# Before The Big Bang

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Well, of course, there was no "before" before the Big Bang, since time itself came into existence at that point, and the notion that time had a beginning leaves natural science with a fundamental problem. It is at base a problem of identity, since whatever a timeless reality might turn out to be, it certainly is not nature. Hubble's discovery of the galactic redshift has put us on a slippery slope that leads to unnatural science.

Science's problem, however, is philosophy's great opportunity, perhaps the greatest challenge since Plato, and if there are any philosophical Alexanders out there weeping for new worlds to conquer, they can dry their tears now. It is by no means a totally new challenge, for anyone who embarks upon it will find Zeno's ancient paradox popping up continually, how to bridge the conceptual and mathematical gap between a continuum divided infinitely into smaller bits and zero. Max Planck and his counter-intuitive quantum of energy will offer a helping hand, but let us first get a clearer idea of how to define the problem.

Physicists in general have done us no service here, having blurred its outlines for their own immediate purposes. Winding back in imagination our expanding cosmos to find its origin, they have reached a point where all the laws of physics break down, the so-called "Planck wall", and then stopped the conceptual film. With the notable exception of Alexander Friedmann, the reluctance of physicists to go all the way is understandable, for not only is the Planck domain separated from the very beginning of time by a seemingly negligible instant, a mere $10^{-43}$ seconds. (This is a fraction made up of 1 with 43 zeros in its denominator, but no normally educated person in the 21st century should need that explanation.) To go right to the beginning of the film, it was theorized, would result in compressing all the energy in the universe in a dimensionless point, resulting in an unmanageable and illogical infinity. There is a general feeling, as well, that anything beyond the Planck size is too small to matter, for in the time it takes to reach it from zero the universe had grown only to $10^{-35}$ metres, that is, twenty orders of magnitude smaller than the proton at the heart of the atom or, to get some sort of visual grasp, a trillion trillion times smaller than a speck of flour. That, surely, is as near as dammit to nothing, but still gives physics something measurable to work on.

The end result of physical theorizing in this frame of reference are two decidedly dodgy conjectures about the origin of our cosmos. Stephen Hawking's widely accepted solution is that it all began randomly with a quantum fluctuation. This might conceivably have happened at the Planck stage, when anything seems to have been possible, since we have no idea of what was "contained" within this speck of unimaginable energy. "Quantum fluctuation" is a decidedly *ad hoc* solution, but it appeals to the modern mind, which likes to put randomness in the unexplained gaps, where once God might have been pressed into service. There is, in fact, more than a whiff of the same law of "chance and necessity" underpinning the great unquestionable dogma of neo-Darwinism, for just as biological evolution is explained by random mutation working with the mechanical winnowing of natural selection, the quantum fluctuation is explained as random movement coupled with the iron law of Heisenberg's Uncertainty Principle. In both instances conventional wisdom blocks the emergence of deeper and more troublesome questions that extend well into the realm of philosophy, into ontology and epistemology. Why, for instance, should the otherwise mechanical genes mutate randomly, and in what realm of reality should we look for the blueprint of the gene which science takes to be the blueprint of the biological form? The greatest advantage of using random fluctuation at the Planck level in physics as an all-purpose explanation is at the same time the greatest objection: it is a causeless cause. When we go back to the beginning of time, to the point where there was no time, the notion of fluctuation is irrelevant, for fluctuations can only happen in time.

The second quasi-solution to the question of cosmic origins is Roger Penrose's mathematical proof that in the right conditions black holes, which form when massive stars shrink under their own gravity, can in certain contexts finish up as naked singularities, that is to say, as the dimensionless points already introduced. From a scientific and philosophical viewpoint the same ontological problem appears in a slightly different form, for a naked singularity is both a something and a nothing, in this world yet not of this world. Or, looked at from another perspective, it is not so much a "what" as a "where". Although Penrose arrived at his solution mathematically, using the axioms of Einstein's General Relativity, it has proved of help to practical astronomers by suggesting a plausible explanation of the nature of quasars, which could be the consequence of black holes re-emerging in time as white holes, energetic "gushers" or "mini Big Bangs", from the point source to which they had been reduced.

Sidestepping General Relativity, and Faraday's field model more generally, and taking a more Newtonian approach, offers a different kind of explanation of how the universe began, and what existed before it. Two new postulates will give a critically different perspective – as critically different as was Copernicus's recentring of the universe on the sun rather than the earth. Firstly, if the cosmos is expanding and cooling, as no scientist would deny today, why not treat it as an adiabatic system familiar to heat engineers, as, for instance, in internal combustion and steam engines. And, secondly, if the beginning of the expansionary process was a true point, why not locate it in something other than a three dimensional domain, in the hyperspace beloved of science fiction writers and well known to mathematicians of a certain ilk, but not to be confused with Hilbert space, which is a descriptive convenience with no ontological claims. From this perspective, the normal universe of sense experience is a subspace of higher dimensioned space, perhaps a privileged subspace, but nevertheless only a province of a greater unseen realm.

That there exists a higher dimensioned reality inaccessible to our senses, a domain as real as our three-dimensioned cosmos is, an act of faith, but no more so than believing its converse, that reality consists of only of the three dimensions assumed unquestioningly by Cartesian science and commonsense alike. After all, we know that the apparently empty space around us is filled with radio waves which remain silent and unobserved until we tune into them at the right frequency. Is science trapped in an illusion that *res extensa,* being all that natural science can handle, is therefore, by false inference, all that can exist, or is a new kind of science now required to go beyond the present barriers to knowledge? Are philosophers imprisoned too in a Cartesian goldfish bowl?

Treating 3D reality as an adiabatic system offers one benefit but seems to raise the problem already noted when one posits a point source as the origin of the cosmos, for at first glance we confront again the unmanageable infinities that are the other side of the infinitesimal. The benefit is that approaching cosmology as the study of a system of expanding 3D space and decreasing temperature is conceptually simple and in accordance with the physical facts. We can calculate the energy content of the universe from the so-called Planck Density, where gravitational-type energy reaches its extreme limit at 5.1 x $10^{96}$ kilograms per cubic centimetre or, somewhat trickier, its equivalent in radiation density. Imagine the pressure of Mount Everest sitting on the top of pin, and that gives some minimal idea of what this kind of energy density would mean. It merits the overused term "awesome". Now comes the logical key that astronomers and quantum physicists have overlooked, the first law of thermodynamics, which states quite simply that energy can neither be created nor destroyed. Following this logic, rather than the mathematical logic of dividing by zero, if the universe is a closed system, its originating point would not contain infinite energy, but the same amount that can be calculated at any stage of its expansion. As with any thermodynamic system, expanding volume is inversely proportional to heat density. My chemistry book at school contained this information in a limerick, whose mnemonic effectiveness continues sixty years on:

> These facts you will learn at your school
> About Messrs Thomson and Joule,
> Who allowed compressed gas
> Through a small hole to pass
> And expand, then the gas became cool.

But how are we to account for the gap between the cosmic "Ur-point" in hyperspace and the first appearance of our 3D cosmos at Planck time? Planck's philosophizing on the nature of recently discovered radiation led him to the desperate solution that energy comes in an indivisible packet, which he named the quantum, thus launching science into the era of quantum physics. Planck himself hated this idea, for there seemed to be no reason why energy should not be divided again and again *ad infinitum*. He half-suspected that his enforced solution was no more than mathematical trickery, and spent years trying to disprove it, but received the Nobel Prize for it in 1918, by which time, despite its irrationality, it was mainstream science. It is *par excellence* one of those things in science of which Richard Feynman said we get an illusory feeling of understanding which is really no more than the effect of familiarity. There does not seem to be any reason *a priori* why Planck's "illogical logic" cannot be applied to closing the cosmological gap. Assuming that the Planck domain is as small a size as an energetic particle can be, why not simply say that the next step down is a reality of no dimensions at all, even though we are nagged by the question, why can't we divide it one more time? The answer has to be simply, that's the way reality is. One suffers with Planck, or chuckles with Zeno!

Once this step from something to nothing is accepted, however reluctantly, both science and philosophy confront another problem, equally difficult and probably even more controversial: how did it begin, what triggered it all? If the non-explanation of "quantum fluctuation" is disallowed, however erudite the phrase may appear, why not take a commonsense approach by asking what triggers anything. What, for instance, sets in train the process that ends in the bullet leaving the gun or the rocket setting off for Mars? Viewed as mechanical systems, one can say that the initiating energy which sends the bullet or rocket on its way is the pressure of the finger on the trigger or the button, but before that what energetic cause triggers the action of the finger in such situations? The answer is the human will which makes the decision. Without the will to make it happen, nothing will happen. Is it possible, then, that our particular universe came into existence as an act of will? Despite appearances, it would not be a religious solution, for religion proper concerns not belief in a higher power, but belief that humankind is, or can be, in communication with it. It is important to realise that postulating the existence of a higher consciousness may take science and philosophy to the gates of theology, but not beyond. What follows religiously from this article of scientific belief is a separate question altogether.

Proof that such a hypothesized higher consciousness, with a quasi-human will, actually exists takes us from science to metascience, and a proper analysis of the profound significance of this development awaits lengthy work by the philosophers of science. Suffice to say here, as at least a pointer, that what began as astronomy has turned into cosmology and then into cosmogony or, to use an increasingly popular term, cosmogenesis. How sure can we be that any conclusions will be certain enough to be accepted as scientifically valid? The question raises in its most acute form the "end of certainty" debate that has recently appeared in theoretical science, but not reached down to what might be called "bread and butter science". With the step into cosmogenesis physical science moves definitively from the ideal of crystal clear certainty into the murkier realities of intuition and the subconscious, and what John Henry Newman (in *The Grammar of Assent*) called the "illative sense". This is essentially a *feeling* of certainty, which may or may not be based on structured evidence or formal logic, but cannot be denied, as one cannot deny, for instance, the smell of creosote. New psychological and neurological vistas open up here, for it seems that what we call a sense of certainty is generated by different parts of the brain and that we might be said, oversimply, to have a split sense of certainty when the limbic and cerebral brain come into opposition. To compress a long and complex argument, cosmogenesis presents science with an extension of the postulational method, which underlies General Relativity theory, and which itself is an adaptation of the axiomatic method of mathematics to science, plus the forensic criterion of the "balance of probabilities". These rather esoteric items are mentioned here to indicate that an attempt to go beyond the Big Bang by tweaking familiar science will not do: a new scientific revolution is required, a relaying of the very foundations of science.

If the postulate of hyperspace be provisionally accepted, what kind of relationship can be surmised between this unseen reality and Cartesian 3-space? The question until now has been ignored, and its existence hidden behind a smokescreen of genuine insights like quantum tunnelling and topos and fantastic speculations like parallel universes and wormholes, all of which assume that reality is three-dimensional. If the imagination of science and philosophy is restricted to a reality of three dimensions, however, there is no way of solving the problem of what our 3-D world is expanding into, which is usually swept under the carpet by calling it a non-question. From a hyperspatial point of view, since the cosmos cannot grow by inflating like a balloon that expands into a pre-existing 3-space, the obvious answer (not necessarily the right one) is that it is expanding into a previously existing but different-dimensioned space. If this is the reality of things, the leading edge, or surface, of the expanding cosmos would be rather like a wave of state change, where 2-space is stepped up to 3-space. A partial understanding may perhaps be obtained by considering the state change that occurs when a pellet of solid carbon dioxide is dropped into a beaker of near-freezing water, caausing an ice crystal to accrete around it almost instantly in a moving front of ice-formation. The introduction of the dry ice pellet may be considered as trigger energy which starts the process in the same way that a conscious decision to, say, raise one's arm can be considered as trigger energy. A beaker of supersaturated brine will sit indefinitely unchanged if undisturbed, but a phase change can be effected by the slightest input of energy, such as dropping into the beaker a grain of sand, which will immediately precipitate salt crystals out. This may be a valid metaphor for a hyperspatial science, in that our familiar 3D reality may exist *in potentia* until actuated, rather as salt exists invisibly in non-crystalline form when dissolved in water. The metaphor may help in clarifying the ontological status of what appears to be a purely mathematical hyperspace in relation to what seems to human senses a "real" 3D subspace. What begins informally as a mental image of our universe dissolved in something greater can be formalized through topology.

Of the interlocking questions that emerge from a theory of hyperspace, the issue of the energy of consciousness will almost certainly be the most contentious, for the Cartesian dualism that dominates science classifies consciousness uncompromisingly as *res cogitans*, and thus by definition outside the remit of natural science. A curious blindness afflicts mainstream science in this regard, for not only do we have the obvious evidence shown above that consciousness supplies the trigger energy for bodily actions, but there is statistically significant and replicable laboratory evidence that human consciousness can affect mechanical systems. The major work on this has been done by Robert Jahn, who has used focused intention, of individuals and groups, to skew the output of electromechanical random number generators. His work is well known and can be found on the Web, but since it does not fit into the current Cartesian paradigm, it is largely ignored. Jahn, it might be said to divert charges of "pseudoscience", is no eccentric or head-in-clouds philosopher, but the Dean Emeritus of the Mechanical and Aerospace Engineering Department at Princeton University.

In searching for the origins of the Big Bang we are probing into a new scientific paradigm, probably a metaparadigm, opening up questions that will certainly be unwelcome to what Thomas Kuhn called "normal scientists", who are usually as conservative in their own way as bishops. Let it be assumed that the energy of consciousness is a reality that science needs now take into account, how could one wake a whole profession from its dogmatic slumber? I would like to suggest an experiment that would put the proposers' money where their philosophical mouth is. Let it be transmitted on TV to entertain and educate as many people as possible in the most dramatic way, with a bang.

Wire up explosive charges to a large, preferably very large, building with a demolition order on it, and connect them to a trigger device consisting of a microswitch whose activation needs energy only in the order of the falling grain of sand just mentioned. Then sit a group of people down and ask them to concentrate on activating this switch simply by willing it to flip. It could work, couldn't it? If it didn't, there might be red faces, but if it did work, no one could be in any doubt thereafter that consciousness is a directable form of energy, it makes things happen.