Available online at www.ilcpa.pl

International Letters of Chemistry, Physics and Astronomy

13(1) (2014) 11-20 ISSN 2299-3843

Codes in the atomic weights of chemical elements

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ABSTRACT

The subject of this thesis is a digital approach to the investigation of the digital basis of digital Periodic Table. The digital mechanism of this Table have been analyzed by the application of cybernetic methods, information theory and system theory, respectively. This paper is to report that we discovered new methods for development of the new technologies in chemistry. It is about the most advanced digital technology which is based on program, cybernetics and informational systems and laws. The results in practical application of the new technology could be useful in chemistry, bioinformatics, genetics, bio-chemistry and other natural sciences.

***Keywords*:** Digital Periodic Table; atomic weight; digital chemistry; digital chemical code; biochemistry

1. INTRODUCTION

The subjects of our research are program lawfulness, cybernetic lawfulness, and informational lawfulness in Periodic system Table. In the science, one question has been present for a long time, that is, if there is one unique common connection that links all chemical elements in this Table.

The doubt is, if the periodical is only a physical-chemical matter of objective material relationship or maybe a matter of numbers and mathematics. With the goal to find the answers on some of those questions, we have made a decision to do a research on, if in this Table exists program, cybernetic and information lawfulness.

Results is: We have discovered that sequences of all elements in this Table conducted, not just according to their chemical and periodical characteristics, but especially according to the program lawfulness, cybernetic lawfulness, and informational lawfulness.

In fact, we have discovered the ***digital balance*** in distribution of elements in Periodic system Table is achieved. Here we wish to present our points of views about the program-cybernetics lawfulness in this Table.

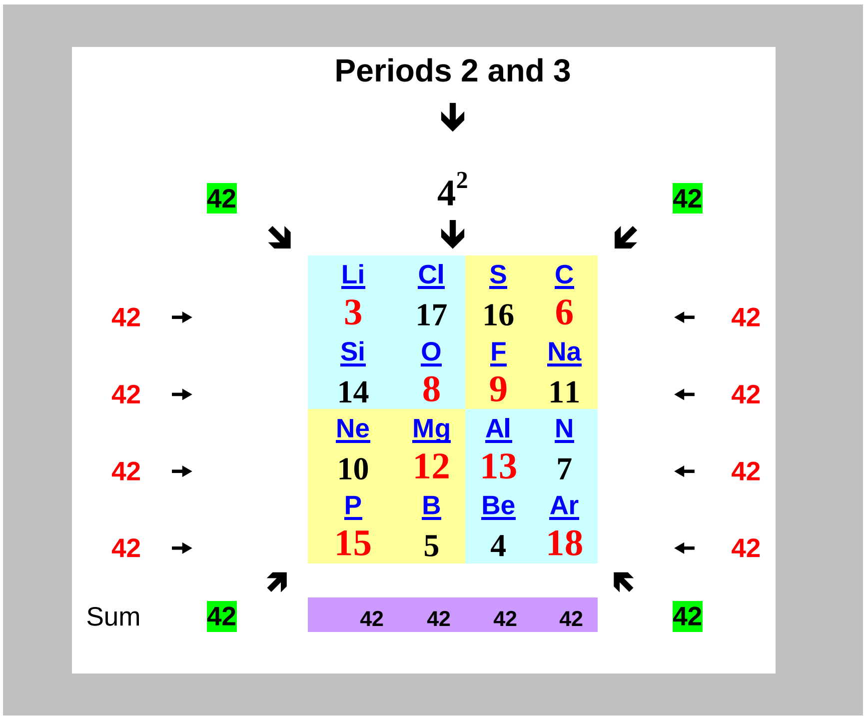
2. RESULTS

Results of our research show that the processes of sequencing the chemical elements are conditioned and arranged not only with chemical and biochemical, but also with program, cybernetic and informational lawfulness too. At the first stage of our research we replaced chemical elements from the Periodic Table with atomic numbers of those elements. This study translates the periodic table of elements from a digital form and explores the idea of improving readers' comprehension and retention of complex information. It is designed to help readers visualize abstract information by actively engaging them in their learning experience. It also helps them understand the interconnectedness of complex systems the periodic table of elements being a prime example by translating digital numerical information into visual patterns that can be detected and compared. Users will hopefully apply this form of learning to other areas as well.

Decode the digital chemical language

The above algorithms enable to decode the digital chemical language and to discover codes that mutually connect the parameters in digital images from Periodic Table.

Examples:



ToeplitzMatrix [(3, 17, 16, 6, 14, 8, 9, 11, 10, 12, 13, 7, 15, 5, 4, 18)]

Input:

ToeplitzMatrix[{3, 17, 16, 6, 14, 8, 9, 11, 10, 12, 13, 7, 15, 5, 4, 18}]

Result:

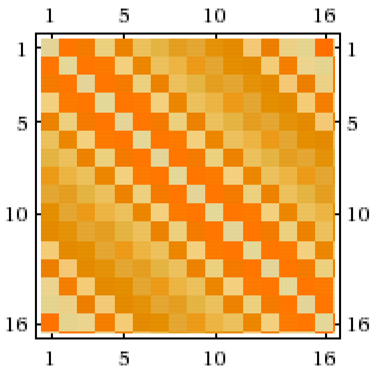
3	17	16	6	14	8	9	11	10	12	13	7	15	5	4	18
17	3	17	16	6	14	8	9	11	10	12	13	7	15	5	4
16	17	3	17	16	6	14	8	9	11	10	12	13	7	15	5
6	16	17	3	17	16	6	14	8	9	11	10	12	13	7	15
14	6	16	17	3	17	16	6	14	8	9	11	10	12	13	7
8	14	6	16	17	3	17	16	6	14	8	9	11	10	12	13
9	8	14	6	16	17	3	17	16	6	14	8	9	11	10	12
11	9	8	14	6	16	17	3	17	16	6	14	8	9	11	10
10	11	9	8	14	6	16	17	3	17	16	6	14	8	9	11
12	10	11	9	8	14	6	16	17	3	17	16	6	14	8	9
13	12	10	11	9	8	14	6	16	17	3	17	16	6	14	8
7	13	12	10	11	9	8	14	6	16	17	3	17	16	6	14
15	7	13	12	10	11	9	8	14	6	16	17	3	17	16	6
5	15	7	13	12	10	11	9	8	14	6	16	17	3	17	16
4	5	15	7	13	12	10	11	9	8	14	6	16	17	3	17
18	4	5	15	7	13	12	10	11	9	8	14	6	16	17	3

			732								672					
3	17	16	6	14	8	9	11	10	12	13	7	15	5	4	18	168
17	3	17	16	6	14	8	9	11	10	12	13	7	15	5	4	167
16	17	3	17	16	6	14	8	9	11	10	12	13	7	15	5	179
6	16	17	3	17	16	6	14	8	9	11	10	12	13	7	15	180
14	6	16	17	3	17	16	6	14	8	9	11	10	12	13	7	179
8	14	6	16	17	3	17	16	6	14	8	9	11	10	12	13	180
9	8	14	6	16	17	3	17	16	6	14	8	9	11	10	12	176
11	9	8	14	6	16	17	3	17	16	6	14	8	9	11	10	175
10	11	9	8	14	6	16	17	3	17	16	6	14	8	9	11	175
12	10	11	9	8	14	6	16	17	3	17	16	6	14	8	9	176
13	12	10	11	9	8	14	6	16	17	3	17	16	6	14	8	180
7	13	12	10	11	9	8	14	6	16	17	3	17	16	6	14	179
15	7	13	12	10	11	9	8	14	6	16	17	3	17	16	6	180
5	15	7	13	12	10	11	9	8	14	6	16	17	3	17	16	179
4	5	15	7	13	12	10	11	9	8	14	6	16	17	3	17	167
18	4	5	15	7	13	12	10	11	9	8	14	6	16	17	3	168
			672								732					
168	167	179	180	179	180	176	175	175	176	180	179	180	179	167	168	

Dimensions:

16 (rows) × 16 (columns)

Matrix plot:



Determinant

361 921 706 319 096 000

Trace:
48

Characteristic polynomial:

$$x^{16} - 48x^{15} - 16\,660x^{14} - 923\,664x^{13} - 16\,340\,370x^{12} + 131\,503\,056x^{11} + 7\,498\,197\,700x^{10} + 48\,216\,061\,008x^{9} - 903\,534\,607\,975x^{8} - 12\,166\,319\,607\,776x^{7} + 16\,426\,714\,927\,848x^{6} + 908\,518\,883\,522\,816x^{5} + 2\,968\,577\,934\,473\,952x^{4} - 20\,173\,450\,118\,317\,440x^{3} - 131\,428\,116\,530\,327\,808x^{2} - 113\,267\,913\,919\,712\,640x + 361\,921\,706\,319\,096\,000$$

Condition number:

250.923

Atomic numbers

			732								672					
Li	Cl	S	C	Si	O	F	Na	Ne	Mg	Al	N	P	B	Be	Ar	
3	17	16	6	14	8	9	11	10	12	13	7	15	5	4	18	168
Cl	Li	Cl	S	C	Si	O	F	Na	Ne	Mg	Al	N	P	B	Be	
17	3	17	16	6	14	8	9	11	10	12	13	7	15	5	4	167
S	Cl	Li	Cl	S	C	Si	O	F	Na	Ne	Mg	Al	N	P	B	
16	17	3	17	16	6	14	8	9	11	10	12	13	7	15	5	179
C	S	Cl	Li	Cl	S	C	Si	O	F	Na	Ne	Mg	Al	N	P	
6	16	17	3	17	16	6	14	8	9	11	10	12	13	7	15	180

Si	C	S	Cl	Li	Cl	S	C	Si	O	F	Na	Ne	Mg	Al	N	
14	6	16	17	3	17	16	6	14	8	9	11	10	12	13	7	179
O	Si	C	S	Cl	Li	Cl	S	C	Si	O	F	Na	Ne	Mg	Al	
8	14	6	16	17	3	17	16	6	14	8	9	11	10	12	13	180
F	O	Si	C	S	Cl	Li	Cl	S	C	Si	O	F	Na	Ne	Mg	
9	8	14	6	16	17	3	17	16	6	14	8	9	11	10	12	176
Na	F	O	Si	C	S	Cl	Li	Cl	S	C	Si	O	F	Na	Ne	
11	9	8	14	6	16	17	3	17	16	6	14	8	9	11	10	175
Ne	Na	F	O	Si	C	S	Cl	Li	Cl	S	C	Si	O	F	Na	
10	11	9	8	14	6	16	17	3	17	16	6	14	8	9	11	175
Mg	Ne	Na	F	O	Si	C	S	Cl	Li	Cl	S	C	Si	O	F	
12	10	11	9	8	14	6	16	17	3	17	16	6	14	8	9	176
Al	Mg	Ne	Na	F	O	Si	C	S	Cl	Li	Cl	S	C	Si	O	
13	12	10	11	9	8	14	6	16	17	3	17	16	6	14	8	180
N	Al	Mg	Ne	Na	F	O	Si	C	S	Cl	Li	Cl	S	C	Si	
7	13	12	10	11	9	8	14	6	16	17	3	17	16	6	14	179
P	N	Al	Mg	Ne	Na	F	O	Si	C	S	Cl	Li	Cl	S	C	
15	7	13	12	10	11	9	8	14	6	16	17	3	17	16	6	180
B	P	N	Al	Mg	Ne	Na	F	O	Si	C	S	Cl	Li	Cl	S	
5	15	7	13	12	10	11	9	8	14	6	16	17	3	17	16	179
Be	B	P	N	Al	Mg	Ne	Na	F	O	Si	C	S	Cl	Li	Cl	
4	5	15	7	13	12	10	11	9	8	14	6	16	17	3	17	167
Ar	Be	B	P	N	Al	Mg	Ne	Na	F	O	Si	C	S	Cl	Li	
18	4	5	15	7	13	12	10	11	9	8	14	6	16	17	3	168
			672								732					
168	167	179	180	179	180	176	175	175	176	180	179	180	179	167	168	

Atomic weight

↓

Li	Cl	S	C	Si	O	F	Na	Sum
6,941	35,45	32,07	12,01	28,09	16.00	19.00	22.99	172,551
Cl	Li	Cl	S	C	Si	O	F	
35,45	6,941	35,45	32.,07	12.,01	28.09	16.00	19.00	185,011
S	Cl	Li	Cl	S	C	Si	O	
32,07	35,45	6,941	35,45	32,07	12.01	28.09	16.00	198,081
C	S	Cl	Li	Cl	S	C	Si	
12,01	32,07	35,45	6,941	35,45	32.07	12.01	28.09	194,091
Si	C	S	Cl	Li	Cl	S	C	
28,09	12,01	32,07	35,45	6,941	35.45	32.07	12.01	194,091
O	Si	C	S	Cl	Li	Cl	S	
16,00	28,09	12,01	32,07	35,45	6.941	35.45	32.07	198,081
F	O	Si	C	S	Cl	Li	Cl	
19,00	16,00	28,09	12,01	32,07	35.45	6.941	35.45	185,011
Na	F	O	Si	C	S	Cl	Li	
22,99	19,00	16,00	28,09	12,01	32.07	35.45	6.941	172,551
172,551	185,011	198,081	194,091	194,091	198,081	185,011	172,551	1499,468

Norm(ListCorrelate({172,551 185,011 198,081 194,091 194,091 198,081 185,011 172,551 }, {1499,468}^conjugate, {1}), p)

Input

$$\left\| \text{ListCorrelate}\left[172\,551 \times 185\,011 \times 198\,081 \times 194\,091 \times 194\,091 \times 198\,081 \times 185\,011 \times 172\,551, \{1499, 468\}^{x^*}, \{1\}\right] \right\|_p$$

z^* is the complex conjugate of z

Result

$$\left\| \text{ListCorrelate}\left[1\,506\,352\,099\,619\,394\,602\,254\,357\,057\,648\,679\,896\,126\,161, \left\{1499^{x^*}, 468^{x^*}\right\}, \{1\}\right] \right\|_p$$

Ne	Mg	Al	N	P	B	Be	Ar	
20.18	24.31	16,941	14,01	30.97	10,81	9,012	39.95	166,183
Na	Ne	Mg	Al	N	P	B	Be	
22.99	20.18	24.31	16,941	14,01	30,97	10,81	9,012	149,223
F	Na	Ne	Mg	Al	N	P	B	
19.00	22.99	20.18	24.31	16,941	14,01	30.97	10,81	159,211
O	F	Na	Ne	Mg	Al	N	P	
16.00	19.00	22.99	20.18	24.31	16,941	14,01	30.97	164,401
Si	O	F	Na	Ne	Mg	Al	N	
28,09	16.00	19.00	22.99	20.18	24,31	16,941	14,01	161,521
C	Si	O	F	Na	Ne	Mg	Al	
12,01	28,09	16.00	19.00	22.99	20,18	24.31	16,941	159,521
S	C	Si	O	F	Na	Ne	Mg	
32.07	12,01	28,09	16.00	19.00	22,99	20.18	24,31	174,65
Cl	S	C	Si	O	F	Na	Ne	
35.45	32.07	12,01	28,09	16.00	19	22.99	20,18	185,79
185,79	174,65	159,521	161,521	164,401	159,211	149,223	166,183	

d^2/dp^2 EuclideanDistance(ListCorrelate({2, 12, 24, 1, 23, 23, 27, 1, 23, 10, 6, 24, 25, 1, 23, 10, 6, 28, 24}, {931}^(x^(x^conjugate)), {1}), p)

Derivative:

$$\frac{\partial^2}{\partial p^2}\left(\text{EuclideanDistance}\left[\text{ListCorrelate}\left[\{185,\ 79\times 174,\ 65\times 159521\times 161521\times 164401\times 159211\times 149223\times 166183\},\ \{166,\ 183\}^{x^{x^{x^{x}}}},\ \{1\}\right],\ p\right]\right) =$$

$$\left(295433821123396187908881027896188782136719111140633508056911\ddots 632769\sqrt{2}\left(166^{x^{x^{x^{x}}}}-183^{x^{x^{x^{x}}}}\right)^2\right)\Big/$$
$$\left(-1087076485116656707288593094849766\,p\left(166^{x^{x^{x^{x}}}}+183^{x^{x^{x^{x}}}}\right)+2\left(622623056850565129099541695067330455\times 2^{x^{x^{x^{x}}}+3}\times 3^{x^{x^{x^{x}}}+1}\times 5063^{x^{x^{x^{x}}}}+295433821123396187908881027903660258818925892689828\ddots 008397719598229\times 27556^{x^{x^{x^{x}}}}+295433821123396187908881027903660258818925892689828\ddots 008397719598229\times 33489^{x^{x^{x^{x}}}}\right)+p^2\right)^{3/2}$$

Ne	Mg	Al	N	P	B	
20.18	24.31	16,941	14,01	30,97	10,81	117,221
Na	Ne	Mg	Al	N	P	
22.99	20.18	24.31	16,941	14,01	30.97	129,401
F	Na	Ne	Mg	Al	N	
19.00	22.99	20.18	24.31	16,941	14,01	117,431
O	F	Na	Ne	Mg	Al	
16.00	19.00	22.99	20.18	24,31	16,941	119,421
Si	O	F	Na	Ne	Mg	
28,09	16.00	19.00	22.99	20,18	24.31	130,57
C	Si	O	F	Na	Ne	
12,01	28,09	16.00	19.00	22,99	20.18	118,27
118,27	130,57	119,421	117,431	129,401	117,221	

Ne	Na	F	O	Si	C	S	Cl	
20,18	22,99	19,00	16,00	28.09	12,01	32,07	35.45	185,79
Mg	Ne	Na	F	O	Si	C	S	

24,31	20,18	22,99	19.00	16.00	28.09	12.01	32.07	174,65
Al	Mg	Ne	Na	F	O	Si	C	
26,98	24.,31	20,18	22.99	19.00	16.00	28.09	12.01	169,56
N	Al	Mg	Ne	Na	F	O	Si	
14,01	26,98	24,31	20.18	22.99	19.00	16.00	28.09	171,56
P	N	Al	Mg	Ne	Na	F	O	
30,97	14,01	26,98	24.31	20.18	22.99	19.00	16.00	174,44
B	P	N	Al	Mg	Ne	Na	F	
10,81	30,97	14,01	26,98	24.31	20.18	22.99	19.00	169,25
Be	B	P	N	Al	Mg	Ne	Na	
9,012	10,81	30,97	14.01	26,98	24.31	20.18	22.99	159,262
Ar	Be	B	P	N	Al	Mg	Ne	
39,95	**9,012**	**10,81**	**30.97**	**14.01**	26,98	**24.31**	**20.18**	176,222
176,222	159,262	169,25	174,44	171,56	169,56	174,65	185,79	

Ne	Na	F	O	Si	C	S	
20,18	22,99	19.00	16.00	28.09	12.01	32.07	150,34
Mg	Ne	Na	F	O	Si	C	
24.,31	20,18	22.99	19.00	16.00	28.09	12.01	142,58
Al	Mg	Ne	Na	F	O	Si	
26,98	24,31	20.18	22.99	19.00	16.00	28.09	157,55
N	Al	Mg	Ne	Na	F	O	
14,01	26,98	24.31	20.18	22.99	19.00	16.00	143,47
P	N	Al	Mg	Ne	Na	F	
30,97	14,01	26,98	24.31	20.18	22.99	19.00	158,44
B	P	N	Al	Mg	Ne	Na	
10,81	30,97	14.01	26,98	24.31	20.18	22.99	150,25
Be	B	P	N	Al	Mg	Ne	
9,012	10,81	30.97	14.01	26,98	24.31	20.18	136,272
136,272	150,25	15,034	143,47	157,55	142,58	15,034	

etc.

Making a sequence of all phenomena in Periodic system Table is conducted according to the exact mathematical laws (for such descriptions we can use theory of systems and cybernetics. The results of our research show that the processes of sequencing the periodic table are conditioned and arranged not only with chemical and biochemical lawfulness, but also with program, cybernetic and informational lawfulness too. Translation of the chemical language of these table into a digital language may be very useful for developing new methods of predicting of phenomenon in chemistry, biochemistry, genetic, medicine and other natural sciences. Examples: protein sub-cellular localization, membrane protein type, protein structure secondary prediction or any other protein attributes.

3. CONCLUSIONS

Indeed, the sequencing of the biochemistry is determined not only by biochemical features, but also by cybernetic and information principles. For this reason, research in this field deals more with the quantitative rather than qualitative characteristics of biochemical information and its biochemical basis. For the purposes of this paper, specific physical and chemical factors have been selected in order to express the chemical information for chemical elements. Numerical values are them assigned to these factors, enabling them to be measured. In this way it is possible to determine of a connection really exists between the quantitative ratios in the process of transfer of biochemical information and the qualitative appearance of the biochemistry. To select these factors, preference is given to classical physical and chemical parameters, including the atomic numbers in the relevant chemical elements, their analog values, the position in periodic table, and their frequencies.

Going through these parameters, it becomes clear that there is a mathematical relationship between quantitative ratios and the qualitative appearance of the chemical elements and that there is a measurement method that can be used to describe the biochemistry of those elements.

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(Received 27 March 2014; accepted 05 April 2014)