17 From deuterium to beryllium in a pre-stellar environment

17.1 The route to element building

The input of kinetic energy through collision and the ensuing increase in the angular velocity of rotation of the proton's 2D membranes, would provide the catalyst for a complete reversal in the polarity of these components. This *surplus* energy would also produce an increase in the resonance of the boundary chords, which in turn would raise the dimensional boundary surface wave energy to levels that would help to induce a positive attractive force between any two colliding bodies. It would be the environment in which these new, three-dimensional entities now found themselves that contributed the most to this unfolding situation - where the momentum from the break-up of the eighth-dimensional lattice was carried over during the big-ping as all this material dropped into four-dimensional expansion (see again Chapter Seven). This momentum would produce collision within a relatively small, crowded volume of 4D space - and thus a temporary but significant increase in temperature.

As the first proton-proton bonding occurred, two 'S' faces with the opposite polarity, would make contact and their boundary chords would combine. This would fundamentally change the character of their charge and the configuration of the fields that this generated. The focus of these attractive forces would change and, if no more contact was made; this bonded pair would cool, lose energy and evolve into the first nucleus of deuterium; arguably the first element proper, with a single proton and a single neutron. A fair proportion of these coupled pairs may well have experienced further collision events in this young, hot, embryonic universe and their subsequent history may well have taken a different turn to that of deuterium. Their field configuration would prevent prolonged contact with each other, but the like-to-unlike configuration that would be exhibited by this single bond, coming into contact with a naked proton (of which there would have been many), may have produced a new kind of collision and one that was of a fundamentally different character. This would all need to occur when the coupled pair were *still* in their raised or excited energy state, as it would seem that in this model at least, the bonding processes described here cannot occur when the components that make up the proton are in their ground-state.

This second coupling or bonding event would thus herald the next stage in the evolution of the elements, but this would be at a time far removed from the processes we tend to observe and infer today within the core of hydrogen stars. This would be a brief and finite episode in the early life of the universe during an initial, but temporary burst of activity, perhaps a hundred or more million years before the birth of such more familiar furnaces. This chapter will try to explore the possibility of such a scenario in a little more detail and catalogue the possibility of these events within a surrounding and changing environment that would soon bring this episode to an abrupt end.

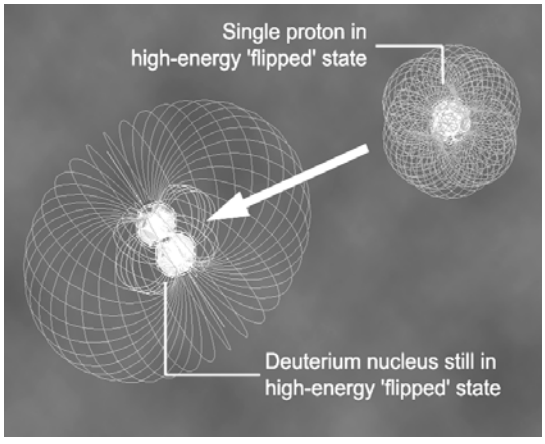

Figure 17.1.01 *The strong inner field of proto-deuterium may attract the flipped 'S' poles of a single (flipped) proton and thus present the possibility of a further bonding scenario.*

With the early cosmos absolutely full of fast moving baryons and independent boundary chord derivatives, a proton-proton collision would produce a single bonded entity that, once reverted to its 'pre-flip' configuration - would have become

this deuterium nucleus. This would now evolve down its own path, unless a further collision event occurred *before* it reverted back to its original polarity. As pondered within the previous chapter, two such double-proton bodies would be producing fundamentally different field configurations to their single proton equivalent and this may have prevented them all but a fleeting contact due to repulsion. This may infer that any further action could only be as a result of these bodies being in close contact with a further single proton only (see also *Figure 17.1.01* on the previous page).

The 'flipped' single bonded *proto-deuterium* body would consist of a weak outer field produced by the alignment of both S1 axes of the coupled protons and a much stronger inner field, utilizing both S2 and S3 axes - again provided by both of these protons. A passing or colliding single

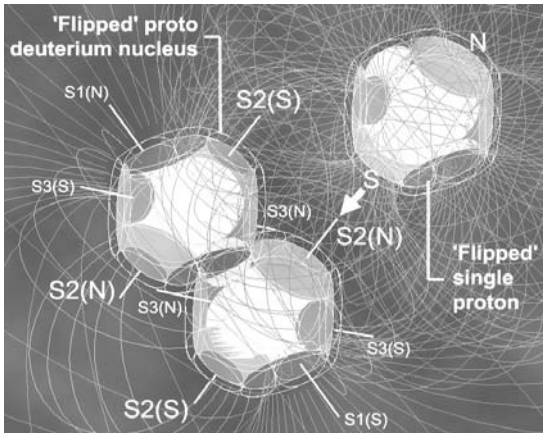

Figure 17.1.02 *The stronger, inner field of proto-deuterium produced by its S2 and S3 axes will attract the opposite pole of a closely passing or colliding single proton and a second bond may form.*

proton would have three pairs of its own north-south fields and these could theoretically bond with any of the opposite poles on proto-deuterium's S2 and S3 axes. This would thus produce a second 'S' to 'S' face bond (which will be called an S2 bond) and this would be orientated so as to be perpendicular to the original S1 bond or axis.

At the 'S' face point of contact between these two colliding bodies, the dimensional boundary chords of each teddy would now intertwine as before and the polar distance would therefore double. This would again reconfigure the north-south fields and produce one that was now more or less identical to that of the original single S1 bond of flipped proto-deuterium, but this new (S2) bond's axis would be running perpendicular to that of the first (see *Figure 17.1.02* in the previous column).

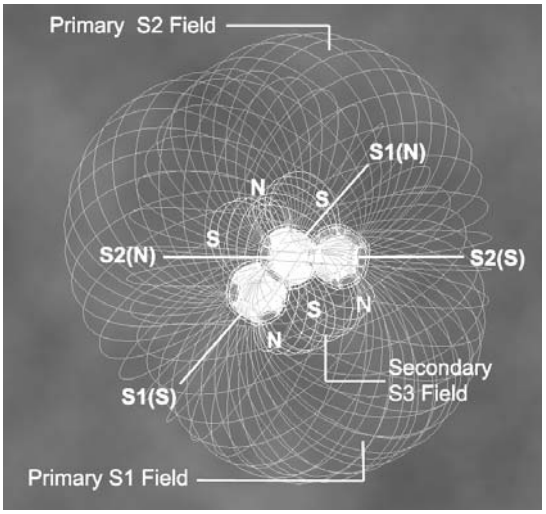

Figure 17.1.03 *As a third proton combines with 'flipped' proto-deuterium, its S2 and S3 axes must reconfigure because of the mutual interaction of the protons and all axes will result in being perpendicular to each other. A helium-3 nucleus will thus be formed.*

The complimentary spin of the S2(N) membrane and one of the single proton's *SOUTH* poles (or visa versa of course) will also allow (and actually encourage) this coupling to take place. This new configuration of *three* bonded protons will not only have modified, but also satisfied the field requirements of two out of the total of three of proto-deuterium's 'S' face axes that produce this polarity in the first place. Both S1 and now S2 bonds (and their respective axes) will be producing a weak outer north-south field, while the remaining S3 axis will also need to reconfigure, because the overall nature of the system's polarity has changed; as has their

interaction. Modelling this in three-dimensions (AutoCAD), there is only one possible configuration that can result and this has been shown in the screen-capture on the previous page (*Figure 17.1.03*).

The axes of the combined S3 fields must be perpendicular to those of the other two and there will at this stage, be *three* of these axes, all running parallel to each other. This configuration takes the form of a combined tri-polar arrangement, centred upon the axis that intersects both the S1 and S2. The field influence at each of these poles is twice that of the other two positions and this will effectively produce a *pseudo* bi-polar field with its axis both perpendicular to - and passing directly through - the intersection point of the other two axes.

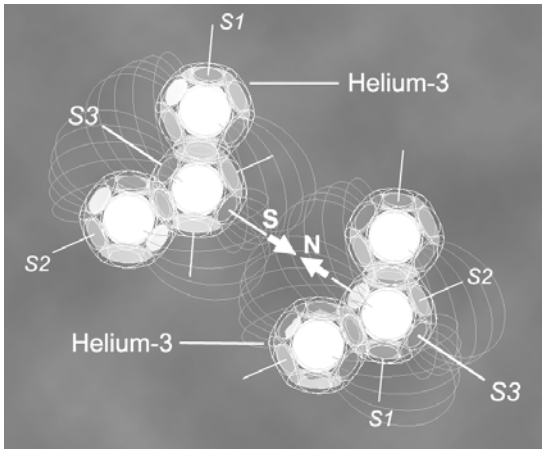

Figure 17.1.04 *As a pair of helium-3 nuclei approach each other, their S1 and S2 fields may interact and cancel each other, allowing the attractive influence of opposite S3 poles to take effect.*

Without wishing at this stage to digress from the accepted path of the simple 'pp1' chain reaction, the next significant phase should occur between two helium-3 nuclei. Before attempting to explore this interplay within the confines of this model, if this *IS* the case, a change in configuration *must* remove the component of strong repulsion between them. This may be due to the alignment of the newly reconfigured S1 and S2 fields whose axes are now also perpendicular to each other and this ninety-degree displacement may produce a *cancelling out* of both (or at least of their effect on their surroundings). This would leave the stronger attractive influence of the S3 field to interact with that of an opposite number with the focus again at the intersection of the other two axes in each case (see *Figure 17.1.04* in the previous column).

17.2 The 'savory' index

In this scenario, it may be the contact itself (between two He-3's) that actually voids the combined fields of their S1 and S2 axes, while repulsion still occurs with either single proton or deuterium. There may however, be another, more fundamental reason why only helium-3 can bond with helium-3 at this stage and this may be due to the concept of ***signature angular velocities of rotation*** first mentioned at the end of the last chapter. With a hint coming from the mass defect found to occur in nature and the way that protons appear to bond within this model, it is possible that the resulting energy threshold or ground state of any particular nuclei *after* they have flipped their polarity back to normal may vary depending on the number of their constituent nucleons. This may in turn, dictate the amount of energy that is required to produce that particular body's *signature angular velocity of rotation* for both its 'H' and 'S' face rotational pairs. Conversely, if the energy levels of these new nuclei return to the original ground state as exhibited by their component nucleons, then it is also possible that this may well affect the angular velocity of rotation of both their 'S' and 'H' face membranes. The difference between these signatures may be compared in terms of what can be referred to as their ***savory index*** (**S**ignature ***A***ngular ***V***elocity ***O***f ***R***otation ***I***ndex).

This index can be defined as the sum of a component nucleon's resultant (or raised) 'S' and 'H' face *angular velocities of rotation* that occur during its 'flipped polarity' state (in π). For example, if a single proton's 'flipped' 'H' and 'S' face membranes can be given the approximate

value of 3.5π and 6.1π respectively (see the previous chapter); then its savory index would be *3.5 + 6.1* or ***9.6***. Similarly, the increased overall mass of deuterium (while exhibiting almost the same 'flipped' ground state energy as the proton), may actually display a *savory index* that is perhaps some five to ten percent *lower* as a result of this additional mass. This may not however, be enough to prevent 'flipped' deuterium and a single 'flipped' proton from bonding under certain conditions, due to what has been called the spinorial *zone of tolerance* hinted at previously in Chapter 16.

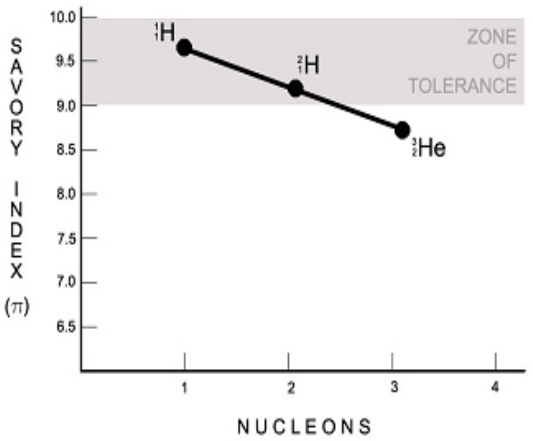

Figure 17.2.01 *The difference in the savory indices of hydrogen, deuterium and helium-3 may contribute to the accepted route of the pp1 chain reaction. Values of pi are hypothetical and unsubstantiated at this stage.*

When one looks at a helium-3 nucleus however, *ITS* increased mass in relation to its 'flipped' ground state energy, may slow this body's overall *signature angular velocities of rotation* to such an extent as to put them 'outside' the spinorial *zone of tolerance*. Helium-3's own *savory index* may produce a significantly different rate of membrane rotation when compared to that of either a single proton - or deuterium - and this may prevent any possibility of bonding between such bodies because of a marked difference in membrane rotation speeds that cannot be absorbed adequately regardless of this zone of tolerance. Therefore, through a combination of like-to-like repulsion and differences in the perceived *savory indices*, bonding may only be able to progress in the direction illustrated by the 'pp1' chain reaction anyway (see *Figure 17.2.01* in the previous column).

In other words, although the interaction of the S1, S2 and/or S3 fields of *ALL* three nuclei may in themselves allow the bonding process to theoretically occur, their differing components of spin (taking helium-3 out of the zone of tolerance), may be the governing factor here. In this scenario - and at this stage in the evolutionary process - only another helium-3 nucleus will have the necessary credentials to bond with helium-3 as they are evolutionarily unique from both a single proton and deuterium.

It was suggested in the previous chapter that the environment during this early time may have played a significant part in how helium-3 originally bonded with He-3. The graph within *Figure 16.3.01* (on page 143) shows helium-4 as a proverbial 'flyer' as far as the straight-line gradient is concerned. This is based on the prediction that helium-4 in this model, will comprise a total of four bonds connecting its alternating two protons and two neutrons (see *Figure 17.2.02* below).

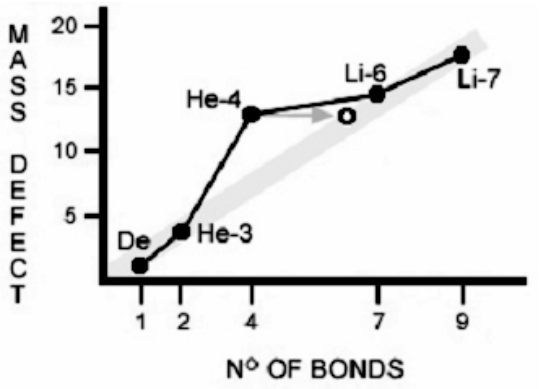

Figure 17.2.02 *The puzzle of helium-4's mass defect, which does not follow the straight-line gradient of the other early elements, synthesised not long after the big-ping.*

The straight-line plot (shown in grey) produces a correlation between the mass defect per nucleus

and the predicted number of bonds utilised; (the mass defects are again, multiples of deuterium or 4×10^{-30} *kg = 1*). Apart from helium-4, the mass defect (and therefore energy) per bond, quite closely follows the gradient. Using this as a (temporary) rule of thumb, helium-4's mass defect should really, correspond with *SIX* bonds (the open circle ahead of the arrow from He-4 in the figure). The problem is however, that in this model at least, there is no way of bonding six nucleons (2 x He-3) utilising just six bonds (this requires seven bonds no matter which way you try it). This curiosity would seem to create a slight puzzle as far as helium-4's own origin in this model is concerned and may also back-up the view addressed in the previous chapter that there may have actually been a *two-stage* process in the synthesis of these early elements not long after the initial big-ping.

17.3 Bonding during an early less expansive universe

Looking at the environment for a moment, one must take into account the component of expansion - which is an integral part of the four-dimensional medium in which this model's 3D material has become suspended. In the very early universe where expansion is so far limited, the force required to bond two nucleons (or indeed to attract any two nucleons or particles) may have been significantly less than that required for the same two particles or nucleons at a later date; when expansion has 'rarefied' this environment. In a small, dense volume of 4D space, the ground state energy level will be relatively high compared to that of a more 'rarefied' one and the input of energy required to cross any previous (dense) threshold would be that much greater, the *more* that expansion makes itself felt.

The energy requirement (or the conversion of mass to energy that is the mass defect) required to bond two helium-3 nuclei during the very early stages of the universe - may have produced a *seven*-bond nucleus, which would correspond to lithium-6. As the universe expands, this same mass defect can only produce the equivalent of a six-bond nucleus (following the straight-line gradient) - but there is an inherent problem here. As stated above, this model cannot produce a six-nucleon body with just *six* bonds and the nucleus must disintegrate. Coincidentally, both helium-6 and helium-5 are short-lived isotopes and the former will theoretically become the latter by *beta-decay* in just under a second. Helium-5 will tend to decay by neutron emission in something like 6×10^{-20} seconds to become helium-4 - which is of course, stable. It could be argued that because of expansion, a pair of bonded helium-3 nuclei do not have quite enough energy to produce the previous seven-bond event and must deteriorate to the next most stable configuration. The mass defect will not change, because the conversion of mass to energy remains the same as it was in a smaller, denser, younger universe - but the physical environment and conditions have. As the universe expands beyond a certain point, lithium-6 synthesis via the collision of two helium-3 nuclei must cease and because of a progressive drop in the density of this expansional and supportive 4D medium, a *second-stage* nucleosynthesis must take over. This now produces helium-4 by the same event. but this must also now include a decay from helium-6 via helium-5 (see *Figure 17.3.01* below).

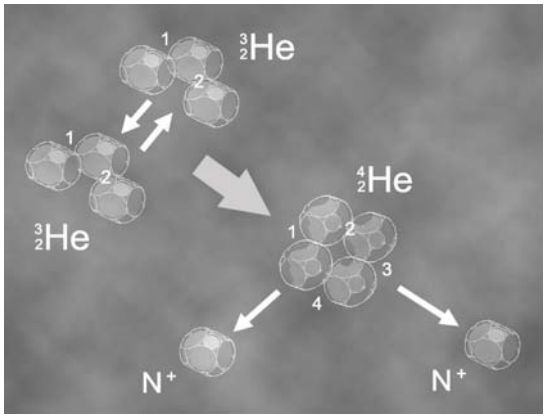

Figure 17.3.01 *As second stage nucleosynthesis takes over, there is not quite enough energy to form a seven-bond nucleus and helium-6 decays via helium-5 to stable helium-4. This will all occur while the protons are still in their 'flipped polarity' state.*

This will at last seed the expanding universe with stable He-4 nuclei, providing the opportunity of collision between these newly synthesised bodies and a proportion of existing helium-3. This changeover to a *stage-two* type of nucleosynthesis must have occurred not long after the initial big-ping - because there is obviously a great deal more helium-4 out there in the universe, than there is lithium-6. This process may have resulted in the present ratio we see for these early metals.

17.4 Towards lithium and beyond

Following the straight-line gradient in *Figure 17.2.02* on page 149, these violent collisions (because of the increased mass of He-4) should have enough energy to produce a seven nucleon, *nine*-bond entity that we would recognise as lithium-7. This element too, is believed to have been formed at a relatively early stage in the universe's history. There may still, even have been enough inertia and heat during this time to fuse a very small proportion of helium-4 nuclei together to form a very limited supply of beryllium (with its eight nucleon and twelve-bond configuration as the short lived *beryllium-8*). This was first inferred within *Figure 16.3.02* in the previous chapter. There is once again, a fundamental problem with naturally occurring beryllium, in that its stable form appears to be its isotope *beryllium-9* - but we shall return to this later.

The final clue as to what may be a two-stage process of early pre-stellar synthesis in the embryonic universe, may be the abundance of helium itself (second only to hydrogen of course) and the ratio of naturally occurring lithium-6 to lithium-7, which from an old table of isotopes[1] is stated as 7.42% and 92.58% respectively. With rapid expansion occurring from the very moment of the big-ping, lithium-6 production would not have lasted long - as this rapid change in environment (and therefore the energy requirements) prevented two helium-3 nuclei from being able to reach a seven-bond state. The results of these collisions would now only have enough energy to produce stable helium-4 after a decay from what would effectively be the characteristics of helium-6 and helium-5 by the loss of two 'flipped polarity' protons in a separate two-stage process. With a growing abundance of He-4, which may have had a comparable savory index to that of He-3; the remaining helium-3 nuclei may now have had the opportunity through continued collision, to bond with this new stable form of helium (when still in the 'flipped' state of course); to produce the calculated early abundance of lithium-7. This does not take into account the later possibility of stellar nucleosynthesis once the first hydrogen stars had formed however.

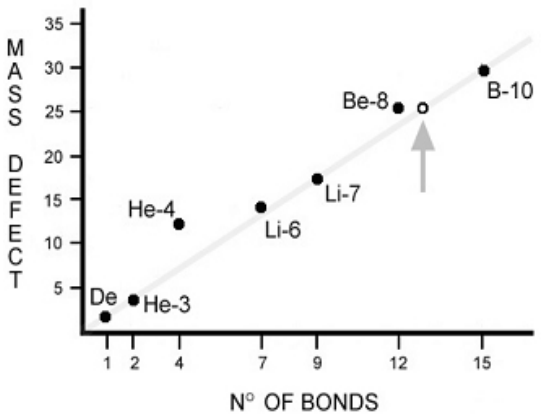

Figure 17.4.01 *Beryllium-8 lies above the straight-line plot and this may infer a surplus amount of energy with its twelve-bond configuration that may render it unstable. A thirteen bond Be-9 isotope may be more stable (shown by the arrow).*

The new (growing) abundance of stable helium-4 would theoretically induce collisions between them while still in their 'flipped polarity' state and these would logically seem to lead to beryllium-8. This is unstable however and will completely disintegrate, by the emission of two alpha particles in something like 3×10^{-16} seconds. As mentioned above, beryllium's *stable* form is its isotope Be-9, which in itself presents another puzzle. Why is this isotope stable and not the more 'balanced' four-proton, four-neutron variety? The answer to this question may again be expansion. By extending the plot in *Figure*

17.2.02 on page 149 to include beryllium, the straight-line gradient (temporary) 'rule of thumb' may provide a clue to what is actually going on during this particular process and this study has been included above as *Figure 17.4.01* on the previous page; (once again, the 'mass defect' is in multiples of deuterium or 4.0×10^{-30} *kg = 1*).

From the table in *Figure 16.3.02* in Chapter 16 (page 143), the mass defect per bond for Be-8 was given as 8.4×10^{-30} *kg* with a predicted bond number of twelve. Looking at the gradient opposite, Be-8 lies above the straight-line plot and this may be the problem. With just twelve bonds there may be a surplus amount of energy that may help to render Be-8 unstable under most conditions. By keeping the same energy (i.e. mass defect) and moving beryllium to the gradient (the open circle indicated by the arrow) - this provides beryllium with thirteen bonds and this would coincide with Be-9. The mass defect per bond effectively drops to around 7.8×10^{-30} *kg*. This raises a further question however as to how the Be-9 configuration is actually achieved? The conventional route to Be-8 would appear to be as part of the (resonant) process that leads to carbon-12 thus:

$$2He^4 + (99 \pm 6)\ keV\ \ g\ \ Be^8$$
$$Be^8 + He^4\ \ g\ \ C^{12} + 2\gamma$$

and this could infer that 'flipped polarity' helium-4 could theoretically bond with another helium-4 nuclei to produce the short-lived isotope beryllium-8; but in order to arrive at Be-9, an extra neutron would need to be captured during this process, which could actually occur with what could be called a ***2He^4 caging effect***. This will be further examined within the planned *Part 2* of this series.

Alternatively a 'flipped polarity' helium-4 could theoretically bond with lithium-7 to produce the short-lived isotope beryllium-11; while a 'flipped' helium-3 would need to bond with a 'flipped' lithium-6 to produce stable beryllium-9. In fact, all combinations are possible as long as the *savory indices* of the nuclei in question are complimentary. The straight-line gradient of *Figures 17.2.02* and *17.4.01* seems to be a helpful guide towards an insight into just what might be happening within the nuclei of these early elements - but it should be remembered that it is still early days yet and still quite speculative at the moment.

As mentioned above, these ideas will be examined and expanded upon further within a much later submission - when the implications of this possible (alternative) evolution have been pondered over more thoroughly.