Appendix B

The Limitation of the Original Envelopes

This is to show how the otherwise infinite string of envelopes to the original oscillation at the start of the universe was subject to a finite limitation. By "finite limitation" is meant that in the vicinity of the cut-off number of envelopes, N_0, the amplitude of each of the further successive envelopes being imposed on the original $U(t)$ was successively significantly less than its immediate predecessor and the rate of that amplitude decrease increased sharply with further envelopes – there was a sharp cut-off of amplitude.

After a moderate number of such cut-off region envelopes the amplitude of any further envelopes becomes infinitesimal. While such infinitesimal (and still continuing to become ever more infinitesimal) envelopes theoretically go on to an infinite number of them, the result is equivalent to the convergence to a finite value of a mathematical infinite series such as, for example that of the cosine. The envelopes cut-off is a result of the mathematics of $U(t)$.

The key to that behavior is to be found in Table B-1, below, the expansion of the $Cos^n(x)$ function. The "Cosmic Egg" expression, equation *2-5*, repeated below

$$U(t) = \pm U_0 \cdot \left[1 - \text{Cos}\left[2 \cdot \pi \cdot f_{env} \cdot t\right]\right]^{N_0} \cdot \left[1 - \text{Cos}\left[2 \cdot \pi \cdot f_{wve} \cdot t\right]\right] \qquad (2\text{-}5)$$

contains the factor

$$\text{Cos}^{N_0}\left[2\pi(f_{env})t\right] \qquad (B\text{-}1)$$

which creates the set of envelopes to the original oscillation. The expansion of the cosine raised to the power of its N_0 exponent behaves according to the pattern illustrated in Table B-1, below. Analysis of the patterns in the coefficients of the individual terms of the $Cos^n(x)$ expansion discloses a pattern related to the binomial expansion as demonstrated in the table.

(a) Binomial Expansion Coefficients $[a + b]^n$

n							Coefficients								
0								1							
1							1		1						
2						1		2		1					
3					1		3		3		1				
4				1		4		6		4		1			
5			1		5		10		10		5		1		
6		1		6		15		20		15		6		1	
7	1		7		21		35		35		21		7		1
:															
:															

$$T(i) = \frac{n!}{(n-i)!\cdot i!}$$

(b) $Cos^n(x)$ *Expansion Coefficients*

n	Coefficients, Times Cos(*), * = 0x	1x	2x	3x	4x	5x	6x	7x
0	1							
1	–	1						
2	1	–	1					
3	–	3	–	1				
4	3	–	4	–	1			
5	–	10	–	5	–	1		
6	10	–	15	–	6	–	1	
7	–	35	–	21	–	7	–	1
:								
:								

$$T(i) = \frac{n!}{(n-i)!\cdot i!}$$

Table B-1

Clearly, with the exception of the constant term (where, in the table, $* = 0x$) the other terms of the expansion of $Cos^n(x)$ have the same coefficients as the corresponding terms of the binomial expansion. The formula for the binomial expansion can thus be used to obtain the coefficients for any value of n in the expansion of $Cos^n(x)$, in the present case for any value of N_0 in the expansion of the $U(t)$ factor

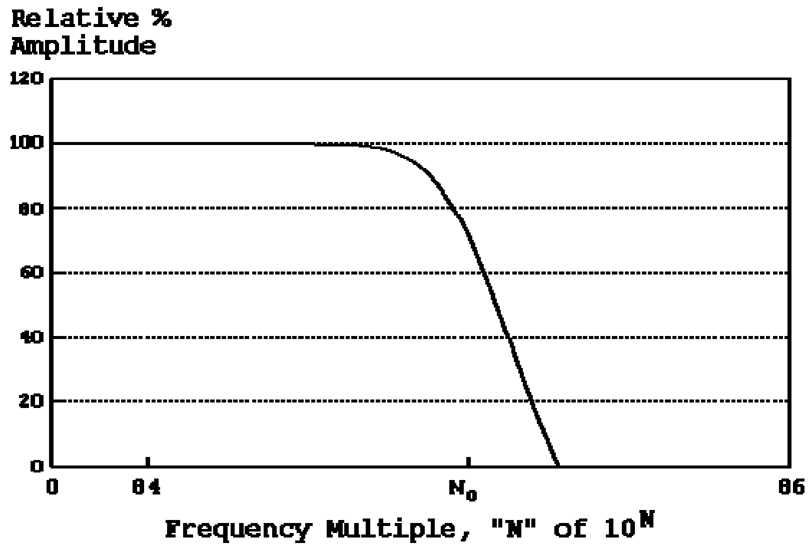
$$Cos^{N_0}\left[2\pi(f_{env})t\right]$$

The cut-off occurs around the value of N_0 regardless of what that value is. Therefore the value of N_0 is not important. Nevertheless it is of interest that various attempts to estimate it give values around 10^{85}.

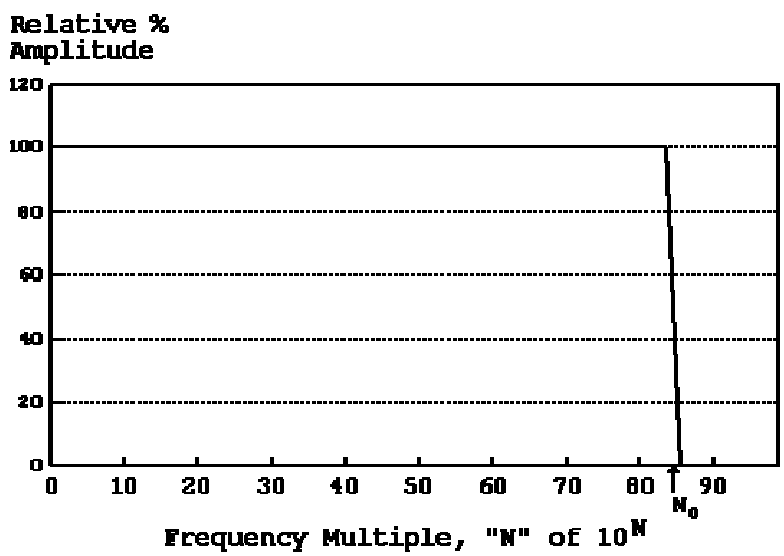
$N_0 = 10^{85}$ is the n of the formula. It is not practicable and most likely not possible to calculate all of the coefficients of the cosine expansion of the envelopes for 10^{85} envelopes. On the other hand, it is not unreasonable to calculate the 85 cases corresponding to the frequency multiples of the expansion: $10^1, 10^2, 10^3, \cdots 10^{85}$.

Figure B-1, below, is a plot of the relative magnitude of the successive coefficients of the various frequency multiples $(1\cdot x, 3\cdot x, \cdots 10^{85}\cdot x)$, in the expansion of $Cos^n(x)$ for $n = N_0 = 10^{85}$. The plot indicates a sharp cut-off, an attenuation of the higher frequencies. Figure B-1(a) uses a linear horizontal axis and shows the cut-off in detail. Figure B-1(b) uses a logarithmic horizontal scale to better present the tremendous range in frequency multiples from 1 to 10^{85}. It shows that the cut-off is quite sharp and drastic.

This cut-off is merely the action of the mathematics of $cos^n(x)$.



(a) Linear Scale



(b) Logarithmic Scale

Figure B-1
The $Cos^n(x)$ Limitation of the "Cosmic Egg