Chapter XX
Novanion unification

20.1 Introduction.

Two novanions multiplied together cannot become zero unless one of them is zero, provided and only provided that the scalar part $t \neq 0$. At $t = 0$, interpreted as the time component at the creation of the universe, for novanionic space components at this time, the algebra has a rich structure in which zero becomes the product of novanion pairs. This is interpreted as the creation of the universe from nothing and has a spacelike extension at $t = 0$.

An interesting and essential feature is that at $t \neq 0$ the novanions become division algebras, that is, nonzero entities cannot be reduced by multiplicative interaction back to a zero state.

20.2 The nonconservation of number at time t = 0.

These ideas can be grafted on to various universe creation theories currently circulating, and without commitment we sketch them.

Embedded in Hawking-Turok *Instanton theory*, this explains the existence of the instanton in the first place**.**

In a Protouniverse theory, developed to explain the non-uniformity and the varying density of the universe**,** the formation of matter from nothingness before the big bang is related to white hole theory, where matter continuously appears at the speed of light, but there is believed to be no observational evidence for white holes.

Alan Guth initiated *Inflationary theory* in 1981. Guth, an expert in scalar fields explaining how elementary particles got their mass, combined the mathematical equations for a scalar field with Einstein's equations describing the expansion of the universe, and developed a theory in which large amounts of matter and energy were created from nothing. After matter and energy were created, the universe experienced an accelerated expansion, becoming exponentially large prior to continuing its evolution according to the big bang model. This theory has been worked on and modified by many cosmologists since its introduction.

In Andre Linde's Self Creating Universe, the bubble universe involves creation of universes from a quantum foam of parent universes. On very small scales, the foam is frothing due to energy fluctuations. These fluctuations may create tiny bubbles and wormholes. If the energy fluctuation is not very large, a tiny bubble universe may form, experience some expansion like an inflating balloon, and then contract and disappear from existence. However, if the energy fluctuation is greater than a particular critical value, a tiny bubble universe forms from the parent universe, experiences long-term expansion, and allows matter and large-scale galactic structures to form. The theory stems from the concept that each bubble or inflationary universe will sprout other bubble universes, which in turn, sprout more bubble universes. The universe we live in has a set of physical constants that seem tailor-made for the evolution of living things. On the other hand, our theory stipulates the existence of only one $t = 0$, and so does not correspond to this Self Creating Universe theory.

Note that we are not adopting here the Einsteinian interpretation of the line element, in which special relativity is described by novanionic vectors without base point. We allocate a base point to all novanion vectors, so that they do not ‘float’, which is the pre-Einsteininan idea due to Lorentz. Then there is a specific and unique zero time and zero space.

The existence of simultaneity within this description is now available. This is especially useful in general relativity if adopted, where the manifold can globalise in other Einsteinian circumstances in multiple ways from its many localisations. The presence of simultaneity guarantees the existence of a unique globalised manifold.

20.3 The creation of time.

In chapter XI we showed that if a = 0, the 10-novanions contain possibilities for two nonzero 10-novanions giving a product which is zero, and gave an example due to Doly García, showing that the 10-novanions satisfying a = 0 do not form a division algebra of standard type

$$(i + i' + i'')(j + j' - 2j'') = 0. \qquad (1)$$

Thus the 10-novanions are not a division algebra given by the condition for equation 11.2.(1), nor do they satisfy definition 11.4.1 since for an arbitrary real number g

$$(i + i' + i'')[(j + j' - 2j'')g] = 0. \qquad (2)$$

It is clearly also the case that

$$(i + i' + i'')(i + i' + i'') = -3, \qquad (3)$$

a scalar time component. This means we have generated a nonzero scalar time component from building blocks derived from the number zero. Further, we can use this time component to generate new time components and new space components by addition and multiplication.

20.4 Novanion interactions.

The fundamental assumption which derives a universal structure from novanion mathematics is that interactions are described at minimum by addition, subtraction and multiplication of novanion propagators. We allow as a further possibility that superexponential operations, including those of $\mathbb{D}$w type could also be present.

The proposed model of the novanion universe generates all novanion states from its initial propagator set obtained by multiplication of novanions equating to zero. We have seen that the model is one in which the propagator seeds are generated at time equals zero. This model universe allows the unrestricted choice of selected mathematical operations acting between propagator seeds and their generated descendents. The generation process occurs as a logical generation not situated in the time and space coordinates occupied by the novanion universe. Generated universes collapse to nothing in an inconsistency, whereas universes which are consistent survive and exist.

Under the simplest assumption, these interactions are restricted by the confinement of interactions at the additive and multiplicative level to those of a ring. The reason for this restriction arises firstly from the observation that Wedderburn’s little theorem, that every finite division ring is commutative, and its extension to the novanion case, implies that if we are to have a noncommutative novanion physics, it cannot be finite.

However, an infinite novanion theory can be restricted to a structure which is built up from integer parts, in other words at some level there is a basic unit of time and basic units of distance. In the novanion model the time component is what we have described as a scalar; it is commutative and associative with itself and with space components. For the analogue in quaternions nt + ix + jy + kz, then i, j and k are quaternion imaginary, and t is a scalar, where i, j and k anticommute and belong to the space components. In this situation t, x, y and z have compatible unit values, that is, they belong to the same set of integers. Space components for general novanions are multiplicatively both noncommutative and nonassociative. When there is no division operation in the novanion algebra we say, in deviation from normal usage, that we have a novanion ring.

Why then is division not allowable in infinite novanion physics? We investigate whether this arises from physically infinite states present in such a universe. These states might actually be present if we adopt, say, the ladder algebra of *Number, space and logic*, Volume I, chapter I [Ad18], where these result in a computable algebra acting on ordinal infinities. We would probably wish to start off a time t = 0 and generate countable infinities from unit values, as indeed we can, because 1 is present in this ring, and generates integers by addition and subtraction, and the multiplicative operation combined with division then generates fractions from these integers, and we end up with numbers which at each stage of this generation process are fractions.

Nevertheless, if we adopt a more mundane approach, we see that if interactions are defined by addition, subtraction, multiplication and division in all possible combinations, then for each time t_1 and t_2 in the system there exists a t_3 with $t_3 = t_1t_2$, and the number of occupancy states of each variable, given an infinite set of available states, that is, the number of possible ways in which it can be generated, is infinite. We will continue later with the interpretation that the number of occupancy states corresponds in some ways with the energy of the system. In this mundane approach we might prefer energy infinites to be absent.

Since zero is present in this system, we have a difficulty that we cannot divide by it in the type of algebra for scalars, that of a field, which we are adopting – and for a field dividing by zero is inconsistent, so we would be saying that this universe is inconsistent, or possibly that any number in it is equal to every other number, which is not very useful. So this is an extra consideration, and from the preamble of this section, the deciding one. We note that if a division operation is absent, under unrestricted choice it is absent everywhere, and we do not allow fractions in the novanion universe that are not integers, say ½, or if we accept $\mathbb{D}$w novanion superstructures then for instance we do not have present in this universe any number to a fractional power. This means quite simply that the system is quantised, even for $\mathbb{D}$w superstructures.

Let us continue with some descriptive aspects of our model. As an example, consider a one dimensional space component. Equation (2) of section 3

$$(i + i' + i'')[(j + j' - 2j'')g] = 0,$$

now operates only from a generated set of g, which must be a set of integers. We also see that generated scalars are

$$(i + i' + i'')(i + i' + i'') = -3,$$
$$(j + j' - 2j'')(j + j' - 2j'') = -4,$$

and since g can be –1, the scalars 3 and 4 are also present. This means, additively as an allowable operation, the scalar 1 = 4 – 3 is present in this universe, and therefore the set 1, 2, 3, ... since 2 = 1 + 1 is generated by an allowable operation, and so on.

This induces us to consider a lattice structure as the building blocks of this model. In a one-dimensional model this is a set of points corresponding to the integers. In an n-dimensional model it corresponds to the points of an n-dimensional cubical lattice.

We will take this description a little further to consider, for each point in the lattice, how often it is occupied under its logical generation from its seed novanions. For the line of the one dimensional toy model, if 1 is present, then starting from zero, it generates by addition an occupied point for every subsequent point in the lattice. When 2 is generated, starting from zero it generates an occupied point in every even occurrence of the lattice. When a number m is generated, starting from zero it generates an occurrence every mth time. This structure is well-known in mathematics; it is the sieve of Eratosthenes. Excluding the number 1, every prime number along the lattice occupies just one point. The number of multiple occurrences at a point is the number of times its number along the lattice factorises.

In general we have a more complicated structure for these occupancy numbers, since we are considering n-dimensional structures, where n is the dimension of the n-novanion, and this generates in space and time these occupancy numbers in multiple ways.

Before we go further we need to say that 10-novanions have a type of symmetrical structure, which implies the lattice universe is also symmetrical if adopted as a model, whereas, since 26-novanions have override structures, this induces asymmetry in its structure, so we would expect here for the first time that its occupancy numbers between different dimensions is also asymmetrical. This is an important feature for the physicality of our model.

One statistical attribute however should be intuitively evident. As the occupied point starting from zero increases, its occupancy number generated from the addition, subtraction and multiplication operations also increases statistically, since there are more opportunities for these numbers to increase the higher the occurrence past zero along the lattice becomes.

Our interpretation is that these occupancy numbers along the lattice correspond to physical quantities, say mass, which special relativistically is energy, and another name for a type of energy is potential.

Additively, there are two possibilities between objects close in distance and time, either as a sum, which since we are counting from distance and time zero will be far away from these objects, and a true local interaction given by their difference. Superimposed are at least multiplicative interactions. Present here is the state corresponding to the interaction given by the coordinates of one object plus a multiplicative component acting on the subtractive novanion defined between the two objects. This interaction is quite local.

Thus we are able, without going into deep calculation, to give an important feature of the novanion universe. After time $t = 0$ it explodes, and it always continues to explode, and the greater the time from zero the greater will be the intensity of this explosion. Interior regions within this explosion may be relatively quiescent. Interactions between adjacent states in a quiescent region interact by, say, multiplication of states counted from zero which give rise to states far away from this region. This generated region may not be even measurable from the adjacent states, but there will be measurable distant objects relative to the region which will be seen as accelerating away with increasing acceleration.

This is in accordance with the observation of a Hubble red shift of distant objects in the universe, and a measured negative curvature, corresponding to the Einstein antigravity term, at outermost parts of the observable universe.

Thus for a particular time t, there will be a shell around the central location of the universe where the curvature of the universe is zero, like the point between the Earth and the moon where there is no net gravitational force to either body, there being attraction between objects within the shell and repulsion between objects at a distance greater than it, and this shell will be measurable. For a region situated asymmetrically with respect to the central location, this means that the asymmetry can be measured and the offset of the region from the central location can be calculated.

20.5 The Hajas identification. n = 10 novanions and heterotic strings.

20.6 n = 26 novanions and bosonic strings.