14 Deuterium and helium-three synthesis in a very early universe

14.1 Early nucleosynthesis

As collisions began to occur between newly evolving particles within a still small, hot, embryonic universe (not long after this model's version of the big-bang as 3D material drops into 4D space), it must have been inevitable that sooner or later, interactions would occur between them. This would more than likely, lead to incidents of bonding and this would probably involve some form of nucleosynthesis - but a form that was somewhat removed from the processes we believe to occur within the core of stars today. For a start, pressures and temperatures would have been different, as were the environmental conditions as a whole and the entire sequence of events may have lasted but a fleeting moment, compared to these similar processes occurring now, in the present. It is perhaps because of the completely unexpected nature of this model's early environment, with its whole surviving teddies and independent boundary chords and what must have been an episode of frequent and violent collision, that a specific chain of events can now be inferred that would ultimately lead to the production of the first elements proper.

The ratio of primordial light elements (hydrogen, deuterium, helium and lithium) is already fairly well understood, thanks to many years of detailed observation - and deuterium has been included here for reasons that will become apparent in due course. The over-riding abundance of hydrogen however, points to a difference in the process of its synthesis, compared to that of the heavier multi-nucleon elements - and the afore mentioned deuterium, forms a vital link in the chain of events that would result in helium and the early abundance of the first metals.

This well-known process[1] (the 'pp1' chain reaction in its simplest form), leads to the nucleosynthesis of helium (see *Figure 14.1.01* in the column opposite) and this sequence will be closely followed in the descriptive argument (and comparison) for the involvement of boundary chords and their interactions in the further evolution of hydrogen. Its occurrence in the core of sun-like, hydrogen rich stars, points to an environment that must have exhibited some similarities at least, to that of the young, closely packed cosmos, not long after the big-ping, when primordial hydrogen had already initially evolved. Such a process within this model (see the previous chapter), would involve the natural capture of a remnant boundary chord that (almost) corresponds to the *mass equivalence* of the energy-well produced by proto-hydrogen's electron or 'e' shell.

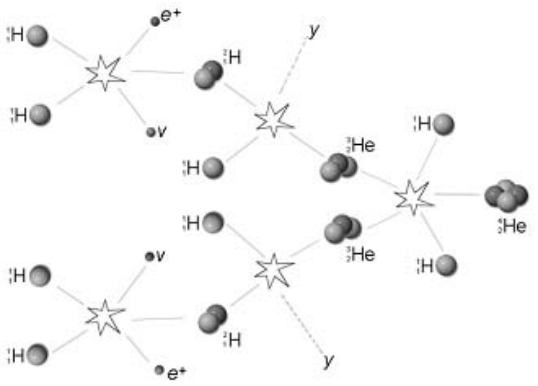

Figure 14.1.01 *The 'pp1' chain reaction maps the accepted route that hydrogen takes during the nucleosynthesis of helium within sun-like stars. It will be used to plot boundary chord involvement within similar processes.*

The synthesis of deuterium and beyond would however, involve collision *AND* the properties of the proton itself and such interactions would therefore, need to be confined to the nucleus. Temperature would play an important part in this synthesis and this may have been provided by the initial momentum of the big-ping and the ensuing collision events that must have followed. As already mentioned in an earlier chapter, such violent early events may have produced a temporary, brief episode of temperature increase directly after the drop of this material into its three-dimensional energy level.

Assuming that such collisions promoted initial coupling events between proton and proton, these episodes could also produce a reaction that would lead to the *re-gassing* of one of these member's 2D membranes and this may have been the result of an input of energy - as well as a mutual reconfiguration. The resultant e-shells of the new elements would also play their part and both of these ideas will be propounded further in this current chapter.

First of all though, we will need to look again at the environment in which these entities found themselves buoyed and the possible processes and changes that may have occurred within their boundary chords and overall structure because of collision and an increase in their threshold energy or ground state. Such changes would need to allow nuclei to bond on a permanent basis and would bring about such a metamorphosis, that the energy level of one member of a bonding pair would be permanently raised to such an extent, that it would revert to its *Stage 1* reconfiguration. These processes (within the confines of this model) will need to be understood and illustrated and this new set of boundary chord rules would be similar to those at work within the core of hydrogen stars today.

The capture of hydrogen's electron mass can be explained in terms of the energy-well created by its 4D+ e-shell (see Chapter 12), but this cannot explain just how the embryonic universe also arrived at its early percentage of heavier elements as well. The conversion of two hydrogen nuclei into deuterium for example, *MUST* involve bonding and in this model, will centre upon the boundary chords from which each proton is constructed. A clue to how and why this is achieved may lie with what happens during the *Stage 1* reconfiguration of the original whole surviving teddy just after it pings into what would become our own 3D/4D space.

This early (3D) transition is brought about by a conflict of *face-spin bias* within the structure of this tetrakaidecahedron, which results in a separation of its boundary chords at their *POCs* (points of convergence). The original boundary chord mass was of course, the result of the 'HSH' condensation of secondary energy derived from the 8D lattice (see again Chapter Nine). This separation would produce a teddy with a slightly smaller mass because of *tri-lateral chord separation* at its *TLSPs* (see again page 74) and boundary chords that were now just under half their previous mass value. This suggests what could be referred to as a maximum three-dimensional ***boundary chord mass capacity***, which would correspond to the previously determined dimensional boundary chord mass value (M^{dbc}) of the original whole surviving teddy. This would obviously open the door to the possibility of a recombination of certain boundary chords during this nuclear bonding process. The question now becomes, how and why would certain boundary chords want to recombine in the first place? This would be answered by the conditions within the environment in which these teddies (now probably hydrogen nuclei) found themselves.

14.2 Collision, resonance and heat

In a relatively small, crowded, embryonic universe, collision will create vibration within the boundary chords of its victims and this vibration (or resonance) will create heat. What this actually does to the individual chords that make up the proton will need to be illustrated in a little more detail.

The transfer of face-spin bias to the 2D membranes of the proton, create friction on the boundary chords - and this will create resonance. Above the chord's energy threshold, this will be naturally dissipated as a dimensional boundary surface wave, already described within Chapter 12 (see again page 97). Collisions on the other hand, will impart a great deal of kinetic energy and this will result in a boundary chord energy level that cannot be readily dissipated as a dim-wave immediately and therefore the chord will increase its vibration in order to compensate.

This will in turn, raise the frequency of vibration and therefore *shorten* (temporarily) the

wavelength of the emitted dim-wave. This will have a consequence on the effect that this dim-wave has on its surroundings.

Remembering from Chapter 10 that the faces of the proton and their 2D membranes may possibly be regarded as *spinorial objects*, a *change* in rotational speed caused by an *input* of energy (such as kinetic energy due to collision), could change the sign of these objects from positive to negative and visa-versa. This would have an interesting consequence on the polarity of these faces and therefore an influence on their behaviour. This may however, be better illustrated by *Fourier analysis*, where the periodicity of the wave function can be seen to increase proportionally due to the input of energy and because these vibrating chords are actually circular in nature, the periodicity (or *'l'*) could be represented as a *Laurent Series* - where one whole revolution of the circumference is the period [2].

The *ground-state resonance* of each type of face, was shown in Chapter 12 to be of a higher energy level for the 'H' face than for the smaller 'S' face. This was qualified only by the fact that that the 'H' face's larger *area of influence* resulted in a greater frictional type of energy and thus produced a higher frequency dimensional boundary surface wave. This new scenario includes an additional input of energy however, over and above that required for these face ground states. This becomes much harder to dissipate as dim-wave energy in the 'S' face chords, because of their smaller area of influence and it is this that increases the frequency of resonance within them. The *larger* 'H' face is composed of more boundary chords anyway and together with a larger area of influence; this collision induced increase in resonance is not felt quite so vigorously. Looking at it another way and considering the areas of influence that each face donates to its respective boundary chords, the *AOI* of the 'H' face is some 1.732 x larger than that of the 'S' face and it is therefore able to absorb a greater proportion of kinetic energy through collision. This becomes easier to dissipate as dimensional boundary surface wave energy. Being that much smaller, the 'S' face will not be as absorbent (energy wise) and its component of kinetic energy will be more inclined to be transferred 'directly' to its boundary chords with a corresponding increase in frequency. Their relative frequencies effectively become reversed. Each of these faces will also have a smaller *period* (that equates to *l/n*) and these *pure-tones (n)* will be represented by the boundary chord value of each of the 'H' and 'S' faces of the proton where:

$$(H)n = 6 \quad \text{and} \quad (S)n = 4$$

Each of these *pure-tones* would therefore represent the vibration of a single boundary chord within its particular face and the 'periodicity' would be illustrated by the circumference of the entire face in question (see *Figure 14.2.01* below).

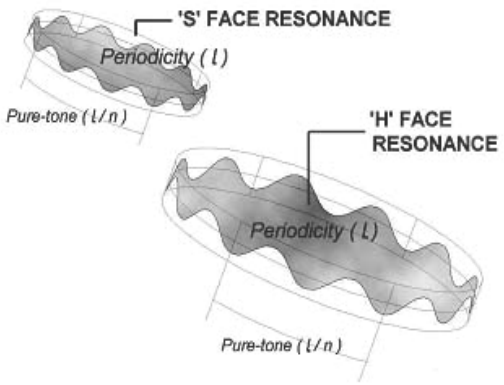

Figure 14.2.01 *A graphic comparison of the relative resonances of 'S' and 'H' face boundary chords due to absorbed energy from proton - proton collision. 'S' face boundary chords will achieve a higher frequency.*

The specific mathematical treatment of these changes will require looking at in much more detail and this will hopefully come at a later date. While the *Laurent Series* would seem (at this stage) to have the possibility of almost perfectly describing the functionality of the boundary chord resonances, it may be possible to illustrate each of the rotational groups (each of which is made up of opposing 'H' faces and 'S' faces) as well. This may be possible (but it is far from a certainty yet),

by extending the use of 'separate' *Reimann spheres* for the paired faces that make up these groups.

This will need to involve the concept of the *annulus of convergence* of the Reimann sphere, which is the region that will lie between two circles in the complex plane - both of which will be centred at the origin. This region would define the separation of the two components that make up each rotational group and each circle (separated by the annulus), may be able to represent each of the power series - one for the positive and one for the negative[3]. This would be handy as far as the bi-polar characteristics of the higher energy dim-wave are concerned, but there is still a great deal of work to be done before any comparisons or conclusions can be drawn from this.

As a final point and as the *Laurent Series* can be used to describe functions that lie *OFF* the unit circle of the complex plane - this may imply that a single Reimann sphere may be all that is required to represent the teddy's (or now the proton's) faces with the use of *displaced* unit circles of perhaps 2π and 3.5π equivalent circumferences. Such a sphere should be able to end up with the teddy's own characteristics and would in addition, also be able to graphically illustrate the relationship that occurs between all of these rotational groups.

14.3 The proton's polarity flip

An increase in the *frequency of resonance* - right across the board, may bring on a change of sign as 'H' face membranes (as rotational groups) speed up their rotation to 2π + and the 'S' face membranes increase to 3.5π + (or perhaps there is the possibility that 'S' face rotation reverts back to around 2π). The consequences of this 'flip' would be interesting to say the least. Previously high energy 4D/5D emitted dimensional boundary surface waves from the 'H' face rotational groups would flip their polarity to that of the 'S' face groups - and the previously lower energy 'negative' 'S' face component would in turn, now be emitted from the 'H' face rotational pairs. They would briefly 'swap' jobs within the bodies of these colliding proton pairs.

This would actually be a good thing as far as this model is concerned, because in the early days of this conjecture, there was a real problem in trying to make the 'H' faces of the proton stick together during bonding, without causing a conflict with adjacent 'S' faces; which up until now, have always appeared to exhibit a (continuously) 'negative' polarity When four or more protons of this configuration are built together, there are always 'S' face to 'S' face bonds (see the arrows in *Figure 14.3.01* below) and this shouldn't happen, because like-to-like just doesn't want to work. Although the adjacent teddies are actually depicted as *Stage 1* neutrons in the figure, they would connect first as protons and the 'S' faces would be planes of *negative charge* - which makes this scenario even worse.

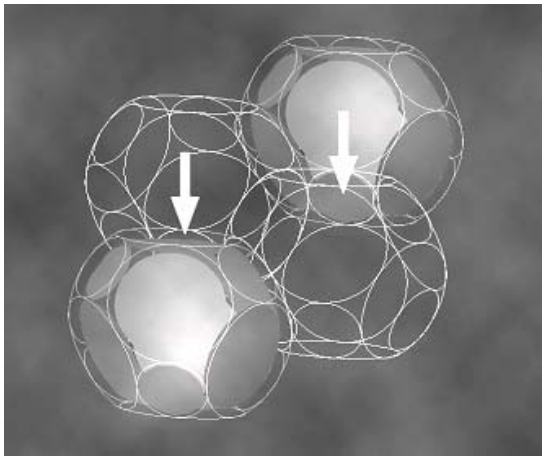

Figure 14.3.01 *When four or more teddies are built up by connecting their 'H' faces together, a conflict is presented between adjacent 'S' faces which would mean like-to-like charges trying to live together.*

However, by allowing these face charges to briefly 'swap' places during these collision events, this solves the problem quite adequately. This also presents a slightly unexpected inference as far as the proton's overall charge characteristics are concerned and this should be explored further.

By allowing the 2D face membranes to speed up their rotation, we are not only changing around the sign of this effect - but also changing the ratio that exists between them. If we produce what amounts to a 6π + rotation in the 'S' face membrane (which in this case would change from the negative back to positive), we have actually cubed the value of the original effect back at the boundary chord and this produces 8x the charge. Doubling the rotation at the 'H' face membrane to 4π will square the charge at its boundary chord and hence produce double the charge. This can be related to the coulomb value given in Chapter 10 (page 84) as follows:

'H' pair component (↓) = *2 x (-5.340 x* 10^{-19} *C)*

= *- 1.068 x* 10^{-18} *C x 4 =* ***- 4.272 x*** 10^{-18} ***C***

and

'S' pair component (↑) = *8x (+1.780 x* 10^{-19} *C)*

= *+ 1.424 x* 10^{-18} *C x 3 =* ***+ 4.272 x*** 10^{-18} ***C***

At this stage, this would seem to suggest that even a very brief reconfiguration during such collision events, *may* produce a teddy or proton that is by all intents and purposes, electrically neutral. Whether or not this also involves a mass transfer to or from the 2D membranes at the same time will have to wait until this can be examined further. This does however, seem to suggest that a change in the charge configuration of the proton will go hand in hand with this type of collision and an overall neutral proton - even though only of a temporary nature - may allow two otherwise repulsive entities enough time in which to couple and again, this will occur with the help of an increased positive bi-polar dim-wave emission.

This will also affect the way that the proton's e-shell is produced and this will basically disappear during this brief period of reversal. With such collisions occurring to what is basically atomic hydrogen; there is the question of what happens to its captured electron mass during the disappearance of its dim-wave produced e-shell. The negative charge cannot just vanish at the same time, as this must be conserved and there will thus be a rather subtle transfer to the electron mass itself. This will be discussed further in due course.

With stronger north and south polar faces (now briefly swapped from the original, larger 'H' faces to those of the 'S' face rotational groups), bonding may be able to occur - and in a way that would be fundamentally different to that originally envisaged and subsequently illustrated in *Figure 14.3.01* on the previous page. This new method of coupling two or more protons together, would now involve only 'S' faces and the whole process becomes a great deal simpler and straightforward. There is no longer the likelihood of conflict between any two adjacent 'like' faces (see *Figure 14.3.02* below).

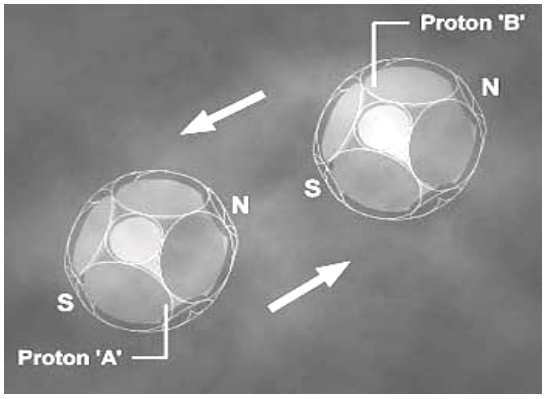

Figure 14.3.02 *As the 'H' and 'S' faces swap places and reconfigure after collision, two protons in close proximity may be drawn together by the attractive components of their stronger bi-polar high energy dim-waves.*

As coupling begins to occur, the strength of this bond will diminish as the teddies in question lose energy (this is still dissipated as *boundary surface wave energy* until the energy threshold or ground state is once again achieved). The boundary chords are however, resonating strongly at this time - and this is where the *boundary chord mass capacity* may play its part in this process. As opposing 'S' faces come together under the much stronger influence of their bi-polar dim-wave

emissions, the chords that make up each of the two approaching faces may either combine completely (producing the same number of face chords) - or intertwine. By combining completely, the chords that end up comprising what will in essence be a single bonded face, would almost return to their pre-*Stage 1* mass - but in so doing, it is difficult to picture just how this would easily occur. It also causes a problem as far as any future decay or separation is concerned, as in this case, this would result in an extremely strong and perhaps *permanent* bond.

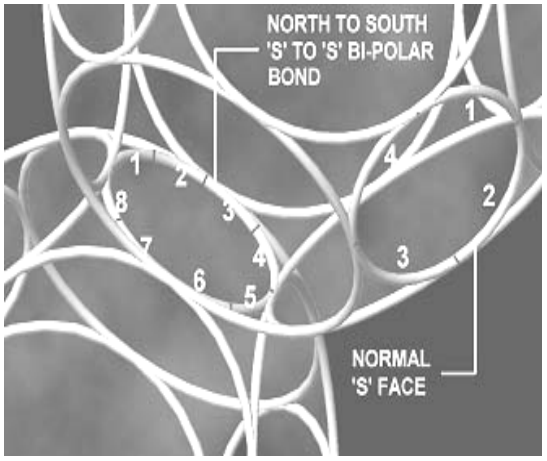

Figure 14.3.03 *As protons couple, their shared faces may combine and thus double the boundary chord value of this bonded 'S' face to a new total of eight compared to the normal face's four.*

An alternative would be to combine the boundary chord values that exist along this bonded single surface, which would result in the bond being able to share *ALL* of the available boundary chords, which in this case, would produce a *shared* 'S' face with a total of *eight* values, instead of the usual four (see *Figure 14.3.03* above). This would also allow a new or modified area of influence *(AOI)* to take effect as far as any future frictional effect is concerned (produced by the rotation of this face's 2D membrane). This new *AOI* would be *half* the area of the original and should therefore produce at least *half* of the original's effect. Considering that there is twice the boundary chord material now in place, this would allow the *SAME* emission from what were originally *TWO* faces of two separate protons.

The increase in the frequency of boundary chord resonance and the faster rotation of the membranes would also help achieve this goal, with a tendency to mix these chord values together. Both protons however, would be continually losing energy through dim-wave emission, which would be dissipating at the 3D/4D and 4D/5D boundaries - while both types of rotational group produced vibration in their chords through membrane friction and the kinetic energy of collision. All of this extra input of energy would eventually dissipate of course, and both protons would return to their ground state and their chord resonance would fall below their energy threshold. Both protons should return to normal and the rotational groups too, would revert back to their pre-collision configuration - with the 'H' faces producing the bi-polar 4D/5D dim-waves and the 'S' faces their singularly expansive 3D/4D versions (see *Figure 14.3.04* below).

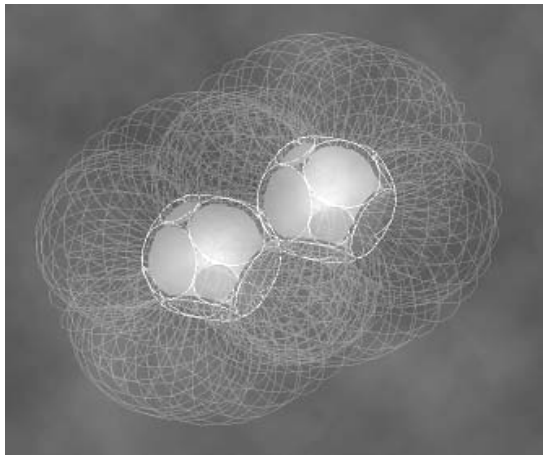

Figure 14.3.04 *As protons revert to normal after the bonding process, their 'H' and 'S' faces resume their previous configuration and the polarity of their charges 'flip' once again.*

There is a problem however and there will be a serious conflict between this pair of protons. Like charges repel one another and although the

bonding face is now a singular one, all the adjacent faces are 'H' and have thus reverted back to being positive as the collision energy has been dissipated as dimensional boundary surface wave energy. There are however a total of four 'H' faces in close proximity to one another and this will cause the conflict. They are not close enough to one another to repel the protons, but they will cause enough disruption within the system to raise the threshold energy of one of the pair to such an extent, that the membranes themselves will *re-gas* from their positions within the chords that bound each of the faces. Their mass will be re-absorbed and they will thus disappear. The charge on this proton's faces will cease and it will revert to its *Stage 1* configuration as a neutron. This will solve this (almost tidal) conflict (see *Figure 14.3.05* below).

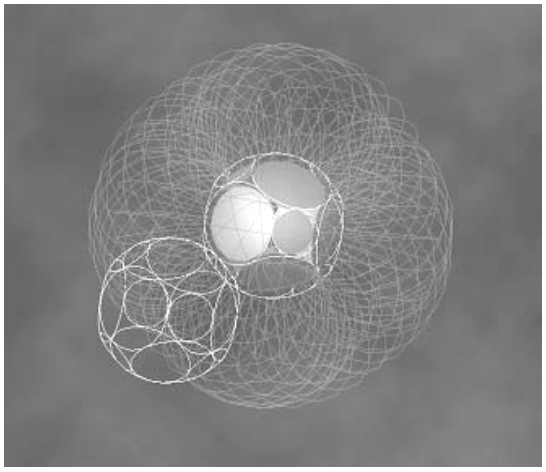

Figure 14.3.05 *As the energy threshold of one of the protons is raised because of the like against like conflict of adjacent 'H' faces, the membranes are re-absorbed, the charge disappears and the proton reverts to a neutron.*

14.4 The appearance of deuterium

Referring back to *Figure 14.1.01* on page 114, this process between two colliding protons becomes the first reaction in the 'pp1' chain and this will produce a ***deuterium*** nuclei. The 'pp1' chain also requires that a positron and a neutrino be released and this should be discussed before going on any further. Within this model's nucleus, there is nothing (yet) to suggest that there need be any additional loss of mass during the bonding process. This *would* be required however, if it were not for the fact that the boundary chord *de-gassing* of the *Stage 2* reconfiguration produces the required difference between proton and neutron any way. Considered as a complete system however, the hydrogen atom (again, within this model) possesses a positive charge at the nucleus, a negative charge at the e-shell *AND* a separately captured *electron-mass*. As protons collide in the crowded early universe and undergo their conversion, these electron masses will escape, as the charges on the faces are turned upside-down.

As mentioned a page or two earlier, the conservation laws in this case, may require that the positive charge of the transforming proton does not merely disappear because it is no longer produced, but is instead transferred to this *escaping* electron mass. As the electron shell disappears from this inverted hydrogen system, so too will its induced energy shell, thus allowing the captured electron mass to break free. This would produce the required positron. The neutrino is more difficult, even though there is a 'charge-less' electron mass available (from the proton that remains a proton) - but the mass is at present, the wrong size. This could be rectified if one brings into play the constant motion axes from Chapter Eight - but this should all really be left until a later date, once this question has been examined in a little more detail.

Deuterium has always been considered as the first isotope of hydrogen, but appears to be pretty stable. In this model, its single proton would produce the same type of e-shell as hydrogen and it would be capable of capturing its own electron mass just the same. However, because it is the first configuration of proton and neutron to be produced in this way, it could be classified as the first 'proper' element of what has become the third-dimensional level.

Returning to the subject of collisions in a

crowded embryonic universe, deuterium would result from the bonding of two protons, as one of these bodies reverts to a *Stage 1 neutron*. There is no reason though - why this bonding process has to stop with just two, because there are after all, a total of *THREE* - 'S' faced rotational groups at work once these face charges have *flipped* position.

14.4 From deuterium to helium-3

Taking it 'one step at a time', the next episode described by the 'pp1' chain reaction, involves the synthesis of helium-3 with its two protons and single neutron (see *Figure 14.4.01* below). Can this be made to work in a similar way to deuterium?

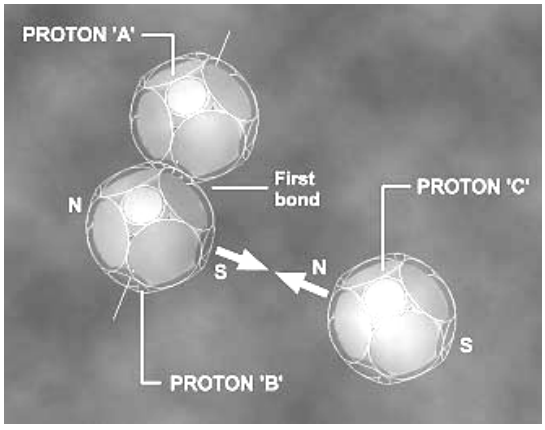

Figure 14.4.01 *While the protons that will form deuterium are still in their over-turned state, a third proton may be attracted by their now positive mutually attractive 'S' face dim-waves.*

In a hot, crowded environment, it would not be difficult to imagine the attraction of a third proton to the coupling that would otherwise produce deuterium. Each proton would possess three *attractive poles* - and two of these would still be available to a *third*, approaching proton and, as can be seen from *Figure 14.4.01*, these polar axes would be perpendicular to that already used by the first bonding process. As this second coupling occurs, similar forces of like-to-like charge create conflict between this trio and a reconfiguration of 2D membranes will again occur. This time however, it will be the central proton that *re-gases* as tidal like effects are created by the other two. This central proton will reconfigure to a *Stage 1 neutron* and in this scenario, the other protons will eventually 'flip' their positions back to normal as before. ***Helium-3*** would have been synthesized, with its two protons and its single neutron (see *Figure 14.4.02* below).

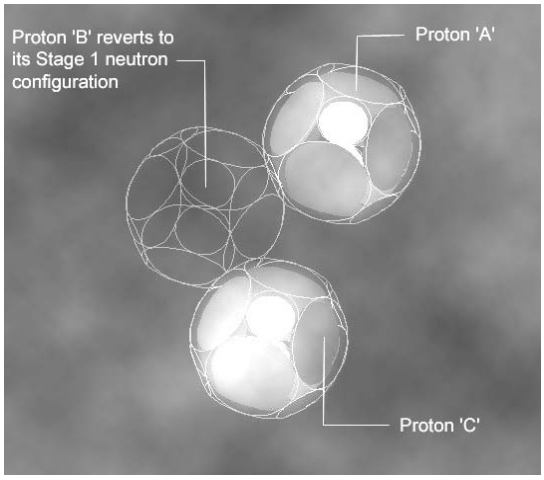

Figure 14.4.02 *As a third proton couples to an existing double bond, with no further action involved - they will 'flip' their polarity back to normal and the central proton will reconfigure to a Stage 1 neutron. Helium-3 will have been synthesized.*

This process releases ***gamma rays***, which in this model, would be equivalent to *high-energy* dimensional boundary surface waves. The last stage in this illustrated version of the basic 'pp1' chain reaction, would involve the collision of *two* helium-3 nuclei, to produce ***helium-4***, with its familiar configuration of two protons and two neutrons (see again *Figure 14.1.01* on page 114). From *Figure 14.4.02* above, it is quite easy to see how the result of this collision would need to lose two protons during this encounter, but there is a problem. By this time - and assuming that the synthesis of *helium-4* progresses just as described by the 'pp1' chain, these colliding helium-3 nuclei would probably have reverted to their normal polarity and configuration. It now becomes more difficult to get a 'chance' collision

to work in quite the same way. The bonding faces themselves would have changed position (the attractive properties of the high-energy dim-waves would now be back with the 'H' faces) and these would not be as powerful as those of the 'S' face during the 'flip' phase. We could however, look at what might happen if two 'flipped' three-proton bodies collided *prior* to them reverting back to their normal configuration. Would this help solve this problem?

Most of the chapters within this submission were originally conceived and written as individual papers and at the time of compiling this particular one, this 'flipped-polarity' work was still on the drawing board (literally). It seemed fairly obvious by now however, that most of the *trans*-hydrogen synthesis during these early stages in the evolution of the universe *COULD* be illustrated by way of this 'flip' in polarity. This model is of course, still in its own very early stages and it will have already become quite patently evident, that the mathematics especially, will require further attention. There is of course, only so far you can go at any one time and similarly, you have to learn to walk before you can run.

There were many unknowns as well, such as the timing of such events within this small, embryonic cosmos and the attempted 're-writing' of history, is always a precarious thing to try to do at the best of times. This model's idea of the 'big-bang' was becoming more and more detached from the accepted model. It was like looking at an expanding three and four-dimensional universe that appeared as if from nowhere. It arrived with an enormous amount of momentum, which caused frequent collision events - and as a consequence, the environment began to heat up. The big problem here, is that it is doubtful whether one could ever tell for certain, just what the time-scale of all these events were in our terms; but one thing *IS* for sure - and this is that the universe was continuing to expand. This would mean that this episode of heating would be finite and the environment during these early times was definitely changing.

A more detailed account of this early phase of nucleosynthesis will be dealt with later in Chapters 16 and 17 and the possibility of this 'polarity-flip' during episodes of high-energy collision will also be explored more fully. The next chapter however, will take a slight detour for a moment and we will delve a little deeper into the nature of the tetrakaidecahedron which after all, is an important and very integral component to the working of this particular model.