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Full Length Research Paper

Algorithm and computational complexity of biochemistry

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The modern science mainly treats the biochemical basis of sequencing in bio-macromolecules and processes in biochemistry. One can ask weather the language of biochemistry is the adequate scientific language to explain the phenomenon in that science. Is there maybe some other language, out of biochemistry, that determines how the biochemical processes will function and what the structure and organization of life systems will be? The research results provide some answers to these questions. They reveal to us that the process of sequencing in bio-macromolecules is conditioned and determined not only through biochemical, but also through cybernetic and information principles. This paper discusses new methods for developing biochemistry technologies, in particular more advanced digital technology based on programming, cybernetics, and informational laws and systems, and how this new technology could be useful in biochemistry, medicine, bioinformatics, genetics, and other natural sciences.

Key words: Biochemistry, algorithm, discrete codes, periodic table, codes 19 and 7, code 931

INTRODUCTION

Many studies have indicated that analysis of protein sequence codes and various sequence-based prediction approaches, such as predicting drug-target interaction networks (He et al., 2010), predicting functions of proteins (Hu et al., 2011; Kannan et al., 2008), analysis and prediction of the metabolic stability of proteins (Huang et al., 2010), predicting the network of substrate-enzyme-product triads (Chen et al., 2010), membrane protein type prediction (Cai and Chou, 2006; Cai et al., 2003, 2004), protein structural class prediction (Cai et al., 2006; Ding et al., 2007), protein secondary structure prediction (Chen et al., 2009; Ding et al., 2009b), enzyme family class prediction (Cai et al., 2005; Ding et al., 2009a; Wang et al., 2010), identifying cyclin proteins (Mohabatkar, 2010), protein subcellular location prediction (Chou and Shen, 2010a; 2010b; Kandaswamy et al., 2010; Liu et al., 2010), among many others as summarized in a recent review (Chou, 2011), can timely provide very useful information and insights for both basic research and drug design and hence are widely welcome by science community. The present study attempted to develop a novel sequence-based method for studying insulin in hopes that it may become a useful tool in the relevant areas.

METHODS

What we did is the following: We translated the physical and chemical parameters from the language of biochemistry into the digital language of programmatic, cybernetic and information principles. This we did by using the adequate mathematical algorithms. By using chemical-information procedures, we calculated the numerical value for the information content of molecules. What we got this way is the digital picture of the phenomenon of biochemistry. These digital pictures reveal to us a whole new dimension of this science. They reveal to us that the biochemical process is strictly conditioned and determined by programmatic, cybernetic and information principles.

RESULTS

The mathematical balance in groups of chemical elements from X to Y exist with the help of the codes 19 and 7.

Algorithm

$$[(\Sigma B(X1,2,3,n) \times A) - (\Sigma A(X1,2,3,n) \times B)] = [(\Sigma B(Y1,2,3,n) \times A) - (\Sigma A(Y1,2,3,n) \times B)]$$

Sr> atomic number = 38;

Te> atomic number = 52;

$[(S_7(38) \times 19) - (S_{19}(38) \times 7)]\} = [(S_7(52) \times 19) - (S_{19}(52) \times 7)]$

$S_7(38) = 245$; $S_{19}(38) = 551$;
$S_7(52) = 343$; $S_{19}(52) = 817$;

$[(245x19)-(551x7)]\} = [(343x19)-(817x7)]$;

$(4655-3857) = (6517-5719)$;
798 = 798;

Figure 1. In these examples, using codes 19 and 7, we have established a mathematical balance of the atomic numbers of the following elements: Cs and Rn and Sr and Te.

A = 19; b = 7;
$[(S7(X1,2,3,n) \times 19) - (S19(X1,2,3,n) \times 7)]\} = [(S7(Y1,2,3,n) \times 19) - (S19(Y1,2,3,n) \times 7)]\}$

X1,2,3,n = Atomic numbers 1,2,3,n
Y1,2,3,n = Atomic numbers 1,2,3,n

Example 1

Cs> atomic number = 55;
Rn> atomic number = 86;
$[(S7(55) \times 19) - (S19(55) \times 7)]\} = [(S7(86) \times 19) - (S19(86) \times 7)]$
$S7(55) = (49 + 50 + 51 + 52 + 53 + 54 + 55) = 364$;
$S19(55) = (37 + 38 + 39 + 40 + 41 + 42 + 43 + 44 + 45 + 46 + 47 + 48 + 49 + 50 + 51 + 52 + 53 + 54 + 55) = 874$;
$S7(86) = 581$; $S19(86) = 1463$;
$[(364 \times 19) - (874 \times 7)] = [(581 \times 19) - (1463 \times 7)]$;
$(6916 - 6118) = (11039 - 10241)$;
798 = 798;

Example 2

This example is given in Figure 1. A similar balance is established among all the other chemical elements. Although those elements have different atomic numbers, these numbers, when put into correlation with codes 19 and 7, given the same mathematical result, which is number 798. This goes for all the sequences in chemistry. All the sequences, those with identical as well as those with different numerical values, when put into correlation with codes 19 and 7, give one result only. In this way, a global mathematical balance is established among sequences in nature. This means that the mathematical balance can be established even when sequences are not in balance.

Number 798, as the result of the said mathematical balance, is in correlation with numbers 19 and 7. This can be seen in the following example:

$798 = [(19 \times 7) + (19 \times 7) + (19 \times 7) + (19 \times 7) + (19 \times 7) + (19 \times 7)]$;

Codes 19 and 7 demonstrate that the process of sequencing in biomacromolecules is really conditioned and determined, not only by bio-chemical, but also cyber-information rules.

$\{[(S_B(X1,2,3,n) \times A)] - [(S_A(X1,2,3,n) \times B)]\}$ **+ (AB)} = ABA;**
A=19; B = 7;

$\{[(S_7(X1,2,3,n) \times A)] - [(S_{19}(X1,2,3,n) \times B)]\}$ **+ (AB)} = (19x7x19);**

(19x7x19) = 931;

$931 > 9\ 3\ 1 > 3^2\ 3^1\ 3^0$;
S = Groups of atomic numbers 1,2,3,n
X1,2,3,n = Atomic numbers 1,2,3,n

Figure 2. Discrete code $3^2 3^1 3^0$ inter connecting some chemical elements.

Discret code $3^2\ 3^1\ 3^0$

In digital pictures of Biochemistry, physical and chemical parameters are in a strict submission to programmed, cyber and information rules. In some examples, chemical elements are connected through the discrete code 931, which is transformed into $3^2\ 3^1\ 3^0$ code. The code we can found using the algorithm given in Figure 2.

The connection is established through various parameters. These are: Odd and even values, primary and secondary values, positioning of chemical elements in a given group of elements, etc.

In the table shown in Figure 3, we have a group of 25 chemical elements. These elements are interconnected through the discrete code $3^2 3^1 3^0$. This code connects them as shown in Figure 4

Each atomic number has its own analogue form. That form is one of constants in the programmed, cyber and information systems in biochemistry. The analogue code together with the code is yet another proof that the process of sequencing in the biomacromolecules is really conditioned and determined, not only by biochemical, but also cyber-information rules.

In the example shown in Figure 5, the atomic numbers of the group of chemical elements in question are interconnected through the discrete code $\mathbf{3^2 3^1 3^0}$. This connection is not a visible one, so we do not know if it exists. This connection can be established using inner and outer atomic numbers and their analogue codes, which can clearly be observed in the previous example.

In the example shown Figure 5, the chemical elements

8 O	9 F	15 P	24 Cr	25 Mn
26 Fe	30 Zn	36 Kr	43 Tc	44 Ru
45 Rh	46 Pd	47 Ag	49 In	59 Pr
60 Nd	61 Pm	62 Sm	63 Eu	64 Gd
65 Tb	79 Au	87 Fr	88 Ra	93 Np

Figure 3. Group of chemical elements in the chemical elements table.

8 O	9 F	15 P	24 Cr	25 Mn
26 Fe	30 Zn	36 Kr	43 Tc	44 Ru
45 Rh	46 Pd	47 Ag	49 In	59 Pr
60 Nd	61 Pm	62 Sm	63 Eu	64 Gd
65 Tb	79 Au	87 Fr	88 Ra	93 Np

Figure 4. Inner and outer atomic numbers.The blue shading is for the outer, and green for inner atomic numbers of the group of chemical elements in question.
Inner atomic numbers = (30 + 36 + 43 + 46 + 47 + 49 + 61 + 62 + 63) = 437;
Outer atomic numbers = (8 + 9 + 15 + 24 + 25 + 26 + 44 + 45 + 59 + 60+ 64 +65+79+ 87+88+93) = 791;
Inner code = 437; Analog inner code = 734; 734||437 Outer code = 791; Analog outer code = 197; 197||791 (734 + 197) = Discret code 931 > $3^2 3^1 3^0$

8 O	9 F	15 P	24 Cr	25 Mn
26 Fe	30 Zn	36 Kr	43 Tc	44 Ru
45 Rh	46 Pd	47 Ag	49 In	59 Pr
60 Nd	61 Pm	62 Sm	63 Eu	64 Gd
65 Tb	79 Au	87 Fr	88 Ra	93 Np

Figure 5. Even and odd atomic numbers. The blue shading is for the even, and green for odd atomic numbers of the group of chemical elements in question. Even atomic numbers = 488; Odd atomic numbers = 740; Even code = 488; Analog even code = 884; Odd code = 740; Analog odd code = 047; (884 + 47) = Discret code 931 > $3^2 3^1 3^0$.

are interconnected through even and odd atomic numbers and their analogue values. The connection between them is the discrete code 931.

In the example shown in Figure 6, chemical elements in even and odd columns are connected through their atomic numbers and analogue codes.

In the example in Figure 7 the chemical elements within the diagonals and those out of diagonals are connected through the discrete code 931.

There is over 10 million of similar combinations of connecting of elements. There are also other groups of chemical elements that are also interconnected through the discrete code 931. Some examples are given in Figure 8.

It is important to note that we are here talking only about the macro theoretical concept of sequencing in Biochemistry and that we are not talking about the biochemical empirical image of these elements.

Discrete code in the constitution of atoms

Discrete code 931 we se in the constitution of atoms. Figure 9 show some examples

As we can see, the electrons in constitution of atoms are really interconnected through the discrete code 931.

8 O	9 F	15 P	24 Cr	25 Mn
26 Fe	30 Zn	36 Kr	43 Tc	44 Ru
45 Rh	46 Pd	47 Ag	49 In	59 Pr
60 Nd	61 Pm	62 Sm	63 Eu	64 Gd
65 Tb	79 Au	87 Fr	88 Ra	93 Np

Figure 6. Even and odd rank. The blue shading is for the chemical elements with the odd category in the group of elements (1,3,5…25), and green for chemical elements with even category in the same group of chemical elements (2,4,6…24). Even rank = (9+24+26+36+44...+ 88) = 587; Odd rank = (8+15+25+30+43...+ 93) = 641; Even rank code = 587; Analog even rank code = 785; Odd rank code = 641; Analog odd rank code = 146; (785 +146) = Discret code 931 > $3^2 3^1 3^0$

8 O	9 F	15 P	24 Cr	25 Mn
26 Fe	30 Zn	36 Kr	43 Tc	44 Ru
45 Rh	46 Pd	47 Ag	49 In	59 Pr
60 Nd	61 Pm	62 Sm	63 Eu	64 Gd
65 Tb	79 Au	87 Fr	88 Ra	93 Np

Figure 7. Even and odd column. The blue shading is chemical elements positioned into odd columns (1,3,5), and green for the elements in the even columns (2,4). Even columns = (9 + 30 + 46 + 61…+ 88) = 492; Odd columns = (8 + 26 + 45 + 60…+ 93) = 736; Even columns code = 492; Analog even rank code = 294; Odd columns code = 736; Analog odd rank code = 637; (294 +637) = Discret code 931 > $3^2 3^1 3^0$.

8 O	9 F	15 P	24 Cr	25 Mn
26 Fe	30 Zn	36 Kr	43 Tc	44 Ru
45 Rh	46 Pd	47 Ag	49 In	59 Pr
60 Nd	61 Pm	62 Sm	63 Eu	64 Gd
65 Tb	79 Au	87 Fr	88 Ra	93 Np

Figure 8. Diagonals. The blue shading is for the elements out of diagonals, and green for the elements within the diagonals.
Atomic numbers within diagonals = 435; Analog code = 534; Atomic numbers out of diagonals = 793; Analog code = 397; (534 +397) = Discret code 931 > $3^2 3^1 3^0$.

Digital periodic table

Mendeleyev assumed that the atomic mass is the most important feature of an atom, so he arranged the table of elements in accordance with this assumption. Today's science is familiar with the fact that the Biochemistry its own language that can be described through the theory of systems and cybernetics, and which functions within specific rules. That new language of Biochemistry enables us to design new Tables of Elements where we will introduce the criterion of the theory of systems and cybernetics for establishing of the order of elements. That could be done as given in Figure 10. Mathematical position of the chemical elements in Periodic table is given in Figure 10.

In the first part of the digital table of elements are the elements from the period 1,2,3,4 and 5, and in the second part are the elements from the sixth and seventh period. Chemical elements from this table are interconnected through the codes: 42, 219 and 692.

Digital code 346

Chemical elements from the sixth and seventh period interconnected through the code 346. Some examples are given in Figure 11.

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

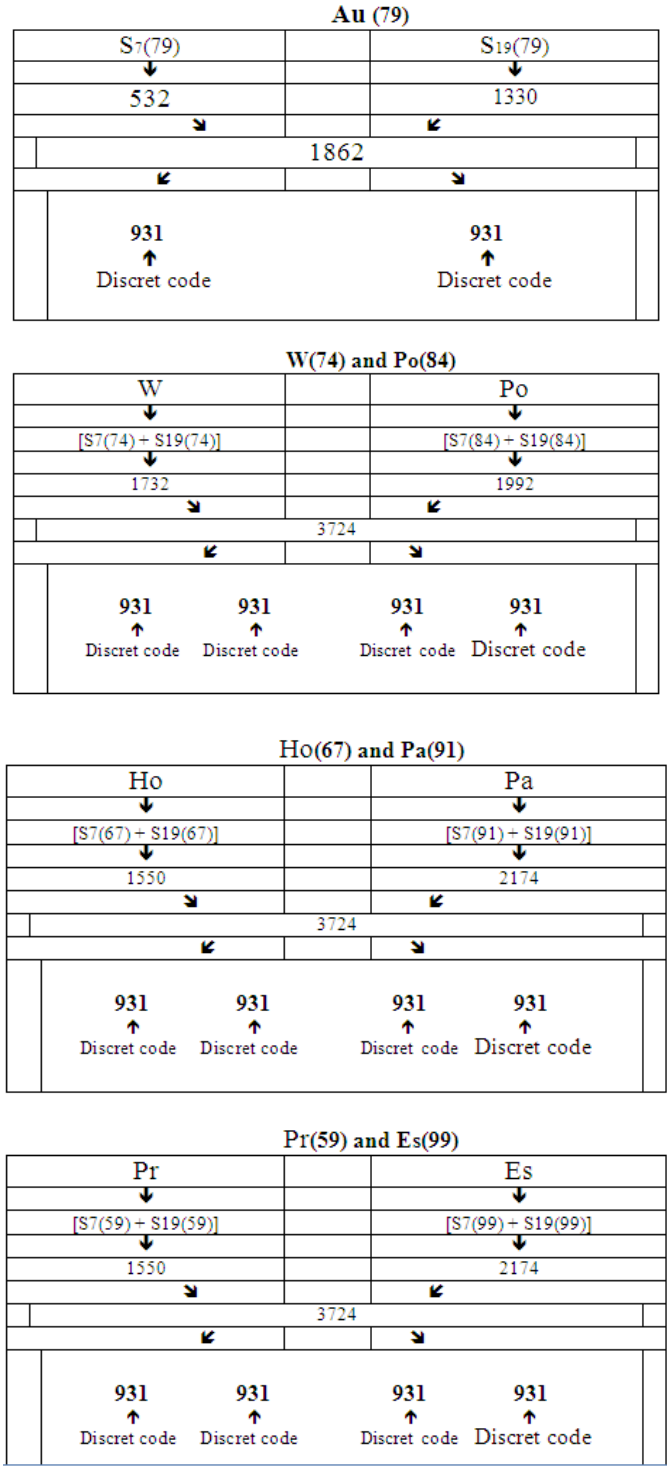

Figure 8. Chemical elements from the previous example interconnected through the discrete code 931.

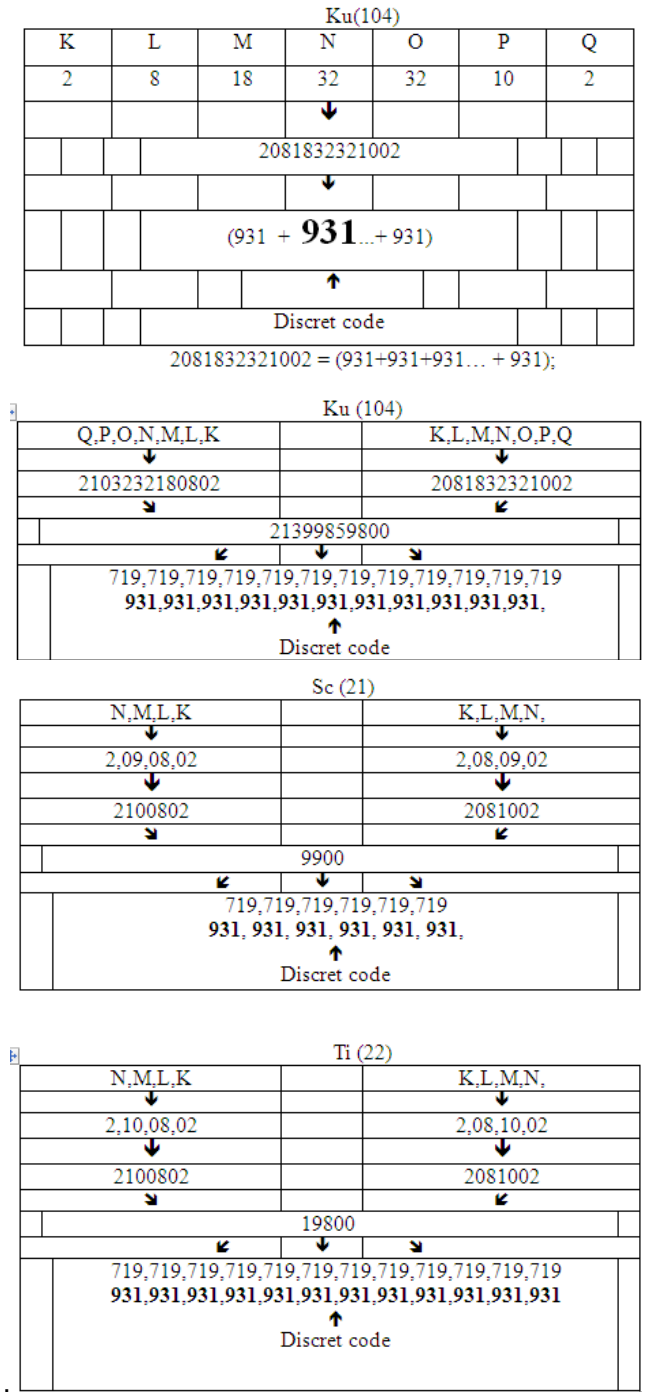

Figure 9. Discrete code in the constitution of atoms.

of systems and cybernetics). Within the digital pictures in biochemistry, the physical and chemical parameters are in a strict compliance with programmatic, cybernetic and information principles.

Conclusion

The process of sequencing in bio-macromolecules is conditioned and determined not only through Biochemical, but also through cybernetic and information principles. The digital pictures of Biochemistry provide us with cybernetic and information interpretation of the

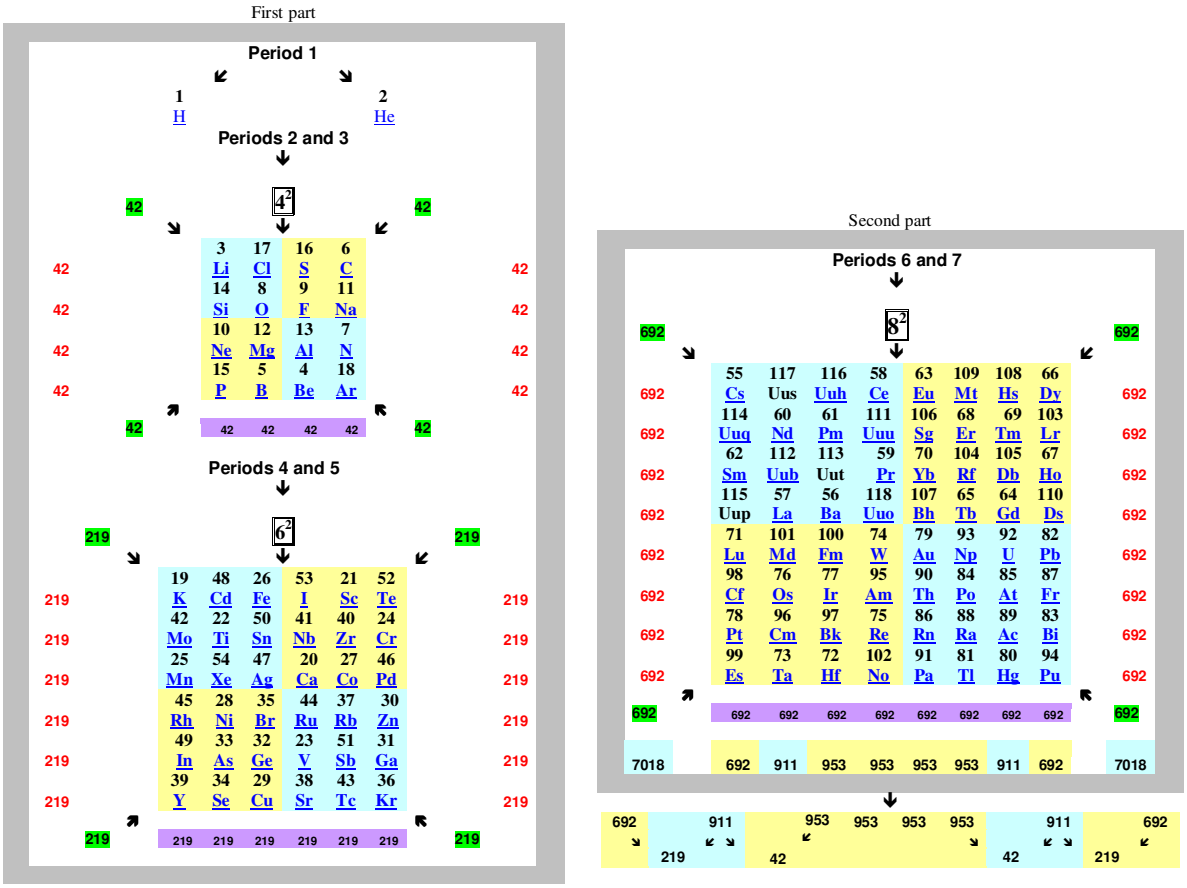

Figure 10. Mathematical position of chemical elements in digital tables of elements.

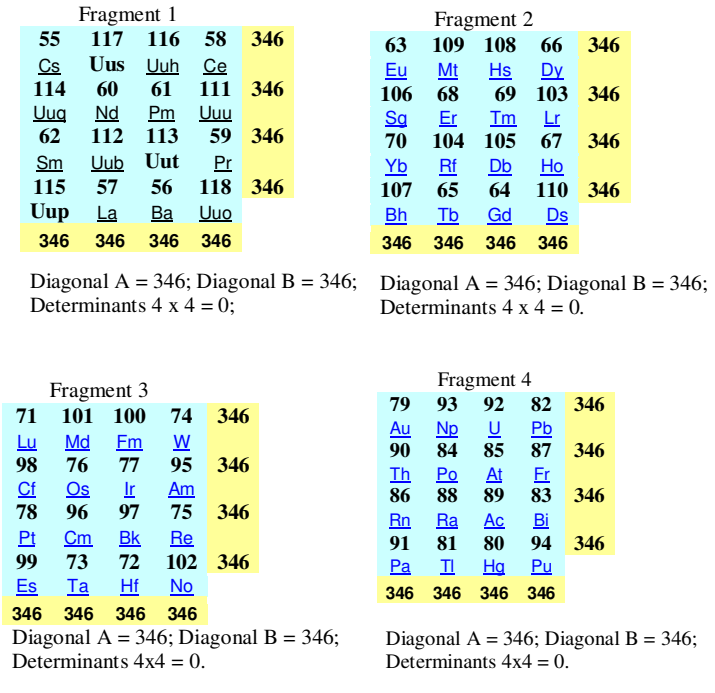

Figure 11. chemical elements from the sixth and seventh period interconnected through the code 346

scientific facts. Now we have the exact scientific proofs that there is a genetic language that can be described by the theory of systems and cybernetics, and which functions in accordance with certain principles.

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