The Rodin Number Map and Rodin Coil

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Many researchers have demonstrated anomalous effects with what has become known as the Rodin coil, a particular winding of electrical wire around a toroid form. These inductive anomalies include a displaced magnetic south pole, levitation, and wireless power transmission. Marko Rodin discovered this special geometry from studying number patterns mapped from a two dimensional plane to a closed two-dimensional space with the topology of a doughnut. He claims that these number patterns represent the natural flow of energy, and therefore winds wire along these natural flow lines. The shears between adjacent currents create a complex overall magnetic field, whose properties are as yet not well understood. But since wound coils are essential to motors, generators, transformers, and numerous electronic devices, we should not be surprised to discover that new 3D geometries for coil windings have the potential to revolutionize all of these components, and possibly provide a new model for the electron itself. This paper introduces some of the theory behind the Rodin coil, in particular the 2D Rodin map. It shows that any repeating 2D pattern can be mapped onto the topological equivalent of a toroid, but that the 2D Rodin map has several properties that make it unique.

1. Introduction

The Rodin number system is more than a mere study of numbers, but of topology. Physical systems always involve flows of energy and matter, and if we describe these systems in terms of fields, their interactions invariably produce nodes, or critical discreet points of inflection. It is possible in most cases, if not in general, to describe systems only in terms of these discreet entities, as conventional science knowingly or unknowingly does with the Schroedinger equation. But for any system, the topologies or relationships within a pattern of nodes are not arbitrary, but follow natural laws. Marko Rodin claims that the patterns found in his number system represent the natural topology of node-based systems, the way nature organizes itself. He claims that matter and energy always flow in circuits, consistent with Newton's 3rd Law, and thus must be described with finite, closed number systems. This paper will show that the modulo-9 number system is unique in many ways, particularly in 3D, and has properties consistent with Rodin's views on physical laws.

Just what exactly a number-system can and cannot describe remains an open question, but there is no doubt that the Rodin system is interesting and worthy of study for its own sake. Neither is there doubt that many people have reported anomalous behavior in the coil designed by Rodin, based on his number system. This paper makes no claim to completeness, but introduces the Rodin number system and coil to interested readers.

2. Modulo Arithmetic

It will be useful to introduce the notation

$\oplus$: addition modulo 9 (or other base)
$\odot$: subtraction modulo 9 (or other base)
$\otimes$: multiplication modulo 9 (or other base)
Θ : division modulo 9 (or other base)

Thus, for example

$$\begin{aligned} 6 \oplus 5 &= (6+5)\bmod 9 = 2 \\ 4 \odot 8 &= (4-8)\bmod 9 = (-4+9)\bmod 9 = 5 \\ 3 \otimes 7 &= (3\times 7)\bmod 9 = 3 \end{aligned} \tag{1}$$

where even negative numbers accept a modulo 9 value by adding multiples of 9, as in the example.

Modulo division Θ is more complicated and most easily done with a modulo multiplication table, as follows for modulo 9:

⊗	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	1	3	5	7	9
3	3	6	9	3	6	9	3	6	9
4	4	8	3	7	2	6	1	5	9
5	5	1	6	2	7	3	8	4	9
6	6	3	9	6	3	9	6	3	9
7	7	5	3	1	8	6	4	2	9
8	8	7	6	5	4	3	2	1	9
9	9	9	9	9	9	9	9	9	9

Table 1. Modulo 9 multiplication table

To find $8\,\Theta\,5$, say, we must add 9 to 8 N times until the total is a multiple of 5. In this case $N = 3$ and the total is 35:

$$8\,\Theta\,5 = (8+9\cdot 3)\div 5 = 7 \tag{2}$$

or we could just look for 8 in the 5th row of Table 1 to see that it lies in the 7th column. As with learning the multiplication table in elementary school, it takes some rote memorization and practice to master modulo division, simple as Table 1 may be.

However, care must be exercised, since modulo division is not necessarily unique or sufficient. For example $6\,\Theta\,3$ could be 2, 5 or 8, $9\,\Theta\,x = 9$ for all x, and $9\,\Theta\,9$ could be any number. A quick glance at Table 1 shows that modulo 9 division is unique and sufficient for all numbers except 3, 6 and 9. The degeneracy of these numbers turns out to be an important feature of the Rodin number map.

Of course, other operations, like exponentiation, can also be performed in a modulo-based system. Thus $2^n = 2,4,8,7,5,1\ldots$, $3^n = 3,9,9\ldots$, $4^n = 4,7,1\ldots$, $5^n = 5,7,8,4,2,1\ldots$, $6^n = 6,9,9\ldots$, $7^n = 7,4,1\ldots$, $8^n = 8,1\ldots$, and $9^n = 9,9\ldots$. Certainly these patterns will come up again.

3. Nomenclature

Though several approaches to the number map are available, perhaps the simplest is to begin with a degenerate case. Imagine the numbers 1 – 9 cycled in a row, with the same numbers staggered in the opposite direction in the next row, as in Table 2.

1		2		3		4		5		6		7		8		9		1		2		3		4		5		6		7		8		9		1
	7		6		5		4		3		2		1		9		8		7		6		5		4		3		2		1		9		8	
2		3		4		5		6		7		8		9		1		2		3		4		5		6		7		8		9		1		2
	6		5		4		3		2		1		9		8		7		6		5		4		3		2		1		9		8		7	
3		4		5		6		7		8		9		1		2		3		4		5		6		7		8		9		1		2		3
	5		4		3		2		1		9		8		7		6		5		4		3		2		1		9		8		7		6	
4		5		6		7		8		9		1		2		3		4		5		6		7		8		9		1		2		3		4
	4		3		2		1		9		8		7		6		5		4		3		2		1		9		8		7		6		5	
5		6		7		8		9		1		2		3		4		5		6		7		8		9		1		2		3		4		5
	3		2		1		9		8		7		6		5		4		3		2		1		9		8		7		6		5		4	
6		7		8		9		1		2		3		4		5		6		7		8		9		1		2		3		4		5		6
	2		1		9		8		7		6		5		4		3		2		1		9		8		7		6		5		4		3	
7		8		9		1		2		3		4		5		6		7		8		9		1		2		3		4		5		6		7
	1		9		8		7		6		5		4		3		2		1		9		8		7		6		5		4		3		2	
8		9		1		2		3		4		5		6		7		8		9		1		2		3		4		5		6		7		8
	9		8		7		6		5		4		3		2		1		9		8		7		6		5		4		3		2		1	
9		1		2		3		4		5		6		7		8		9		1		2		3		4		5		6		7		8		9
	8		7		6		5		4		3		2		1		9		8		7		6		5		4		3		2		1		9	
1		2		3		4		5		6		7		8		9		1		2		3		4		5		6		7		8		9		1

Table 2. Degenerate Rodin map

There are numerous things to observe about this map, but first we need to establish some nomenclature. For this and other maps, we'll refer to each location containing a number as a *cell*, as in an Excel spreadsheet. Cells will be identified by brackets $\lfloor\ \rfloor$ and $\lceil\ \rceil$, corresponding to odd and even rows and columns. It's immediately apparent that numbers appear only in odd row-odd column $\lfloor\ \rfloor$ or even row – even column $\lceil\ \rceil$ combinations, so we can uniquely identify each number by parity, row r and column c, that is, by $\lfloor rc \rfloor$ and $\lceil rc \rceil$. Since the numbers in the 10th odd (even) rows (columns) are identical with those in the 1st, we don't need indices larger than 9 to uniquely specify every location. Moreover, we can dispense with comma separators between r and c unless necessary to distinguish variables.

In Table 2, the location of the "1" in the upper left corner (first odd row and column) is identified as cell $\lfloor 11 \rfloor$, and the location of the "2" to its right is $\lfloor 12 \rfloor$. The "1" and "2" on the bottom row are specified with exactly the same coordinates, because the pattern continues indefinitely and these numbers relate to their neighbors in exactly the same way. The same holds for the "1" and "2" in the 1st row, 10th and 11th odd columns. The "7" in the 1st even row and column (down and to the right of the "1" in the upper left) is located at $\lceil 11 \rceil$, as is the "7" in the same row, 10th even column. Some more examples you should verify, increasing in generality:

$$\lfloor 67 \rfloor = 3 \qquad \lceil 43 \rceil = 2 \tag{3}$$

$$\lfloor 1n \rfloor = \lfloor n1 \rfloor = n \qquad \lceil 1n \rceil = \lceil n1 \rceil = 8 \odot n \tag{4}$$

$$\lfloor rc \rfloor = \lfloor cr \rfloor = r \oplus c \odot 1 \qquad \lceil rc \rceil = \lceil cr \rceil = \odot r \odot c \tag{5}$$

The last two equations compactly summarize the entire table. As can be verified, it's symmetric since indices m and n can be reversed. We could say that odd cells $\lfloor\ \rfloor$ are "positive" in m and n, and the even cells $\lceil\ \rceil$ are "negative" in m and n. Remember that "negative" numbers also modulate into numbers ranging from 1 to 9, as in $\lceil 11 \rceil = \odot 1 \odot 1 = (-2+9) \bmod 9 = 7$.

We shall refer to specific rows and columns using the same nomenclature, so that rows progress from top to bottom as $\lfloor 1, \lceil 1, \lfloor 2, \lceil 2, \lfloor 3, \lceil 3, \ldots$, and columns from left to right as $1\rfloor, 1\rceil, 2\rfloor, 2\rceil, 3\rfloor, 3\rceil, \ldots$

Finally we must distinguish between eight possible directions for number patterns to follow. For this, we might adopt the familiar directions N, S, E, W plus the diagonals NE, SE, SW, NW, but it will prove easier to generalize using the symbols "+", "-" and "0" for direction. By convention "+" will mean "down" for rows and "to the right" for columns. The combination "00" will not be used. With these direction identifiers as subscripts, we can compactly specify the pattern beginning at any cell in any direction. So for example, in Table 2 $\lfloor 11 \rfloor_{++} = 173553719826446289$, $\lfloor 24 \rfloor_{0+} = \lfloor 24 \rfloor_{+0} = 567891234$, $\lfloor 19 \rfloor_{+-} = 9$, and $\lfloor 19 \rfloor_{+-} = 9$.

The number of terms in a sequence will always be 18 or one of its factors: 1, 2, 3, 6, or 9, since the pattern always repeats after 18 rows or columns. We now have a nomenclature allowing compact and meaningful discussion of map details.

4. The Rodin Number Map

Before moving on to more interesting cases, we need to examine some details in the degenerate case of Table 2. It's "degenerate" precisely because of the diagonal $\lfloor 19 \rfloor_{+-} = 9$, or more generally $\lfloor 1n \rfloor_{+-} = n, \odot n$, as 18, 27, 36, etc. In modulo 9 arithmetic, the change from n to $\odot n$ amounts to multiplication by -1 or by 8. That is, $1 \otimes 8 = 8$, $2 \otimes 8 = 7$, $3 \otimes 8 = 6$, etc., as shown in Table 1. Can we rearrange the table so that we can find multiplication by numbers other than -1? Indeed, we can. But what patterns of multiplication are there? Repeated multiplication of any number by 3 or 6 degenerates to 9 after two iterations, as, for example $4 \otimes 6 = 6$ and $6 \otimes 6 = 9$. Since $4 \otimes 4 = 7$, $4 \otimes 7 = 1$, and $4 \otimes 1 = 4$, repeated multiplication by 4 follows the pattern 471 or 285. And by the same reasoning, multiplication by 7 results in the reverse sequences 741 and 258. The only remaining possibilities are multiplication by 2 and by 5, which result in the patterns 124875 and 578421. These "doubling" and "halving" sequences are what we seek in the Rodin map.

But how do we obtain this map? By shifting the rows or columns in Table 2. The relative layout of row $\lceil 1$ to row $\lfloor 1$ was arbitrarily chosen to give the degenerate result, with all 9s on the diagonal. We could shift row $\lceil 1$ relative to row $\lceil 2$ and obtain a different number map, but once that is established, all the other rows must follow the pattern. That is, if row $\lceil 1$ shifts n place relative to row $\lfloor 1$, then row $\lfloor 2$ must shift n places relative to row $\lceil 1$, or $2n$ places relative to row $\lfloor 1$, and so on. Regardless of n, the 10th and 19th rows ($\lceil 5$ and $\lfloor 1$) will shift $9n$ places relative to row $\lfloor 1$, and thus remain in place in modulo 9 arithmetic.

But by how much should we shift row $\lceil 1$? If we shift the numbers in $\lceil 1$ by 1 place to the right, we must shift $\lfloor 2$ by 2 to the right, $\lceil 2$ by 3 to the right, and so on. This shift pattern results in an overall map that is the mirror image of Table 1, centered around the $\lfloor 19 \rfloor = 9$. The "9" in $\lceil 18 \rceil$ would shift to $\lceil 19 \rceil$, the "9" in $\lfloor 28 \rfloor$ to $\lfloor 21 \rfloor$, etc. In general, the shifted map is a mirror image of the original, except the "miiror point" shifted from $\lfloor 19 \rfloor$ to $\lceil 19 \rceil$ as shown in Table 3. You can verify that Table 3 also mirrors Table 2 about row $\lfloor 1$.

1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1
8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	
9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	
8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8
1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	
7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7
2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	
6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6
3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	
5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5
4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	
4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4
5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	
3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3
6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	
2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2
7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	
1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1

Table 3. Mirrored degenerate Rodin map

All this is to reduce the number of possible shifted patterns from nine down to five, because left shifts of Table 2 mirror rights shifts of Table 3, and one can only shift four places to the right or left, before wrapping around. Thus, the five possibilities and their mirrors are then 1R(0L), 2R(1L), 3R(2L), 4R(3L) and 5R(4L). Because this is an introduction, we won't belabor the details, except to note that of the latter four possibilities, only two have the special properties of the Rodin map, namely 3R(2L) and 4R(3L). One involves a shift 3R and the other 3L. Since 3 is the square root of modulo base 9, every third row remains in place even after shifts. Effectively in right shifts, the 1st, 4th and 7th rows below the top shift right, and the 2nd, 5th and 8th rows shift left. For left shifts, the reverse. We will actually shift from Table 3 rather than Table 2, since Rodin maps conventionally display the multiplication diagonals, $\lfloor 1n \rfloor_{++} = n, \odot n$ in Table 3, in the ++ direction. Tables 4 and 5 are thus 3R- and 3L-shifts of Table 3.

Take your time studying these pattern maps, since there are scores of minor details to notice, beyond what is described here. For example, the modulo-9 sum of the eight nearest neighbors to any cell always equals 9, as you can verify in the highlighted case of $\lfloor 58 \rfloor = 7$ in Table 4.

1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1
2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	
3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3
9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	
5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5
7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	
7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7
5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	
9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	
2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2
1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	
4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4
8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	
6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6
6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	
8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8
4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	
1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1

Table 4. Right-shifted (1x2) or [27] Rodin map

1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1
5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	
6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6
9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	
2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2
4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	
7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7
8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	
3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3
3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	
8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8
7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	
4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4
2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	
9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	
5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5
1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	
1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1

Table 5. Left-shifted (1x4) or [18] Rodin map

Now verify the mathematical descriptions of Tables 3-5, analogous to Eq. (5) for Table 1:

Table 3 $\quad \lfloor rc \rfloor = \lfloor cr \rfloor = r \odot c \oplus 1 \quad \lceil rc \rceil = \lceil cr \rceil = \odot r \oplus c \odot 1$ (6)

Table 4 $\quad \lfloor rc \rfloor = \lfloor cr \rfloor = r \oplus 2c \odot 2 \quad \lceil rc \rceil = \lceil cr \rceil = \odot r \odot 2c \odot 4$ (7)

Table 5 $\quad \lfloor rc \rfloor = \lfloor cr \rfloor = r \odot 4c \oplus 4 \quad \lceil rc \rceil = \lceil cr \rceil = \odot r \oplus 4c \oplus 2$ (8)

Since in modulo-9 arithmetic, $\oplus 2 = \odot 7$ and $\odot 2 = \oplus 7$, we can easily spot a 147 pattern in the column and offset coefficients of the three tables:

Table 3 $\quad \lfloor rc \rfloor = \lfloor cr \rfloor = r \odot c \oplus 1 \quad \lceil rc \rceil = \lceil cr \rceil = \odot r \oplus c \odot 1$ (6a)

Table 4 $\quad \lfloor rc \rfloor = \lfloor cr \rfloor = r \odot 7c \oplus 7 \quad \lceil rc \rceil = \lceil cr \rceil = \odot r \oplus 7c \odot 4$ (7a)

Table 5 $\quad \lfloor rc \rfloor = \lfloor cr \rfloor = r \odot 4c \oplus 4 \quad \lceil rc \rceil = \lceil cr \rceil = \odot r \oplus 4c \odot 7$ (8a)

And since $\oplus 1 = \odot 8$ and $\oplus 4 = \odot 5$, we can also reverse the coefficients to highlight a 258 pattern in the opposite directions.

Table 3 $\lfloor rc \rfloor = \lfloor cr \rfloor = r \oplus 8c \odot 8 \quad \lceil rc \rceil = \lceil cr \rceil = \odot r \odot 8c \oplus 8$ (6b)

Table 4 $\lfloor rc \rfloor = \lfloor cr \rfloor = r \oplus 2c \odot 2 \quad \lceil rc \rceil = \lceil cr \rceil = \odot r \odot 2c \oplus 5$ (7b)

Table 5 $\lfloor rc \rfloor = \lfloor cr \rfloor = r \oplus 5c \odot 5 \quad \lceil rc \rceil = \lceil cr \rceil = \odot r \odot 5c \oplus 2$ (8b)

These equations illustrate a very important point, and reveal some unique features of the modulo-9 system. The only non-degenerate ways to count in modulo-9 are by 1's , 2's or 4's. Counting by 3 or 6 from n gives only $n \oplus 3$, $n \odot 3$ and n itself, degenerate in the sense that not all numbers can be reached. Moreover, counting by 8, 7, or 5 mirrors counting by 1, 2, or 4, as a quick look back at Table 1 depicts. These three independent modes of counting (by 1, 2, or 4) actually correspond nicely with the three dimensions of physical space, providing one reason modulo-9 arithmetic describes the topology of 3D space so well.

To see that correspondence between counting intervals and dimension, notice that rows in all three tables count by 1, but that columns in Table 3 count by 1, in Table 4 by 2, and in Table 5 by 4. Tables 2 and 3 are degenerate precisely because the counting in the rows is the same as the counting in the columns. We obtain a complete map only when the counting in the rows and columns differ. In fact, the method of counting in the rows and columns is an excellent way to identify each map. Thus, the map is Table 4 is a 1x2 map because it features counting by 1 in the rows and by 2 in the columns. Similarly the map in Table 5 is a 1x4 map.

The only remaining non-degenerate possibility is a 2x4 map, bringing the total to three possible maps, again in correspondence with three dimensions. The 2x4 map can't be created by row shifting Tables 2-5 alone, but can be obtained from Tables 4 (1x2) or 5 (1x4) via column shifting. In Table 4, if column $\overline{1}\rceil$ is shifted down relative to column $\underline{1}\rfloor$, we obtain a degenerate 2x2 map, but if shifted up, we get a 4x2 map, as in Table 6.

1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1
5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	
3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	3
3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	
5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	5
1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	
7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7
8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	
9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	9
6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	
2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2
4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	
4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	4
2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	
6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6
9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	
8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	8
7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	
1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1

Table 6. 4x2 or [45] Rodin map

Similarly in Table 5, if column $\overline{1}\rceil$ is shifted up relative to column $\underline{1}\rfloor$, we obtain a degenerate 4x4 map, but if shifted down we get a 2x4 map, as in Table 6. Verify that these two maps are topologically equivalent by exchanging rows with columns and shifting $\lfloor 11 \rfloor = 1$ in Table 7 to $\lceil 22 \rceil = 1$ in Table 6. Table 7 is thus redundant, and Tables 4-6 suffice for all three topologically independent Rodin maps.

1	8	6	4	2	9	7	5	3	1	8	6	4	2	9	7	5	3	1
2	4	6	8	1	3	5	7	9	2	4	6	8	1	3	5	7	9	
6	4	2	9	7	5	3	1	8	6	4	2	9	7	5	3	1	8	6
6	8	1	3	5	7	9	2	4	6	8	1	3	5	7	9	2	4	
2	9	7	5	3	1	8	6	4	2	9	7	5	3	1	8	6	4	2
1	3	5	7	9	2	4	6	8	1	3	5	7	9	2	4	6	8	
7	5	3	1	8	6	4	2	9	7	5	3	1	8	6	4	2	9	7
5	7	9	2	4	6	8	1	3	5	7	9	2	4	6	8	1	3	
3	1	8	6	4	2	9	7	5	3	1	8	6	4	2	9	7	5	3
9	2	4	6	8	1	3	5	7	9	2	4	6	8	1	3	5	7	
8	6	4	2	9	7	5	3	1	8	6	4	2	9	7	5	3	1	8
4	6	8	1	3	5	7	9	2	4	6	8	1	3	5	7	9	2	
4	2	9	7	5	3	1	8	6	4	2	9	7	5	3	1	8	6	4
8	1	3	5	7	9	2	4	6	8	1	3	5	7	9	2	4	6	
9	7	5	3	1	8	6	4	2	9	7	5	3	1	8	6	4	2	9
3	5	7	9	2	4	6	8	1	3	5	7	9	2	4	6	8	1	
5	3	1	8	6	4	2	9	7	5	3	1	8	6	4	2	9	7	5
7	9	2	4	6	8	1	3	5	7	9	2	4	6	8	1	3	5	
1	8	6	4	2	9	7	5	3	1	8	6	4	2	9	7	5	3	1

Table 7. 2x4 or [45] Rodin map

Though beyond the scope of this paper, one can create a 3D Rodin map by assigning xyz axes to the three modes of counting (by 1, 2 and 4). Thus, xy-planes would contain 1x2 maps, xz-planes 1x4 maps, and yz-planes 2x4 maps. Polarity is a concern, and the relationships between map layers are nontrivial, not to mention the difficulty of displaying such a 3D map. But one can certainly imagine a unique number assigned to every point in space.

In fact, there exists an interesting shape associated with each cell in the 3D Rodin map. Draw diagonal lines along the ++ and +- directions to obtain a diamond shape surrounding each cell. There exists a similar diamond in each of the other two planes, and each number therefore has 12 neighbors, 4 in each plane. It turns out that the implied diamond shape surrounding each cell becomes a 12-sided rhombic dodecahedron in 3D. Several interesting relationships between this shape and other tessellating shapes will be explored in a future paper by Volk.

Finally, there exist Rodin number systems for moduli other than 9. The modulus must be odd, or counting by 2 would degenerate, and must be a square, so that N shifts of N restores a map to its original settings in modulus N^2 . Just as there are 2+1 possible maps in the modulo-9 system, there are 4+3+2+1=10 maps in the modulus-25 system, and in general the number of possible maps in a modulus-N^2 system is:

$$\sum_{n=1}^{N-1} n = \frac{N(N-1)}{2} \qquad (9)$$

So it is possible to construct Rodin maps in modulo-25, modulo-49, modulo-81, etc., but only in the modulus-9 system does the number of possible maps equal the number of shifts required to construct all the topologically different kinds of maps. Also only in the moduls-9 system are the counting axes themselves powers of 2 (1,2 and 4). For example, in the modulus-25 system, the counting axes are by 1, 6, 1, 16, 21 or equivalently 24, 19, 14, 9, 4.

This paper will not examine higher-modulus systems, though Table 8 displays a 1x4 example of a modulus-25 system. It uses letters A-Y in place of the numbers 1-25, so that each "number" in the pattern requires only one character. In the interest of space, this map does not display even one complete cycle in either direction, but enough to validate the pattern.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
I	H	G	F	E	D	C	B	A	Y	X	W	V	U	
E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
E	D	C	B	A	Y	X	W	V	U	T	S	R	Q	
I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
A	Y	X	W	V	U	T	S	R	Q	P	O	N	M	
M	N	O	P	Q	R	S	T	U	V	W	X	Y	A	B
V	U	T	S	R	Q	P	O	N	M	L	K	J	I	
Q	R	S	T	U	V	W	X	Y	A	B	C	D	E	F
R	Q	P	O	N	M	L	K	J	I	H	G	F	E	
U	V	W	X	Y	A	B	C	D	E	F	G	H	I	J

Table 8. 1x4 modulo-25 Rodin map (characters A-Y)

5. Doubling, Halving, and the Enneagram

Undoubtedly the most striking feature of all three Rodin maps (Tables 4-6) is the recurrence of certain number patterns along the ++ direction. We find the pattern 396693 in every 3rd diagonal, and 124875 in opposite directions along the two diagonals between. For example, in Table 6 $\lceil 11 \rceil_{++} = 578421$ and $\lceil 12 \rceil_{++} = 124875$. But as noted in the end of Section 2, the sequence 124875 reproduces the powers of 2 in modulo-9 arithmetic, and 157842 reproduces the powers of 5. Since division by 2 is synonymous with multiplication by 5, the Rodin Number system is usually regarded as a base-10 system, though all calculations are performed modulo-9.

In passing, note that the patterns in the +- direction exhibit certain regularities as well. Each of the three Rodin maps carries a signature in the +- direction, namely:

1x2	231495867	27	Table 4
1x4	165297438	18	Table 5
2x4	462891735	45	Table 6

In each case, the patterns appear both forward and backward in every +- diagonal, so that, for example, the 2's and 7's in Table 4 are repeated as the +- pattern is reversed. Therefore, the 1x2 chart can actually be identified by the repeated numbers in the +- series. That is, the 1x2 map is aka the "27" map, the 1x4 is aka the "18" map, and the 2x4 map is aka the "45" map. Not only that, but the first four digits in each series ("2314" for the 27 map) precisely mirror the last four ("5867"). That is, the 2 and 7, 3 and 6, 1 and 8 and 4 and 5 all form conjugate pairs in modulo-9. The same holds for the 18 and 45 maps. Finally, all three patterns have 9 always in the middle, and 3's and 6's always second to the outside. But however satisfying this regularity, the greater interest lies in the ++ patterns.

The ++ paths of doubling or halving constitute the most important feature of the Rodin map. Marko Rodin postulates that matter and energy naturally flow along these paths. While the claim admittedly sounds outlandish at first, the idea is consistent with several things known about flows. That everything ultimately flows in circuits is really an extension of Newton's 3rd Law to continuums, since every infinitesimal motion must accompany a returning motion. This can't hold for every infinitesimal element of matter unless matter flows in circuits. Moreover every circuit must accompany another circuit with opposite sense, or we have a rotation without counter-rotation, in violation of the principle behind Newton's 3rd Law. If the doubling and halving paths represent flows, the Rodin map can be interpreted as depicting "flow out, flow back, gap, flow out…" This kind of sequencing is found in matter, anti-matter pairs, the positive nucleus to negative shell of atoms, and even to DNA sequencing. It gets to the very heart of Rodin's concept of motion.

One way to visualize this flow process is with the enneagram, which is nothing more than a 9-pointed geometric figure, based on a regular nonagon. To this day the enneagram is associated with occultic and pagan mysticism, though it is in fact nothing more than a geometric figure. The drive by the western medieval church to ban anything connected with paganism, in particular harmonic science, has enshrouded in mystery what the ancients might have known about this symbol, though assuredly the symbol has very ancient origins. Very possibly the ancients had knowledge of these very number patterns, and Rodin's discovery is actually a rediscovery. Be that as it may, here are some enneagrams from the Rodin website depicting doubling and halving: [1]

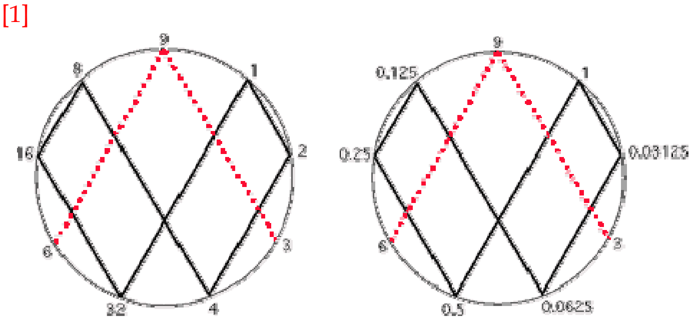

Fig 1. Doubling and halving enneagrams

It's easy to confirm that the numbers 32 and 16 in the left figure become 5 and 7 respectively in modulo-9. Further, the digits in the halving enneagram also match the number pattern, as, for example $0.03125 \to 3 \oplus 1 \oplus 2 \oplus 5 = 2$. These patterns continue indefinitely in both directions, strengthening the connection between modulo-9 arithmetic and the base-10 number system. The enneagram becomes even more provocative if we replace 9,8,7,6,5 with 0, -1, -2, -3, -4, giving it a symmetry surrounding the number 0. In this case, the doubling sequence becomes 1,2,4, -1,-2, -4, again corresponding to the xyz axes in 3D space. Note also that the degenerate 3, 6 and 9 remain aloof from the pattern.

6. Toroid Mapping and the Rodin Coil

Playing with numbers is all very well, but what can be done with numbers? How does one apply these ideas to physics? How can one test the hypothesis that doubling and halving circuits actually represent the natural flow directions of energy and matter? The answers may come from asking the right question, namely: "How can we map this infinite pattern onto a finite surface?" This is a question of topology, and one that leads to some interesting results.

Since we are dealing with a 2D map, we must find two ways to "recycle" the map, as it were. To make the top row $\lfloor 1$ actually the same as the bottom row $\lfloor 1$ in any of the above maps, we have to wrap the map around a cylindrical form. The resulting cylindrical tube is finite around the cross-section, but infinite in length, so we're half way to our goal. To connect the ends of a cylindrical tube, we can only wrap the tube into a toroid. There is no other way to map an infinite, but repeating pattern onto a finite surface. This is the connection between the Rodin map and the toroid shape.

However, there are several ways to connect the maps. For example, there could be more than one cycle or generation of maps around the cylinder (cross section), or around the toroid itself. But even more interesting is the possibility of twisting the cylinder before connecting the ends. Why do this? To reduce the number of circuits in each direction from three to one. In the case of the 1x2 map in Table 4, imagine joining the top and bottom rows with the map wrapped horizontally around a cylinder. If we simply joined the right and left ends, the circuit $\lfloor 11 \rfloor_{++}$ would wrap back into itself, but never connect with $\lfloor 14 \rfloor_{++}$ or $\lfloor 17 \rfloor_{++}$, which are also "positive" flowing circuits. To connect the three circuits, we must deliberately add or subtract some non-degenerate (not 3, 6, or 9) number of columns, and twist the cylinder before connecting.

1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2
5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	
2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	3
4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	
3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4
3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	
4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5
2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	
5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6
1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	
6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	7
9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	
7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	8
8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	
8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9
7	2	6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	
9	5	1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1
6	1	5	9	4	8	3	7	2	6	1	5	9	4	8	3	7	2	6	1	
1	6	2	7	3	8	4	9	5	1	6	2	7	3	8	4	9	5	1	6	2

Table 9. 20/9 (4x1) or [18] Rodin map (360 cells)

Table 9 is an inverted version of Table 5, but with four (two $\rfloor$ and two $\rceil$) extra columns to the right, accounting for $2\tfrac{2}{9}$ or $\tfrac{20}{9}$ horizontal generations of the map. Since each generation contains $2\cdot 9^2 = 162$ cells or tiles, the total number of tiles in this choice is 360, appropriate for description in terms of degrees. Each circuit then flows through 120 tiles. The $\lfloor 11 \rfloor = 1$ in the upper left flows through to the same cell in the lower middle, which is identical with the same cell in the upper middle. The flow continues to the next $\lfloor 11 \rfloor = 1$ pair near the right. Thence the flow at the $\lfloor 33 \rfloor = 4$ cell on the right merges into the $\lfloor 41 \rfloor = 4$ cell on the left. This process continues through $\lfloor 63 \rfloor = 7$ on the right to $\lfloor 71 \rfloor = 7$ on the left, and finally back to $\lfloor 93 \rfloor = 1$ on the right to $\lfloor 11 \rfloor = 1$ on the left. Such a wrapping can produce a torus similar to the one depicted in Fig. 2.

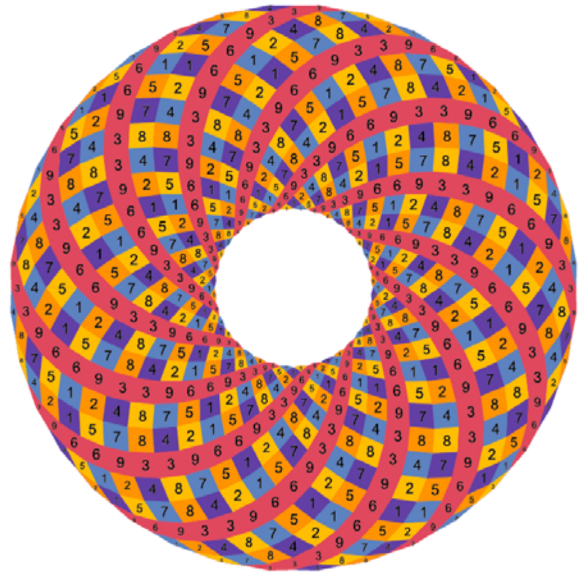

Fig 2. The Rodin torus [2]

Of course, the actual Rodin coil consists of electrical wires wrapped along the "doubling" circuit paths. Two adjacent wires are wound to carry currents in opposite directions, but with gap spaces between pairs, represented in the torus by the 396693 pattern. The recommended wrapping traverses 12 times around the cross section, but only 5 times around the toroid circumference. Interestingly the non-degenerate ratio 5/12 is found in music as the perfect 4th (or 5th) on the even-tempered scale. Harmonic scientists like Richard Merrick argue that the 12-note even tempering is not arbitrary, but fundamental to the very structure of matter. [3] Possibly the Rodin coil depicts this structure.

Fig 3a,b. Sample Rodin coils [4,5]

7. Applications

Certainly vortices are nothing new, and toroid or doughnut shapes have been known since ancient times, but nonetheless Rodin's peculiar coil, combining toroidal and poloidal circuitry, has attracted the attention of numerous independent investigators. For example, Jean-Louis Naudin, in the spirit of Faraday, placed iron filings above a running Rodin coil, and obtained the pattern shown in Fig. 4. [4] Naudin sees this torsion pattern as evidence for Myron Evans' B3 field. [6] Jamie Buturff levitated a 64 gram magnet with only a 3V supply (Fig. 5). [7] Even conventional science has demonstrated interest in the toroidal slinky-like structure, in the design of fusion reactors (Fig. 6). [8]

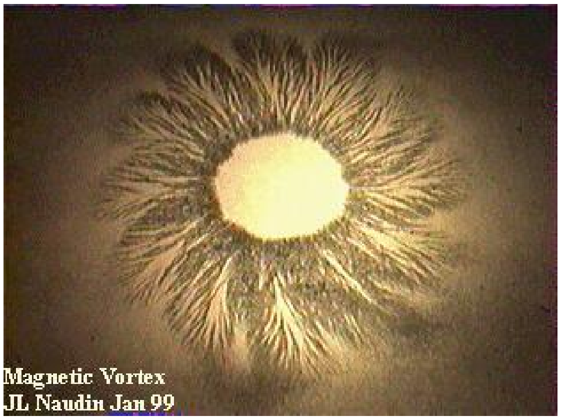

Fig 4. Iron filings atop a Rodin coil display a torsion field [4]

Fig 5. Levitating magnet above a Rodin coil [7]

Fig. 6. New design of a thermal fusion reactor [8]

But arguably the most fascinating connection with the Rodin coil is the geometry of DNA, which also contains two "circuits" of opposite polarity, separated by a gap. Rodin's theory of nested vortices, not covered here in detail, predicts eddies along the DNA path, apparently confirmed by current research. [2]

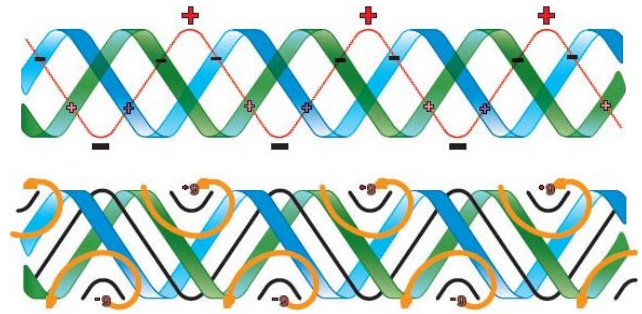

Fig 7a. DNA polar circuits plus gap. **7b.** Compression and decompression of nested vortices. [2]

8. Conclusion

The Rodin number map and coil create an interesting challenge to science today. Unquestionably many people are interested in them, as evidenced by the number of related submissions and views on youtube. Many have reported unusual phenomena with the coil, but to date no scientifically disciplined, quantitative, controlled studies have been published. The proper attitude for open-minded scientists is the middle ground, neither accepting unsupported claims, nor rejecting ideas simply for lying outside conventional experience. Clearly modulo arithmetic, the Rodin number map, and the Rodin coil all provide yet-to-be-explored areas of research.

References

[1] http://rodin.freelancepartnership.com/content/view/7/26/

[2] Marko Rodin, islands@gmail.com

[3] Richard Merrick, **Interference: A Grand Scientific Musical Theory** (Richard Merrick, 2009).

[4] Jean-Louis Naudin, http://jnaudin.free.fr/.

[5] Bill Ramsay, Clifton, Colorado.

[6] Myron Evans, **Classical and Quantum Electrodynamics and the B(3) Field** (World Scientific Publishing, 2001); and several others.

[7] Jamie Buturff, Sedona, AZ, Jamie.buturff@gamil.com.

[8] http://www.markorodin.com/content/view/13/31/.