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GENETIC CODE: ALPHANUMERICAL REGULARITIES WITHIN A CODON DETERMINED AMINO ACID ORDER

A b s t r a c t

In this paper, it is shown that within Damjanović's model of the amino acid (AA) order, which is per se an alphanumerical system, strict further regularities exist. First of all, the relationships between ordinal AA number, molecule number, atom number and nucleon number within the rows and columns of the system appear to be determined by the simplest possible symmetry and proportion (1:1 or 1:2). Also, all key relations exist in a strict correspondence with the principle of the minimum change, and continuity principle, in the form of a unit change law; the change exactly for a unit in atom number, nucleon number and so forth.

K e y w o r d s: Genetic code, Genetic code Table, Canonical amino acids, Ramanujan's numbers, The Gamow's diamond code, The simplest symmetry, The simplest proportion, The unit change law, Once chosen amino acids, Twice chosen amino acids, Nuclides, Nucleon number, Atom number, The Damjanović's system (model) of the amino acids order.

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GENETSKI KOD: ALFANUMERIČKE PRAVILNOSTI UNUTAR KODONSKI DETERMINISANOG AMINOKISELINSKOG REDA

Izvod

U radu se analizira Damjanovićev model aminokiselinskog reda (Damjanović, 1998) unutar genetskog koda. Pokazano je da taj red, to jest redosled aminokiselina, sa precizno utvrđenim rednim brojevima (0,1,2, ... ,19) predstavlja strogo determinisan sistem u kome sume rednih brojeva korespondiraju sa brojem aminokiselinskih molekula, a takođe i sa brojem atoma i nukleona u tim molekulima, u okviru, samim sistemom datih, aminokiselinskih klasa i potklasa. Sama korespondecija, pak, uspostavlja se preko najjednostavnije moguće simetrije i proporcije (1:1 ili 1:2). Pri tome, sve ključne relacije korespondiraju i sa principom minimuma promjene, kao i sa principom kontinuiteta, u formi strogog zakona jedinične promjene; promjene tačno za jedan molekul, jedan atom i/ili jedan nukleon.

1. INTRODUCTION

Four-five decades ago, Gamow was the first who attempted to classify 64 codons into 20 classes, corresponding to 20 canonical amino acids (AAs). Unfortunately, the actual genetic code appears to be less regular than Gamow's diamond code. Indeed, the experimentally observed results showed that the codon - amino acid assignment realize through the relationships very different of those, postulated by the diamond code. (Cf. legends to Figures 2 and 5 in Hayes, 1998: "Symmetries of the diamond code sort the 64 codons into 20 classes ... All the codons in each class specified the same amino acid"). Nowadays, however, Damjanović has found a new codon classification into 20 classes, which appears to be in full correspondence not only with 20 canonical AAs, but with the natural numbers series 0-19 too. (Damjanović, 1998: Figures 1 and 2). In this paper, we will present some new regularities valid for the Damjanović's alphanumerical system, i.e. model.

-	07 **S**	08 **S**	08 **R**	-	23 -**3** - 27
-	06 **A**	09 **R**	-	-	15 -**2** - 21
-	05 **P**	10 **G**	-	-	15 -**2** - 09
-	04 **T**	11 **C**	11 **W**	11 *	37 -**3** - 31
19 **Y**	03 *	12 **I**	12 **I**	12 **M**	58 -**4** - 52
18 **D**	02 **E**	13 **L**	-	-	33 -**3** - 30
17 **H**	01 **Q**	14 **V**	-	-	32 -**3** - 32
16 **N**	00 **K**	15 **F**	15 **L**	-	46 -**4** - 50
70 **4** 41	28 **7** 61	92 **8** 78	46 **4** 61	23 **1** 11	259 -**24** - 252

Table 1. *Alphanumerical amino acid order in relation to the atom number* Within framework: alphanumerical amino acid order after Damjanović's model. Out of the framework, on the right and down: the sums within the rows and columns, respectively; first sequence - the sum of the AAs ordinal numbers, including ordinal numbers for two *stop* codon spaces (designated with asterisk); second sequence (bold) - the sum of the AAs molecules within rows and columns, respectively; third sequence - the sum of the number of atoms within corresponding AAs molecules, i.e. within their side chains (cf. Survey 1, step 1 and 2, and then 5-8).

2. THE SIMPLEST SUMMETRY AND PROPORTION

In Table 1, we present the AAs order according to the said model, which is per se alphanumerical. By this, "alpha" components (K, Q, E, etc.) are related not only to the letter-designations of AAs, but to AAs physico-chemical properties at the same time. On the other hand, "numerical" components are related to the natural numbers series 0-19 (directly) and to the molecule number, atom number and nucleon number within AAs classes (indirectly). From Table 2 one can read that the whole codon (and amino acid) space is separated into two spaces: *odd space* with the rows which contain odd number of molecules (only 3) and *even space* with the rows which contain even number (2 or 4) of molecules. The molecule number within two spaces appear to be in accordance with "the symmetry in the simplest case" (Marcus, 1989) in the form of a simplest possible proportion 1:1 or 1:2 at the same

1	259 - **24** - 252	1. Within all rows WITH STOP CODONS
2	245 - **24** - 252	2. Within all rows WITHOUT STOP CODONS
3	125 - **12** - 120 134 - **12** - 132	3.1. Within "3 molecules" 3.2. Within "2 or 4 molecules" WITH STOP CODONS
4	114 - **12** - 120 131 - **12** - 132	4.1. Within "3 molecules" 4.2. Within "2 or 4 molecules" WITHOUT STOP CODONS
5	128 - **12** - 120 131 - **12** - 132	5.1. Within odd positions 5.2. Within even positions WITH STOP CODONS
6	125 - **12** - 120 120 - **12** - 132	6.1. Within odd positions 6.2. Within even positions WITHOUT STOP CODONS
7	143 - **12** - 122 116 - **12** - 130	7.1. Within inner positions 7.2. Within outer positions WITH STOP CODONS
8	129 - **12** - 122 116 - **12** - 130	8.1. Within inner positions 8.2. Within outer positions WITHOUT STOP CODONS

Survey 1. *Total sums of amino acid ordinal numbers, molecules and atoms* First result follows from Table 1 as the addition of the sums in all rows, or all columns. Second result as the first minus the sum of the ordinal numbers for two *stop* spaces [259 - (3+11 = 14) = 245]. Third and fourth results follow from Table 2. The further results follow also from Table 1. For example the result 5.1 ("odd positions") follows as a result of addition: 23+15+58+32 = 128; and the result 5.2 ("even positions") as a result of addition: 15+37+33+46=131; the result 7.1 (four "inner posit ions"): 15+37+58+33=143 and the result 7.2 (four "outer positions"): 23+15+32+46=116. Analogously, follow all other results.

time[2]. There are, namely, 12 molecules as "odd" and 12 as "even." The same proportion is valid for 4:4 odd/even rows, or for 4:4 inner/outer rows as follows from Table 1, and as we can read from Survey 1. Notice that within all these patterns (12:12 = 1:1 molecules) there is an atom number, also in relationship 1:1 with the differences for ± 0 or ± 1, accordingly to the continuity and minimum change principle, i.e. accordingly to the unit change law.

-	07 **S**	08 **S**	08 **R**	-	23 -**3** - 27
-	06 **A**	09 **R**	-	-	15 -**2** - 21
-	05 **P**	10 **G**	-	-	15 -**2** - 09
-	04 **T**	11 **C**	11 **W**	11 *	37 -**3** - 31
19 **Y**	03 *	12 **I**	12 **I**	12 **M**	58 -**4** - 52
18 **D**	02 **E**	13 **L**	-	-	33 -**3** - 30
17 **H**	01 **Q**	14 **V**	-	-	32 -**3** - 32
16 **N**	00 **K**	15 **F**	15 **L**	-	46 -**4** - 50
35 35	*14* 14	*46* 46	*19* 27	*11* 12	
2 2	**4 3**	**4 4**	**2 2**	**0 1**	125 -**12** - 120
18 23	*34* 27	*33* 45	*35* 26	*00* 11	134 -**12** - 132

Table 2. *Alphanumerical amino acid order in relation to atom number with a distinction* All as in Table 1 plus a distinction: the spaces (rows) which possesses three molecules each (italics), and the spaces (rows) which posses two or four molecules; 3 as odd; 2 and 4 as even numbers (cf. Survey 1, step 3 and 4).

So, within two different odd/even patterns ("odd" number of molecules and "odd" rows, etc.) there are the same number of atoms, 120 and 132, respectively (120 as 121-1 and 132 as 131+1). Within inner/outer rows there is a *vice versa* situation for the number of atoms: 121+1 and 131-1 (cf. results 3-6 with results 7-8 in Survey 1). Going step by step, we see that there are 120 (i.e. 1$\underline{2}$1-1) atoms within all four "3 molecules" rows and within all four "odd positions," i.e. odd rows, what means that the difference is for ± 0. On the other hand, within four "2 or 4 molecules" rows there are 132 (i.e. 1$\underline{3}$1+1) atoms

[2] Within the symmetry in the simplest case, the ratio 1:1 is related to two halves of one whole. On the other hand the ratio 1:2 is related to a half and a whole both within the same whole.

as well as within four "even positions," i.e. even rows. The difference is ±0, still once. The differences for ±1 appear if we include four "inner positions" and four "outer positions," as it is presented in Table 1 in relation to Survey 1. Precisely, that is the differences for ±1, regarding in relation to the arithmetic mean and the differences for 2 (132 in relation to 130) regarding the absolute values. As a noteworthy is the fact that the results, valid for 4 and 4 inner-outer rows, are also valid for 2 and 3 columns in Table 1 (cf. first and second line of step 5 in Survey 2). With this known, we see that molecule number and atom number within rows and columns appear as whole quanta, exactly as it was by essential, semiessential and nonessential AA subclasses (Rakočević and Jokić, 1996, pp. 348-349).

-	07 **S**	08 **S**	08 **R**	-	23 -**3** - 162
-	06 **A**	09 **R**	-	-	15 -**2** - 115
-	05 **P**	10 **G**	-	-	15 -**2** - 042
-	04 **T**	11 **C**	11 **W**	11 *	37 -**3** - 222
19 **Y**	03 *	12 **I**	12 **I**	12 **M**	58 -**4** - 296
18 **D**	02 **E**	13 **L**	-	-	33 -**3** - 189
17 **H**	01 **Q**	14 **V**	-	-	32 -**3** - 196
16 **N**	00 **K**	15 **F**	15 **L**	-	46 -**4** - 278
70 **4** 305	28 **7** 349	92 **8** 427	46 **4** 344	23 **1** 075	259 -**24** - 1500 (1500=1255+245) (1500=1010+490)
654			419		

Table 3. *Alphanumerical amino acid order in relation to nucleon number within first nuclides* All as in Table 1, except third sequence, which represents the sums of the number of nucleons within first nuclides of the atoms existing within AAs molecules (side chains). Down: further additions of the sums.

3. ONCE AND TWICE CHOSEN AMINO ACIDS

Within Damjanović's model (Table 1), there are 24 AAs molecules in the positions from 0 to 19. The 16 AA molecules are chosen only once: K,Q, E, T, P, A, G, C, V, F, W, M, N, H, D, Y; and 8 AA molecules are chosen twice (because a higher degree of degeneracy): S, S, R, R, I, I, L, L. The ratio related to two subclasses is 16:8 = 2:1, accordingly to the symmetry and proportion in the simplest case.

Within the natural numbers series, the sum from 0 to 19 equals 190

1	$1+2+\ldots+19=190$ $1+2+\ldots+24=\underline{300}$ $\underline{\mathbf{2}}\times 245$	The sum of ON of 24 AAs ↓ $\underline{\mathbf{1}}\times 245$
2	$245+(3+11)=259$ $245+(6+11)=2\underline{6}2$	Table 1, down right: $2\underline{5}2$ atom number
3	$20+24=\underline{\mathbf{2}}/1(22)$ $\underline{\mathbf{1}}/2(1+2+\ldots+22)=25\underline{\mathbf{3}}$	Amino acid molecules $25\underline{\mathbf{2}}$ atom number
4	$(20+24)+(245+252)=555$ $245=190+\underline{\mathbf{55}}$ $245=300-\underline{\mathbf{55}}$ $204=48+156(12^1+12^2)$	$555-\underline{\mathbf{44}}=511$ $511+14=525$ $525+252=777$ $525+204=729(12^3)$
5	$(09+31+52+30)=1\underline{2}1+1$ $61+61=122=1\underline{2}1+1$ $41+61+61+11=2\times 87$	$1\underline{3}1-1=(27+21)+(32+50)$ $1\underline{3}1-1=41+78+11$ $78=1\times 78$
6	$1/\underline{\mathbf{2}}(190+300)=245$ $1/\underline{\mathbf{2}}(3+11)=7$	$(245+7=252)1/\underline{\mathbf{1}}$
7	$120=2\times 60$ $132=2\times 66$ $78=1\times 78$	$60=(1\times 60)$ $66=(1\times 60)+(1\times 6)$ $78=[(1\times 60)+(1\times 6)]+(2\times 6)$
8	$(1\times 78)+(2\times 87)=252$ $(06\times 07)\times 06=252$	$252=78+(41+61)+(61+11)$ $(41+61)=06\times 17$ $(61+11)=06\times 12$

Survey 2. *The relations between the sums of ordinal numbers and the number of atoms* ON - Ordinal number of amino acids (AAs) after Damjanović's model, presented within framework in Table 1. The explanations in the text.

and from 0 to 24 equals 300; all together, accordingly to the additive number theory[3], equals $190 + 300 = 490$ or 2×245, exactly as a whole quantum of nucleon number with in 8 twice chosen molecules, i.e. their side chains $(2S-31)+(2R-100)+(2I-57)+(2L-57) = 2\times245 = 490$, what means a ratio 1:1 (cf. the results in Table 3, down, right); and exactly as two whole quanta of the sum of ordinal numbers for 24 AAs: $[(K-00)+(Q-01)+(E-02)+(T-04)+(P-05)+(A-06)+(G-10)+(C-11)+(V-14)+(F-15)+(W-11)+(M-12)+(N-16)+(H-7)+(D-18)+(Y-19)]+[(S-7)+(S-8)+(R-8)+(R-9)+(I-12)+(I-12)+(L-13)+(L-15)] = 1\times245$, what means a ratio 1:2 (cf. step 1 in Survey 2). By this, one must notice that the result 245 as a half of the sum of possible two ordinal numbers sequences (190+300) increased by a half of the sum of ordinal numbers of two stop spaces [1/2 of (3+11) equals 7] gives a number of 252 units, which is the same number valid for the atom number within 24 AAs molecules, i.e. their side chains (cf. Survey 2, step 6).

-	07 **S**	08 **S**	08 **R**	-	23 -**3** - 191
-	06 **A**	09 **R**	-	-	15 -**2** - 136
-	05 **P**	10 **G**	-	-	15 -**2** - 051
-	04 **T**	11 **C**	11 **W**	11 *	37 -**3** - 257
19 **Y**	03 *	12 **I**	12 **I**	12 **M**	58 -**4** - 352
18 **D**	02 **E**	13 **L**	-	-	33 -**3** - 223
17 **H**	01 **Q**	14 **V**	-	-	32 -**3** - 229
16 **N**	00 **K**	15 **F**	15 **L**	-	46 -**4** - 329
70	28	92	46	23	259 -**24** - 1768
4	**7**	**8**	**4**	**1**	(1768=1474+294)
350	415	509	405	089	(294=245+49)
765		914			(245+245=490)
1679					

Table 4. *Alphanumerical amino acid order in relation to nucleon number within last nuclides* All as in Table 3, except the data (in third sequence) for last, instead for first nuclides. For details se the text.

[3]Hodge (1983) in Van Nostrand's Scientific Encyclopedia, p. 2034: "*Additive number theory ...* A partition of n is a decomposition of the number n into additive parts. Repetitions in the additive parts are allowed and the order is irrelevant."

4. RELATIONS THROUGH UNIT CHANGE LAW

The obtained sum of 245, plus ordinal numbers for two stop codon spaces, 3 for UAA & UAG; and 11 for UGA, equals 259 (down, on the right in Table 1; first step in Survey 1; and second step in Survey 2). Regarding on the second step in Survey 2 (second line), we see that the total sum of all possible ordinal numbers is 262, if two stop codons on the position "3" are taken separately ($3 + 3 = 6$). And now, this quantum of 262 stands in a "unit change law" relation with the atom number, 252, existing within 24 AAs molecules, i.e. their side chains (Table 1, down, right; and Survey 2, second step, second line). On the other hand, if we understand (in accordance with the additive number theory) that $20 + 24 = 44$ AAs, then arithmetic mean is 22. The sum from 0 to 22 (within natural numbers series) equals 253, what means the realization of "the unit change law" still once. Indeed, the sum of the possible ordinal numbers in this case is 253 and the atom number for 24 AAs is 252 (Survey 2, step 3). As a third insight, the number

-	07 **S**	08 **S**	08 **R**	-	23 -**3** - 353
-	06 **A**	09 **R**	-	-	15 -**2** - 251
-	05 **P**	10 **G**	-	-	15 -**2** - 093
-	04 **T**	11 **C**	11 **W**	11 *	37 -**3** - 479
19 **Y**	03 *	12 **I**	12 **I**	12 **M**	58 -**4** - 648
18 **D**	02 **E**	13 **L**	-	-	33 -**3** - 412
17 **H**	01 **Q**	14 **V**	-	-	32 -**3** - 425
16 **N**	00 **K**	15 **F**	15 **L**	-	46 -**4** - 607
70	28	92	46	23	
4	**7**	**8**	**4**	**1**	128 -**24** - 1519
655	764	936	749	164	131 -**24** - 1749
1419		1849			

Table 5.1. *Alphanumerical amino acid order in relation to nucleon number within first plus last nuclides - first distinction* All as in Tables 3 and 4 with the data for nucleon number within first and last nuclides of the atoms existing within AAs molecules, i.e. their side chains (162 from Table 3 plus 191 from Table 4 equals 353, etc.). The distinction is related here to odd and even rows. For details, see the text.

262 as two quanta [(2 × 1**3**1) ±0] corresponds to the atom number 131+1 within "odd-even" patterns (Survey 1, steps 3-6) and to the atom number 131-1 within "inner-outer" positions (Survey 1, steps 7-8; Survey 2, step 5); also to the sum of ordinal numbers (131±0) of AAs existing within even rows (Table 5.1, within ending result: 131-**24**-1749).

4.1. Relations through Ramanujan's numbers

The additive 20+24 AAs molecules, plus atom number (252) and plus the sum of ordinal numbers (245) equals 555 as it is shown in step 4 of Survey 2. From this step it is also self-evident a correspondence (through a specific way) with the Ramanujan's numbers[4], if we take a double quantum of the number 555 (that means the number $1110 = 10^3 + 10^2 + 10^1$). By this one must notice that the numbers 555, 55, 44, 777, etc. (Survey 2, step 4), correspond to the Shcherbak's insights about the analogies to quantum physics through a unit change law [5]. On the other hand, because atom number in all five columns of the system (Table 1) can be expressed by only two permutations 78/87, through a proportion 1:2 (cf. Survey 2, step 5, line 3), we can conclude that Shcherbak's insight about cyclic permutation is here valid also [6].

4.2. Relations through multiples of number six

In a previous work (Rakočević, 1998) we have shown that spectively. On the other hand the middle result in the system (78), the atom number within third column in Table 1, we can read as $(1\times 60)+(3\times 6)$

[4]Hodge (1983), p. 2034: "Ramanujan ... remarked that 1729 was interesting because it was the smallest positive integer that could be expressed as the sum of two cubes in two different ways, namely $1729 = 12^3 + 1^3 = 10^3 + 9^3$. This is an example of an additive number theory result."

[5]Shcherbak (1994), p. 475: "The digital pattern of nucleon number notations (111..., 222..., 333) ... are written in the same symbols"; p. 476: "The laws of additive-position notation of numbers ... have analogies with quantum physics. Any position (level) ... is characterized by symbol (state) ... . When the highest state ... is attained, there is a quantum transition to further level $j+1$, its value being increased by unity and so forth."

[6]Shcherbak (1994), p. 475: "The digital pattern of nucleon number notations ... (925, 592) is noteworthy in this respect ... the numbers are arranged by the cyclic permutation."

or $(1 \times 66) + (2 \times 6)$ [7].

4.3. Relations through nuclides

Shcherbak (1993, 1994) has shown that a classification of canonical AAs into four-codon and non-four-codon AAs is related to the nucleon number, existing within first nuclides of 5 bioelements (H, C, N, O and S). In Damjanović's AA system, however, the splittings into rows and columns are related not only to the first, but to the last nuclides also, and to all nuclides at the same time.

-	07 **S**	08 **S**	08 **R**	-	23 -**3** - 353
-	06 **A**	09 **R**	-	-	15 -**2** - 251
-	05 **P**	10 **G**	-	-	15 -**2** - 093
-	04 **T**	11 **C**	11 **W**	11 *	37 -**3** - 479
19 **Y**	03 *	12 **I**	12 **I**	12 **M**	58 -**4** - 648
18 **D**	02 **E**	13 **L**	-	-	33 -**3** - 412
17 **H**	01 **Q**	14 **V**	-	-	32 -**3** - 425
16 **N**	00 **K**	15 **F**	15 **L**	-	46 -**4** - 607
70 **4** 655	28 **7** 764	92 **8** 936	46 **4** 749	23 **1** 164	 125 -**24** - 16$\underline{6}$9 134 -**24** - 1$\underline{5}$99
$\underline{1}$419			91$\underline{3}$		

Table 5.2. *Alphanumerical amino acid order in relation to nucleon number within first plus last nuclides - second distinction* All as in Table 5.1 except the distinction, which is related here to odd (3) and even (2 or 4) number of molecules within the rows. For details, see the text.

Remark 4.1. The first nuclides, valid for 20 canonical AAs are: H-1, C-12, N-14, O-16 and S-32. The last: H-2, C-13, N-15, O-18 and S-36. Finely, the nuclides between the first and last are: O-17, S-33 and

[7] Rakočević (1998), p. 289: "Within seven 'golden' amino acids (side chains) there are 60 atoms; within their seven complements there are $[60 + 1 \times 6)]$ and within six non-complements there are $\{[60 + (1 \times 6)] + (2 \times 6)\}$ of atoms. The differences are $1 \times 6, 2 \times 6$ and 3×6 which means realization of minimum change principle and continuity principle at the same time." Notice here, as a curiosity, that the number 6 is the first possible perfect number $(6 = 1 + 2 + 3 = 1 \times 2 \times 3)$. [About perfect and friendly numbers as determinants of the genetic code, see in Rakočević (1997, pp. 60 -67)].

S-34. The notion "all nuclides" includes all three types of the presented nuclides.

So, in Table 3 as a referent system are taken the sums of the number of nucleons within "the first nuclides" - third sequence, behind the bold sequence (as a sequence of molecule number), whereas in Table 4 the referent system make the sums of the number of nucleons within last nuclides. In tables 5.1 and 5.2 are the sums of the sums (nucleon number in both first and last nuclides). Finely, in Tables 6.1 and 6.2, are presented the sums of nucleons of all 13 nuclides existing in 5 types of atoms within side chains of 20 canonical AAs.

-	07 **S**	08 **S**	08 **R**	-	23 -**3** - 387
-	06 **A**	09 **R**	-	-	15 -**2** - 251
-	05 **P**	10 **G**	-	-	15 -**2** - 093
-	04 **T**	11 **C**	11 **W**	11 *	37 -**3** - 563
19 **Y**	03 *	12 **I**	12 **I**	12 **M**	58 -**4** - 732
18 **D**	02 **E**	13 **L**	-	-	33 -**3** - 480
17 **H**	01 **Q**	14 **V**	-	-	32 -**3** - 442
16 **N**	00 **K**	15 **F**	15 **L**	-	46 -**4** - 624
70 **4** 723	28 **7** 849	92 **8** 1020	46 **4** 749	23 **1** 231	259 -**24** - 3572

Table 6.1. *Alphanumerical amino acid order in relation to nucleon number within all nuclides* All as in Table 5.1 but with the data for nucleon number within all nuclides (after Remark 4.1) and without the distinction. For details, see the text.

Going from Table 3 to Table 4, from the system with first nuclides to the system with last nuclides, we see that both Shcherbak's insights are still valid. Within first two columns in Table 3 there are 654, whereas in Table 4 there are 654+111 nucleons (cf. Footnote 4; see Survey 3, steps 1 and 2). On the other hand within two column pairs there are 419 and 914 nucleons, respectively (cf. Footnote 5; see Survey 3, steps 3 and 4). By this in the cycling process participate not only the digital notations but the spaces also (one column excluded and two columns included in Table 3 and vice versa in Table 4). In Survey 3 are given some further examples of the changes, exactly for a unit (in first, second, third or fourth position of the digit notations), or through a cycling process.

-	07 **S**	08 **S**	08 **R**	-	23 -**3** - 387
-	06 **A**	09 **R**	-	-	15 -**2** - 251
-	05 **P**	10 **G**	-	-	15 -**2** - 093
-	04 **T**	11 **C**	11 **W**	11 *	37 -**3** - 563
19 **Y**	03 *	12 **I**	12 **I**	12 **M**	58 -**4** - 732
18 **D**	02 **E**	13 **L**	-	-	33 -**3** - 480
17 **H**	01 **Q**	14 **V**	-	-	32 -**3** - 442
16 **N**	00 **K**	15 **F**	15 **L**	-	46 -**4** - 624
70	28	92	46	23	128 -**24** - 1654
4	**7**	**8**	**4**	**1**	131 -**24** - 1918
723	849	1020	749	231	(1918= **419** + **1499**)

Table 6.2. *Alphanumerical amino acid order in relation to nucleon number within all nuclides with a distinction* All as in Table 6.1 plus a distinction which is related (as in Table 5.2) to odd and even rows. For details, see the text.

5. CONCLUSION

If one understand that within Genetic code table 16 AAs are chosen once and 4 AAs are chosen twice, as it is presented in Damjanović's system of the AAs, then strict alphanumerical regularities appears to be very relevant for the genetic code. First of all, the relationships between ordinal AA number, molecule number, atom number and nucleon number within the rows and columns of the system appear to be determined by the simplest possible symmetry and proportion. Also, all key relations exist in a strict correspondence with the principle of the minimum change and continuity principle in the form of a unit change law, the change exactly for a unit in atom number, nucleon number and so forth.

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1	$\underline{0}654/\underline{1}654$	Tab. 3 / Tab. 6.2
2	654 / 765	Tab. 3 / Tab. 4
	419 / 914	Tab. 3 / Tab. 4
3	419 / 419	Tab. 3 / Tab. 6.2
	$91\underline{4}$ / $91\underline{3}$	Tab. 4 / Tab. 5.2
4	$1\underline{4}19$ / $1\underline{5}19$	Tab. 5.1 / Tab. 5.1
5	$1\underline{8}49$ / $1\underline{7}49$	Tab. 5.1 / Tab. 5.1
	$16\underline{7}9$/ $16\underline{6}9$	Tab. 4 / Tab. 5.2
6	$1\underline{5}99$/ $1\underline{4}99$	Tab. 5.2 / Tab. 6.2
	749 / 749	Tab. 5.1 / Tab. 6.1
7	$\underline{7}49$ / $\underline{8}49$	Tab. 6.1 / Tab. 6.1
	Table 6.2:	
8	$849 + 231 = 3 \times 41\underline{7}$	$41\underline{7}$ / $41\underline{9}$ Tab. 3
	$723 + 849 = 12 \times 131$	131 Tab. 5.1
	$749 + 231 = 4 \times 245$	Surv. 2, row 1

Survey 3. *The analogies with the filling of quantum levels within the atoms* The changes for 1 in first, second or third position of the digital notations of the sums, presented in Tables 1 - 6. The explanations in the text.

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