*. The mystical void, pregnant with possibilities, is related to the cosmologist's quantum vacuum, teeming with potential, and engendering the cosmic seed. Again, the Kabbalistic point of Wisdom and its expansion into the circle of Understanding are paralleled by the Big Bang expansion from a point. Matt also associates the physical vacuum with a later development in Kabbalist thought, associated with the Lurianic Kabbalah of the sixteenth century. This is the idea that the infinite God, in order to make room for the creation of the world, withdraws its light from a point to produce a space, a space filled with a

residue of the divine light and the forces needed for withdrawal. This act of divine limitation or concealment is called *tsimtsum*, or ‘contraction’, and precedes the emanation of the *sefirot* into the space and the subsequent creation of the world. Matt associates this space with the quantum vacuum – neither are truly empty.

Matt makes other correspondences too, the most important of which concerns another feature of the Lurianic Kabbalah. A complex emanative process is described during which, at one stage, vessels associated with the lower seven *sefirot* are broken or cracked by a downflux of divine light. Religious practice then aims to aid the restoration of fallen lights, a repair or mending (*tikkun*) of the divine world. Matt associates this ‘breaking of the vessels’ with the modern physical theory of broken symmetry, an idea applied to very early moments in the history of the universe. Originally, it is supposed, all four forces of nature were unified and indistinguishable, but as the universe expands and cools, the forces break off progressively, first gravity, then the strong force, becoming highly confined in range, and finally the weak and electromagnetic forces. Matt says: ‘We exist today in our present condition, with all our flaws and imperfections, because of broken symmetry, just as Jewish mysticism teaches that our jumbled, blemished reality derives from the breaking of the vessels.’ In looking back to the high temperatures of the early universe, the physicist works towards greater physical unity and symmetry in the world; likewise, the analogy goes, the religious practitioner works towards the restoration of spiritual unity.

## **Why bring Kabbalah and modern cosmology together?**

At this point, let’s turn from the correspondences to the motivation for making them. How seriously do Primack, Abrams, and Matt take the correspondences they describe. Why do they think it is worthwhile making them? Are they actually claiming that the Jewish mystics of old foresaw cosmological details that are only now being revealed by science? The answer, in short, is ... ‘No’. They are not making such a strong claim.

Primack and Abrams explain that they hope to shift us from a common but outdated picture of a universe ‘devoid of all human meaning’ to the ‘emerging scientific cosmology’, which they believe has much greater power to inspire awe and provide a source of meaning for our everyday lives. Why, though, we may ask, should they turn to comparisons with the Kabbalah, and not just popularise modern cosmology from a purely scientific point of view, like many popularisers of science? The authors believe that scientific accounts of the universe on their own are insufficient: they must be translated into stories or myths that enable a culture to connect with and give meaning to its universe. For successful community and for individual sanity, a culture needs a cosmological story that gives meaning to the universe. Primack and Abrams believe that the scientific picture as it is ordinarily expressed is unable to fulfil this role. Even modern cosmology needs the help of a special language

for its meaning to become evident. The authors therefore look for suitable languages and metaphors that will properly express the wonder and meaning of modern cosmology. It is the Kabbalah that provides them with the requisite language because it contains ideas that they believe fit ‘amazingly well’ with modern cosmology. So, according to Primack and Abrams, modern cosmology needs re-expression as a communal, meaningful story, and to do this we need special concepts. Kabbalah is able to provide these concepts.

Primack and Abrams do not claim that modern cosmology has rediscovered what Kabbalists knew centuries before. Nor do they wish to be seen as furthering the interests of Kabbalah. They explain:

We are not kabbalists, nor are we trying to promote Kabbalah. We are not arguing that Kabbalah was prescient, or that the kabbalists somehow knew mystically what science is now discovering. We are interested in Kabbalah because it developed a set of ideas describing the origin of an expanding universe and integrated these ideas into its religious worldview. Can Kabbalah help us to integrate the scientific concepts we have been describing into our own culture?

Primack, Abrams and Matt are certainly struck by similarities between Kabbalah and Big Bang cosmology, such as the idea that the universe expands from a point. In fact Primack and Abrams say that Kabbalah is the only traditional cosmology they know of in which expansion from a point is described.<sup>11</sup> However, they do not want to claim that the similarities they observe result from the ability of Kabbalists to penetrate into the origin and structure of the universe. Kabbalah provides a set of concepts for expressing modern cosmology in a way that will be useful for human society, not a set of concepts that prefigure the discoveries of modern cosmology. In fact, both Kabbalah and modern cosmology are not necessarily true in an ultimate way (after all, scientific models are superseded in time), but they can be understood as two systems of metaphor that together point toward a truth larger than either can express alone.

Similarly, Matt says he ‘is not out to prove that thirteenth-century Kabbalists knew what cosmologists are now discovering’. He sees intriguing parallels but says he is not trying to synthesise mysticism and cosmology. They are, he maintains, two distinct approaches, ‘two tools of understanding’, two approaches to ‘the questions of our origins’ that ‘are distinct and should not be confused: each is valid in its own domain’. Matt says that their respective insights ‘resonate’, leading to a deeper understanding. They are complementary, one looking at the outer world, the other at the inner.

It is fairly clear, then, that Primack, Abrams and Matt avoid outright claims of agreement between mysticism and modern physics. There is good reason for taking this more cautious approach. Previous attempts to bring together mysticism and physics, such as Fritjof Capra’s *Tao of Physics*, usually drew on Eastern mystical philosophy, Buddhist, Hindu, and Taoist. Here, for instance, we find again comparisons between the vacuum of quantum physics and the creative void of mystical

philosophies. However, Capra and others were forthright in claiming a direct connection between physics and mysticism: scientists were discovering truths that ancient mystics had realised long before.

Although well received by the general public, these earlier works have been heavily criticised by scientists and academics on several counts, including the weakness of the parallels, and the foolhardiness of tying eternal mystical truths to ephemeral physical theories, which are highly speculative or change every few years. Our authors, in contrast, make milder claims for their parallels and so are not so vulnerable to some of the criticisms. They say they look to Jewish mysticism for inspiring metaphors and resonances that will help to give depth to the modern cosmological story. They do not claim that mysticism and physics reach the same answers about the nature of reality or the origin of the cosmos. If the parallels are rather inexact, it doesn't matter too much, although the parallels do have to be sufficiently similar to create resonances. Also, if the scientific theories undergo considerable change, as they tend to do, it's not a disaster for the endeavour, because we can go and find different religious metaphors and language to give depth of meaning to our revised scientific cosmologies.

Within the larger context of science-religion dialogues and debates, these attempts to bring together Kabbalah and modern cosmology are probably best associated with the approach that takes science and religion to be *complementary*. The language and metaphors of Jewish mysticism and modern cosmology are complementary ways of talking about our origins and together give a fuller picture of the truth. This general attitude, which values science–religion interaction, may be called *complementarism*: it is accepted that science and religion can be concerned with a common subject-matter – in our case, cosmological matters – but it is held that they look at two different *aspects* of the same thing, or provide two different *descriptions* of the same thing. Together science and religion give a more rounded picture than either could provide on its own. They complement each other.

In contrast, the literature represented by Capra's *Tao of Physics* claimed an actual consonance or concordance between Eastern mysticism and physics. Mysticism and physics are not merely complementary but reach the same truths about the world. Primack, Abrams and Matt do not seem to go this far. Their positions are milder, standing somewhere between those who see perfect agreement ('concord') and those who argue that science and religion are irreconcilable enemies ('conflict'), or those who argue that science and religion are two completely different endeavours that should be kept apart ('separation'). Matt adopts the language of separationism when he says that mysticism and modern cosmology 'are distinct and should not be confused: each is valid in its own domain', but I think his basic position is complementarist. Mysticism and scientific cosmology can be brought together as complementary descriptions that together give a richer account. Those who truly insist on the distinctness of science and religion would say that the two should be kept well apart, isolated in their own domains. Like the tiger and the shark, each is master of its own domain but powerless

outside it. Science, it is said, employs reason, uncovers facts, and investigates the ‘how’ of things, whilst religion relies on faith, is concerned with values and ethics, and searches for the ‘why’ behind things. Scientists and religious thinkers should keep to their proper areas of concern because there is no profit in mixing unrelated fields.<sup>12</sup> It is clear, though, that Matt, like Primack and Abrams, sees profit in bringing religious and scientific accounts together. They believe that Jewish mystical pictures of creation add a much needed dimension of value and meaning to the bare, scientific cosmology, and they believe that Jewish mysticism is up to the task because its resources of concept and metaphor are peculiarly suited to modern cosmological ideas. Jewish mysticism can turn contemporary cosmology into a *meaningful* story.

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<sup>1</sup> Norbert M. Samuelson, *Judaism and the Doctrine of Creation*, Cambridge University Press, 1994, p.18. See also Arthur Green, *Seek My Face, Speak My Name*, Aronson, 1992.

<sup>2</sup> Samuelson, pp. 5, 15.

<sup>3</sup> Some examples: Willem Drees, *Beyond the Big Bang: Quantum Cosmologies and God*, Open Court, 1993; Christopher Southgate et al, *God, Humanity and the Cosmos*, Trinity Press, 1999; Paul T. Brockelman, *Cosmology and Creation: The Spiritual Significance of Contemporary Cosmology*, Oxford University Press, 1999.

<sup>4</sup> On the history of Big Bang theory, and some of the religious aspects, see Helge Kragh, *Cosmology and Controversy: The Historical Development of Two Theories of the Universe*, Princeton University Press, 1996.

<sup>5</sup> Gershom G. Scholem, *Major Trends in Jewish Mysticism* (1961 [1941]), p.20.

<sup>6</sup> Clifford A. Pickover, *Surfing Through Hyperspace*, Oxford University Press, 1999.

<sup>7</sup> He explains that the sefirot are traceable to the fourth-century common-era text, the *Sefer Yezirah*, or ‘Book of Creation’, in which they are ‘numbers’.

<sup>8</sup> Joel R. Primack and Abrams, Nancy Ellen 1995. “In a Beginning ...” *Quantum Cosmology and Kab-ba-lah*. *Tikkun* 10 (1): 66–73.

<sup>9</sup> Matt, Daniel C. 1996. *God and the Big Bang: Discovering Harmony Between Science and Spirituality*. Woodstock, Vermont: Jewish Lights Publishing.

<sup>10</sup> The greater the energy, the shorter the life of the fluctuation, in accordance with Heisenberg’s Uncertainty Principle.

<sup>11</sup> But note the *bindu* of Hindu cosmology.

<sup>12</sup> Separationism or isolationism can have different motives. For religious thinkers, the position may be attractive because it seems to provide a way of defending religion against modernist threats of science and reason. It is thought that if religion concerns itself with only faith and feeling, and makes no claims about matters treated by science, then it will have nothing to fear. Alternatively, separationists may not be out to defend religion by isolating it from science, but rather aim to dispose of religion as irrelevant to scientific concerns. Stephen Jay Gould, the prolific writer on evolutionary biology, belongs to this camp, with his talk of ‘non-overlapping magisteria’.