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DO PRIME NUMBERS OBEY THREE DIMENSIONAL DOUBLE HELIX ?

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Abstract

When a subset of sequential integers is arranged in a specific way, there appears a paired set of slanted straight lines along which prime numbers seem to naturally arrange themselves in a repeated fashion. This arrangement can further be observed to be a two dimensional surface applicable to the cylinder. If this arrangement is on a piece of paper, then one can fold the paper in the form of a cylinder, and the paired set of slanted straight lines unite at the page edges to form a double helix winding down the cylinder. Paired primes are thus seen to be an association between primes residing on these two paired helixes, and further analysis shows that there appears to be two types of paired primes. Is the **prime number double helix** nature's secret for jump starting life (DNA) and thereby defeating entropy (at least in the initial stage) by creating **order from order** instead of order from disorder? The prime number trends examined exhibit right handed chirality; left handed chirality is obtained by symmetry considerations.

Discussion

The purpose of this paper is to present a technique of looking at sequential integers which seems to bring out a hidden structure of the prime numbers. A seven column array of integers is set out as in Tables 1a and 1b. The prime numbers are highlighted in bold black. The non-primes are then deleted leaving only the primes. There results an unmistakable diagonal trend in the primes, which can be resolved into two trends for two sets of primes. This set of paired trends is then repeated and repeated for different primes. One can draw trend lines under each of the trend sets of diagonal primes as depicted in Tables 2a and 2b. Tables 3a and 3b are included to show that this diagonal trend continues into higher order primes, even though the density of primes along the trend lines fluctuates: sometimes increasing, decreasing, and sometimes disappearing altogether.

If Tables 2a, 2b, 3a, or 3b are printed out on a sheet of paper, the paper can be folded into a cylinder with the left side folding from front to back and joining with the right side which is folded from front to back. The trend lines then join on the back side of this cylinder as one then perceives a set of paired three dimensional helixes winding down the cylinder. Paired primes are thus seen to be an association between primes residing on these two paired helixes.

Table 1a: Seven Column Array of Integers

1	**2**	**3**	4	**5**	6	**7**
8	9	10	**11**	12	**13**	14
15	16	**17**	18	**19**	20	21
22	**23**	24	25	26	27	28
29	30	**31**	32	33	34	35
36	**37**	38	39	40	**41**	42
43	44	45	46	**47**	48	49
50	51	52	**53**	54	55	56
57	58	**59**	60	**61**	62	63
64	65	66	**67**	68	69	70
71	72	**73**	74	75	76	77
78	**79**	80	81	82	**83**	84
85	86	87	88	**89**	90	91
92	93	94	95	96	**97**	98
99	100	**101**	102	**103**	104	105
106	**107**	108	**109**	110	111	112
113	114	115	116	117	118	119
120	121	122	123	124	125	126
127	128	129	130	**131**	132	133
134	135	136	**137**	138	**139**	140
141	142	143	144	145	146	147
148	**149**	150	**151**	152	153	154
155	156	**157**	158	159	160	161
162	**163**	164	165	166	**167**	168
169	170	171	172	**173**	174	175
176	177	178	**179**	180	**181**	182
183	184	185	186	187	188	189
190	**191**	192	**193**	194	195	196
197	198	**199**	200	201	202	203
204	205	206	207	208	209	210
211	212	213	214	215	216	217
218	219	220	221	222	**223**	224
225	226	**227**	228	**229**	230	231
232	**233**	234	235	236	237	238
239	240	**241**	242	243	244	245
246	247	248	249	250	**251**	252
253	254	255	256	**257**	258	259
260	261	262	**263**	264	265	266
267	268	**269**	270	**271**	272	273
274	275	276	**277**	278	279	280
281	282	**283**	284	285	286	287
288	289	290	291	292	**293**	294
295	296	297	298	299	300	301
302	303	304	305	306	**307**	308
309	310	**311**	312	**313**	314	315
316	**317**	318	319	320	321	322
323	324	325	326	327	328	329
330	**331**	332	333	334	335	336
337	338	339	340	341	342	343
344	345	346	**347**	348	**349**	350

Table 1b: Seven Column Array of Integers (con't)

351	352	**353**	354	355	356	357
358	**359**	360	361	362	363	364
365	366	**367**	368	369	370	371
372	**373**	374	375	376	377	378
379	380	381	382	**383**	384	385
386	387	388	**389**	390	391	392
393	394	395	396	**397**	398	399
400	**401**	402	403	404	405	406
407	408	**409**	410	411	412	413
414	415	416	417	418	**419**	420
421	422	423	424	425	426	427
428	429	430	**431**	432	**433**	434
435	436	437	438	**439**	440	441
442	**443**	444	445	446	447	448
449	450	451	452	453	454	455
456	**457**	458	459	460	**461**	462
463	464	465	466	**467**	468	469
470	471	472	473	474	475	476
477	478	**479**	480	481	482	483
484	485	486	**487**	488	489	490
491	492	493	494	495	496	497
498	**499**	500	501	502	**503**	504
505	506	507	508	**509**	510	511
512	513	514	515	516	517	518
519	520	**521**	522	**523**	524	525
526	527	528	529	530	531	532
533	534	535	536	537	538	539
540	**541**	542	543	544	545	546
547	548	549	550	551	552	553
554	555	556	**557**	558	559	560
561	562	**563**	564	565	566	567
568	**569**	570	**571**	572	573	574
575	576	**577**	578	579	580	581
582	583	584	585	586	**587**	588
589	590	591	592	**593**	594	595
596	597	598	**599**	600	**601**	602
603	604	605	606	**607**	608	609
610	611	612	**613**	614	615	616
617	618	**619**	620	621	622	623
624	625	626	627	628	629	630
631	632	633	634	635	636	637
638	639	640	**641**	642	**643**	644
645	646	**647**	648	649	650	651
652	**653**	654	655	656	657	658
659	660	**661**	662	663	664	665
666	667	668	669	670	671	672
673	674	675	676	**677**	678	679
680	681	682	**683**	684	685	686
687	688	689	690	**691**	692	693
694	695	696	697	698	699	700

Table 2a :
Prime Numbers As
They Order Along
Paired Straight Lines

	2	3		5		7
			11		13	
		17		19		
	23					
29		31				
	37				41	
43				47		
			53			
		59		61		
			67			
71		73				
	79				83	
				89		
					97	
		101		103		
	107		109			
113						
127				131		
			137		139	
	149		151			
		157				
	163				167	
				173		
			179		181	
	191		193			
197		199				
211						
					223	
		227		229		
	233					
239		241				
					251	
				257		
			263			
		269		271		
			277			
281		283				
					293	
					307	

Table 2b :
Prime Numbers As They Order Along Paired Straight Lines (con't.)

					293	
					307	
		311		313		
	317					
	331					
337						
			347		349	
		353				
	359					
		367				
	373					
379				383		
			389			
				397		
	401					
		409				
					419	
421						
			431		433	
				439		
	443					
449						
	457				461	
463				467		
		479				
			487			
491						
	499				503	
				509		
		521		523		
	541					
547						
			557			
		563				
	569		571			

Table 3a :
Larger Prime Numbers
As They Still Order Along Paired
Straight Lines

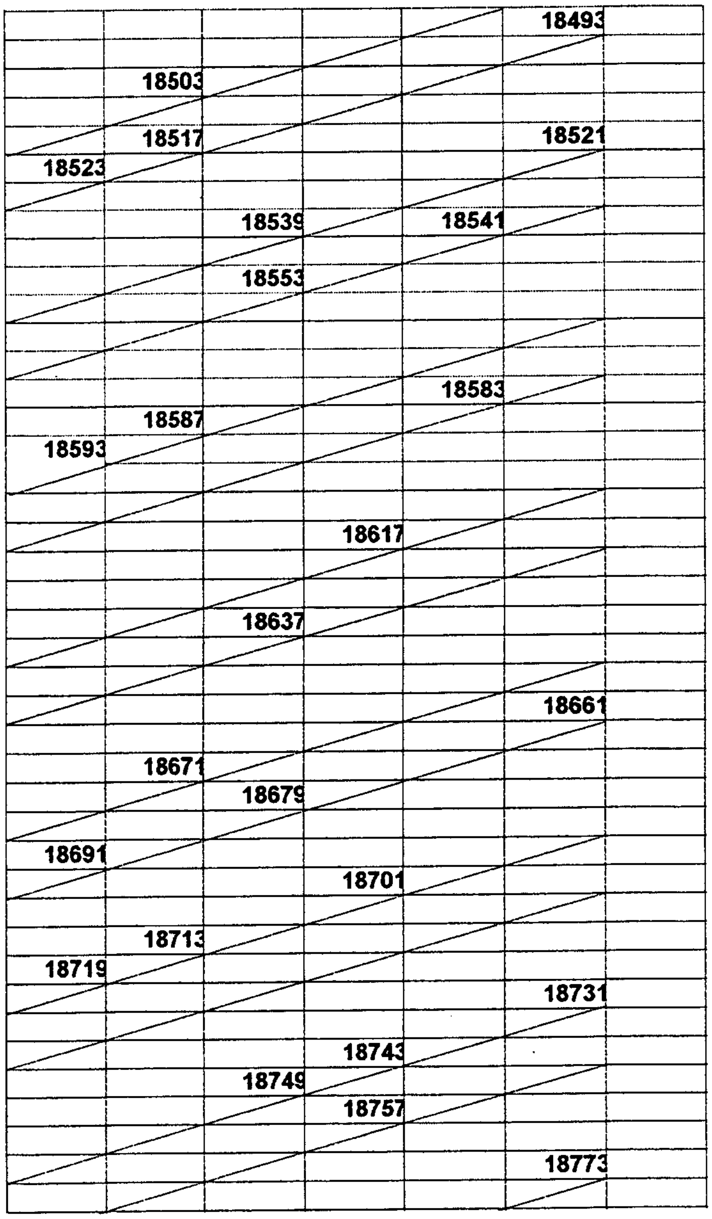

Table 3b :
Larger Prime Numbers As They Still Order Along Paired Straight Lines (con't.)

					18773	
					18787	
				18793		
	18797					
18803						
	18839					
18859						
			18869			
					18899	
			18911		18913	
		18917		18919		
				18947		
		18959				
		18973				
	18979					
		19001				
			19009			
19013						
				19031		
			19037			
			19051			
19069				19073		
			19079		19081	
				19087		
			19121			

Further Discussion

The most obvious question to be asked is whether or not nature actually utilizes such a seven column array to create the prime induced geometry of this double helix so as to be used as a blueprint for the further creation of the physical DNA double helix upon which life is based. Does the key to finding the secret of living systems reside in how quantum mechanics deals with prime numbers? If true, this would then mean that either ordinary quantum mechanics can somehow distinguish prime numbers in order to create animate from inanimate matter, or else there is a new type of quantum mechanics based solely or in large part upon prime numbers, specifically for the design and maintenance of living systems.

It is also possible to work within the two dimensional framework. Since the paired straight lines seem to be repeated in a regular fashion, one can find the equation for the first two straight trend lines and then add integral values to obtain the others. The way this spreadsheet is set up, it is assumed that one is working in the fourth quadrant. The equation for the first line is 6x - 35 and the equation for the second line is 6x - 49. If one gives the designation of '1' for the first line of any pair (helix 1) and '2' as the designation for the second line of any pair (helix 2), then the general equations are as follows:

$P_{1(n)x} = 6x - 35 - 42n_1$ . . . . (1)
$P_{2(n)x} = 6x - 35 - 14 - 42n_2 = 6x - 49 - 42n_2$ . . . . (2)
for x = 1, 2, 3, 4, 5, or 6 and n_1, n_2 = 0, 1, 2, 3,........ ∞
$P_{1(n)x+1} - P_{1(n)x} = P_{2(n)x+1} - P_{2(n)x} = 6$ for contiguous primes.
Since these equations are assumed to be in the fourth quadrant (see note), $P_{1(n)x}$ and $P_{2(n)x}$ are negative. One can set up spread sheet formulas to determine n for a prime candidate as follows for the following examples:

Table 4:

P1 =	-509	-19013	-431	-69371	-479	-19001	-881
X =	5	1	4	1	3	3	6
n1 =	12	452	10	1651	11	452	21
P2 =	-898423	-112303	-433	-99991	-18793	-18787	-883
X =	1	2	6	3	5	6	1
n2 =	21390	2673	10	2380	447	447	20

where, for example,
$n_1 = 12 = (B1-(6*B2)+35)/(-42)$ for B1= -509 and B2=5 and
$n_2 = 21390 = (B5-(6*B6)+49)/(-42)$ for B5 = -898423 and B6 = 1

(Note: One can also pretend to be in the third quadrant, in which case the intercept is a bit easier to visualize, since column 7 becomes the 0 column or the vertical axis. The equations then become
$P_{1(n)x} = 6x + 7 - 42n_1$
$P_{2(n)x} = 6x - 7 - 42n_2$
In this case $x = -1, -2, -3, -4, -5,$ *and* -6*)*

The main assertion of this paper is that all of the primes, except for 2 and 3, obey the three dimensional double helix presented or, in the alternative, the repeated set of two dimensional paired straight lines presented. Unfortunately, non-primes (composites) have not been completely eliminated from these trend lines, but the vast majority have. Furthermore, paired primes have been shown to be of two types from Table 4. Namely, in the case of (431, 433), prime 431 resides on helix 1 with prime 433 on helix 2, both from the **same** complex of n = 10, while, in the case of (881, 883), prime 883 resides on helix 2 of the complex n = 20, while prime 881 resides on helix 1 of the next complex of n = 21.

Type I paired primes:
$n_1 = n_2 = n$
$x_2 = x_1 + 2$

Examples of Type I are
(17, 19), (59, 61), (101, 103), (149, 151), (18911, 18913)

Type II paired primes:
$n_2 = n$
$n_1 = n + 1$
$x_1 = 6$
$x_2 = 1$

Examples of Type II are
(41, 43), (419, 421), (461, 463), (18521, 18523)
Could paired primes have a physical correspondence with base pairs in the

double helical structure of DNA?
The equations for this helix are $x = r \cos\theta + 3$, $y = r \sin\theta$, $z = k\theta$
where r = cylinder radius centered at $x = 3$ with the helix wrapping around in a clockwise direction making θ negative, and k is a constant. The attempt will be made to give an estimate of k based upon the difference in the intercepts of equation (1).

Let $b_{10} = -35$ and let $b_{11} = -35 - 42$. Then $\Delta b = b_{11} - b_{10} = -42$
But $\Delta z = k\,\Delta\theta$, and $\Delta\theta = (-\theta - 2\pi) - (-\theta) = -2\pi$

$$\Delta b = -42 = \Delta z = k(-2\pi) \quad \text{or } k = \frac{21}{\pi}$$

As an aside, let us consider the story related by Edward Kasner and James R. Newman in *The World of Mathematics* (which was related from W.W.R. Ball, *Mathematical Recreations and Essays,* 11th ed., New York: Macmillan, 1939) in which the great French amateur mathematician Fermat was sent a letter:

> *"Accordingly, it is still a source of wonder that Fermat replied without a moment's hesitation to a letter which asked whether 100895598169 was a prime, that it was the product of 898423 and 112303, and that each of these numbers was prime."*

Fermat said that 100895598169 was not a prime, but let us use Table 5 to investigate whether or not this non-prime falls along the trend lines.

Table 5:

P1 =	-100895598169	-100895598169	-100895598169	-100895598169	-100895598169	-100895598169
X =	1	2	3	4	5	6
n1 =	2402276146.19	2402276146.33	2402276146.47	2402276146.61	2402276146.76	2402276146.90
P2 =	-100895598169	-100895598169	-100895598169	-100895598169	-100895598169	-100895598169
X =	1	2	3	4	5	6
n2 =	2402276145.85	2402276146	2402276146.14	2402276146.28	2402276146.42	2402276146.57

Therefore, this non-prime falls along the trend line of helix 2.

Let us now investigate the primes 898423 and 112303 using Tables 6 and 7.

Table 6:

P1	=	-898423	-898423	-898423	-898423	-898423	-898423
X	=	1	2	3	4	5	6
n1	=	21390.33	21390.47	21390.61	21390.76	21390.90	21391.04
P2	=	**-898423**	-898423	-898423	-898423	-898423	-898423
X	=	**1**	2	3	4	5	6
n2	=	**21390**	21390.14	21390.28	21390.42	21390.57	21390.71

Table 7:

P1	=	-112303	-112303	-112303	-112303	-112303	-112303
X	=	1	2	3	4	5	6
n1	=	2673.19	2673.33	2673.47	2673.61	2673.76	2673.90
P2	=	-112303	**-112303**	-112303	-112303	-112303	-112303
X	=	1	**2**	3	4	5	6
n2	=	2672.85	**2673**	2673.14	2673.28	2673.42	2673.57

Thus we determine that both of these primes also reside on the second helix.
For $P_{2(n)x}$ we now have
$-P_{2\,(21390)\,1} = 898423$
$-P_{2\,(2673)\,2} = 112303$

Conclusion

Is the **prime number double helix** nature's secret for jump starting life (DNA) and thereby defeating entropy (at least in the initial stage) by creating **order from order** instead of order from disorder? If any of these speculations are true, then it would make sense for there to exist another type of quantum mechanics, or at least a new level or layer of the present one, simply for the sole purpose of organizing large sets of molecules by using the double helix of prime numbers as a blueprint for creating DNA. Of course, this would necessitate a new type of wave field surrounding these molecules in order to introduce the concept of 'biologically active'. This new field would probably not be based upon probability, per se, but one based upon feedback of information from the surrounding environment at the very large multi-molecular level.....an 'awareness field' if you please. Clearly, there must be an objective field which would operate in conjunction with a new set of 'quantum mechanical type' laws/rules acting in partnership with this prime induced geometry; integral equations, for example, allow feedback mechanisms to exist quite naturally.

The chirality of the prime number double helix in this paper is right handed; however, if one flips the entire table of numbers (assumed to be in the fourth quadrant) around the x axis up into the first quadrant, while still keeping the rotation of θ clockwise, then the slope of the double straight lines change from positive to negative giving left handed chirality. Instead of considering just left handed DNA, perhaps this region of left handed chirality could also be utilized by the presumed new type of quantum mechanics to process other life- necessary molecules, such as amino acids. It is entirely possible that this prime induced double helix geometry, giving right and left handed chirality, could contribute to an understanding of the problem of homochirality in biological chemistry.

The density of primes seems to vary on either helix with an apparent tendency towards decreasing as higher order primes are encountered. A proposed explanation for this may lie in a curious observation which is directly related to the previous Fermat example; namely, that the product of primes results in a composite number which also lies on one of the two helixes (it is totally uncertain if this is true in the case of every prime). Could this be one of the contributing factors as to why the density decreases with increasing order of primes; namely, because of the curious mathematical necessity that the double helix is compelled to make extra room for these composites formed from the multiplication of two previous primes? These extra composite slots force the primes and any groups that they are associated with further away from each other; thus, decreasing the prime density. Another curious attribute of these two helixes is that one can possibly predict on which helix the product of two primes, thus a composite number, will fall. Using the formula for the n^{th} term in an arithmetic series $a_n = a_1 + (n - 1)\,d$, where a_1 is the first term and d is the common difference between successive terms in the sequence or progression, one has for helix 1 (H_1) $a_1 = 5$ and $d = 6$ and for helix 2 (H_2) $a_1 = 7$ and $d = 6$. Thus for H_1, $a_n = 6n - 1$ and for H_2, $a_n = 6n + 1$. These two formulas simply pick out the primes and the composites for each of the two helixes. If we consider the product of primes, then symbolically $H_1 \otimes H_1 = H_2 = H_2 \otimes H_2$ and $H_1 \otimes H_2 = H_1$.

References

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