Essays on natural codes: probably and improbably (I)

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В сисстемах небесных сфер ... верояатно, совершались и совершаться продолжают изменениия, подобные тем, какие перед нами протекают при химических реакциях частиц ... Грядущий Ньютон найдет законы подобных изменений. В химии они хотя и своебразны, но, конечно, представляют только вариации на общую тему гармонии, царствующей в природе.

Д.И. Менделеев (Периодический закон, 1958, с. 554)

Abstract. The text represents a narration of narration. First, an article was written on the analogies of the genetic and chemical code (MMR, 2018b), and then its Supplement 1 (MMR, 2020b); both articles written in standard scientific language, without associations and contexts that would lead to other topics and other scientific disciplines. However, it proved necessary to do both in this third step, which required an essayistic way of telling. Only such a way made it possible (with the hope that I succeeded in that) to say directly where "iacet lepus": the existing paradigms in current chemical and biological science are the reason for "preventing" insight into analogies and a kind of unity of natural codes.

Introductory note. Why essays, and why the first one titled "Probably and improbably"? I assume that the readers of my works on natural codes (genetic and chemical, above all, but also on the code of natural language; all together – on the universal code of nature) know that these works deviate from the *paradigm* valid in the so-called "current science". But none of them – my readers – mentioned the paradigm in any comments, nor did I, for the simple reason that I would not question the publication of the article. Now it can no longer be postponed, if the full truth is to be expressed (at least as I see it). And in order for that to be possible, a different genre of narrative is necessary, precisely the essay,[1] which I am approaching.

[1] "The essay leads nowhere but, on the contrary, brings any bolder ..., astonishing hypothesis and conception that comes to mind – into the reality from which they (those hypotheses and conceptions) arose" (Mikhail Epstein = Mihail Epštejn, 1997, p. 17).) [In encyclopedias today, the name of M. Epstein is placed on the same level with Noam Chomsky and Umberto Ecco.] Despite the freedom and comfort in setting hypotheses and concepts, the essay, paradoxically, requires more precise language in narration than standard scientific. Hence my decision to write these essays bilingually; the original written in my native tongue (Serbian) to be translated into English, so that the reader is not in doubt about what I wanted to say, if sometimes my English fails. This is true for the basic text of the essay, but not for the legends of the

To better understand what I am talking about, I will give an example. After forty years of research,[2] two of my works, published in Elsevier's journals two years ago (MMR, 2018a,b), represent in some way the epilogue of all my research: they contain a new paradigm! In the first case, by pointing out that in order to understand genetic code (GC), in addition to the term code, the terms the cipher of the code and cipher key are also necessary; and in the second case, the attitude from which it follows – in order to understand the Periodic system of chemical elements (PSE), it is necessary to understand that PSE is actually a chemical code. In Supplement 1 for the article (MMR, 2018b), I went a step further than the original: the newly discovered regularities in isotopy are more than a trend: "It is not just a trend only, but an *unexpected* agreement of experimental results with an *unexpected* model." Unexpected agreement, with unexpected model. That statement also contains the meaning of the title of this essay: unexpected as improbable and vice versa.

The power of paradigm. In Box 1, we have a testimony to the essence of the paradigm of current chemical science: from 1970 and 2015. Both times it is said that it is a convention when the question is asked what is the essence of chemical science in general, and, in particular, the essence of PSE. In doing so, Prof. Grdenić points out that during the hundred years of validity of the phlogiston paradigm, although incorrect theory, chemical science has nevertheless advanced in its development. In a way, as I see it, a similar situation has recurred in our time, over the last hundred and ten years, from 1911 to the present day. Namely, after the discovery that the atom is not a simple and indivisible but a particle of complex structure (Rutherford, 1911), interest in those works of Mendeleev in which the possible correspondence of the order of chemical elements in PS with the series of natural numbers and specific laws of that series ceased. With the discovery of the structure of the atom, Mendeleev's *Periodic System* practically disappeared from chemistry, and was replaced by the *Periodic Table*, permanently further modified and in its versions it grew to over a hundred variants. Therefore, the chemistry of the test tube is on the scene all the time, instead of the system chemistry (MMR, 2019b, 2020a).

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illustrations that I originally write in English, because there, due to the taxative narration in the legends, ambiguities are generally no expected.

[2] At the end of 1980, my master's work in the field of *chemistry teaching* was completed and bound in the form of a master's thesis. … My professors-mentors thought that, going in the same direction in research, I could do a doctorate in a relatively short time, also in chemistry teaching. However, in the meantime a new idea flashed to me, I felt that I finally had a fundamental topic in my hands, and I suggested to my mentors that I do a doctorate in biochemistry ("Information approach to researching the biochemical basis of genetic processes"). And so, for 40 years now, I have not stopped researching the genetic code, so that, in the meantime, I would expand the field of research to the universal code of nature.

Box 1. Contents from which the paradigm in current chemical science can be seen

"According to Th. S. Kuhn, the scientific revolution changes the paradigm, concept or pattern, according to which scientists conduct researches and interpret their discoveries (Kuhn, 1970) ... Phlogiston theory was a chemical paradigm to which chemists adapted all their observations and discoveries, as long as Lavoisier did not reject it in 1789.[3] It was a scientific revolution in chemistry that introduced real chemical elements. The definition of a chemical element did not need to be changed. After Lavoisier chemists were confronted with atomistic. To Lavoisier, atoms were a matter of philosophy, not chemistry, because he saw no way to prove them by experiment. ... In the summer of 1970 in Snowmass-at-Aspen, Colorado, the Chemistry Teaching Section of the American Chemical Society, in collaboration with the International Union of Pure and Applied Chemistry (IUPAC), organized a Conference on Chemistry Teaching. Among other issues discussed was what chemistry was in 1970 and what it would be like in the near future. An extensive report on the Conference was published in the January 1971 issue of the *Journal of Chemical Education*. Conference participants, including prominent American physical chemist G. Hammond (b. 1921) and British inorganic chemist Sir Ronald Nyholm (1917–1971), agreed that teaching chemistry depends on the teacher's understanding of chemistry and its task. That's why it's best to say "that chemistry is what people who call themselves chemists do". In the end, however, they accepted the definition: "Chemistry is a comprehensive study of the preparation, properties, structure and reactions of chemical elements and their compounds, as well as the systems they make up." They found that from 1850 until today there have been no significant changes in answering the question of what chemistry is" (Drago Grdenić, History of Chemistry, Zagreb, 2001, Novi Liber and Školska knjiga, in Croatian).

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"The task group does not intend to recommend the use of a 32-column periodic table or an 18-column. This choice which is a matter of convention, rather than a scientific one, should be left to individual authors and educators. The task group will only concern itself with the constitution of group 3. Once this is established, one is free to represent the periodic table in an 18 or 32 column format." (*"Project Details The constitution of group 3 of the periodic table"* (IUPAC document): "Project No.: 2015-039-2-200; Start Date: 18 December 2015; Division Name: Inorganic Chemistry Division; Division No.: 200") [This citation I have given in (MMR, 2018b, in Appendix).]

[3] At this place Prof. Grdenić explains how the phlogiston theory was founded: "In 1669, Johann Joachim Becher (1635-1682) proposed three 'earths' for chemical elements – fatty, glassy and mercury earth, and Georg Ernst Stahl (1659 - 1734), in 1723 fatty earth called phlogiston and used it to explain burning and other chemical changes." Therefore, the calculation shows that the "chemical element", called first *fatty earth*, and then *phlogiston*, was on the scientific scene for 120 years.

Box 2. The excerpt from: MMR, 1994a, p. 176

Mendelian concept includes both geometrism and the unit change law; in other words, it is a concept that immediately must correspond to the genetic code (*Prediction* 11.1). But, we`ll quote Mendel himself: „Bezeichnet *n* die Anzahl der characteristischen Unterschiede an den beiden Stammpflanzen, so gibt 3^n die Gliederzahl der Kombinationsreihe, 4^n die Anzahl der Individuen, welche in der Reihe gehören, und 2^n die Zahl der Verbindungen, welche konstant bleiben. So enthält z.B. die Reihe, wenn die Stammarten in 4 Merkmalen verschieden sind, 3^4 = 81 Glieder, 4^4 = 256 Individuen und 2^4 = 16 konstante Formen; oder *was dasselbe ist*, unter je 256 Nachkommen der Hybriden gibt es 81 verschiedene Verbindungen, *von denen* 16 konstant sind" (Mendel, 1866, p 22; underlined by M.R.). According to Mendel, in given example, the 16 „Verbindungen" that represent the 'phenotype' at the same time belong to the „Verbindungen" of the 'genotype' which number is 81 totally. But, it is more important that, according to Johannsen, a system of the hybrid cross is determined only by the two entities ('phenotype' and 'genotype') while, according to Mendel such system is determined by the four entities: 1^n–2^n–3^n–4^n (n=1,2,3 ...): Stammarten – Konstante Formen – Glieder – Individuen; viz. in modern language: Parent–type – Phenotype – Genotype – Individual–type. The Johannsen`s model does not correspond to the genetic code in any way from the aspect of code characteristics as already explained in this study. The Mendelian model, however, represents in fact the union of Trinity–Quaternity in a sense that only the first entity (Stammarten) is allowed to be separated from the Quaternity system (note that Mendel only uses the term Stammarten, i.e. Stammpflanzen for the first entity but not the mathematical expression 1^n which we use for the explanation of the Mendelian idea). The Mendelian model also represents the performance of the unit change law on the two levels as it is immediately selfevident. Finally, it is possible to demonstrate that the codons in the system of 64 codons in the genetic code can be classified according to the Mendelian model of „four entities" (that makes a sense of *Prediction* 11.1) (*see* Addendum 3).

Sister paradigms.[4] To make matters worse, it happened, by some strange coincidences, that parallel in biology, possible connections with the possible *order of things* in Nature (corresponding to the series of natural numbers) were erased and paradigms of chance and randomness were established on the scientific scene. Mendel's work on the basis of

[4] By introducing a handful of inter-titles, parallel with a handful of boxes, this essay, with its structure, enters a specific area of the essay genre, the leaf-genre. ("The classic of this genre is Vasili Rozanov's *Fallen Leaves*. But, the second picture is closer to me: sticky spring leaves ... like the beginnings of thoughts that have not yet unfolded into any big 'forest grove', open to the future. ... The leaf is genre, in the middle between [note] and essay: it is a developed [note] or short essay. Of course, there are various leaves: small are birch, large - maple, medium - oak, linden, elm … invite the reader, different shapes and sizes of slips will appear in front of him.") (M. Epstein = M. Epštejn, Sticky slips = Lepljivi listići, 2015, p. 5, in Serbian).

modern genetics (Mendel, 1866) was rediscovered, and the experiments with garden peas described in it were performed again in 1900. Despite Mendel's description of genetic output so clearly and unambiguously corresponding to a series of natural numbers (1-2-3-4) (Box 2), Johansen reduced it all to two terms: *genotype* and *phenotype*. Instead of researchers having fun with Mendel's "miracle" four, it was easier to obscure everything with simple arbitrariness;[5] it was just missing to say, as in chemistry, "that genetics is what people who call themselves geneticists do." [In a way, the introduction of the term genotype-phenotype is analogous to the introduction of the term "atomic number" in chemistry, as a substitute for the "ordinal number" of an element, as was originally the case with Mendeleev. It is even more incredible that a convention has been established according to which one does not take the natural unit of mass - the mass of one hydrogen atom, but the twelfth of the C-12 isotope ?!]

As far as Darwinism is concerned, everything is left to that, as if Darwin saw (and viewed) only mere coincidences, and did not see the *order of moves* (selection steps) that maintain the unity of the "codon ring" and the "mutation ring", as R. Swanson presented a few decades later (Swanson, 1984). And, in fact, he saw that, despite coincidences, biological taxonomic outcomes strictly correspond to the series of natural numbers, and he sophisticatedly expressed all this in one and only illustration (diagram) within his unique book *The Origin of Species*, about which I wrote in details in several times (MMR, 2017c).

In the search for a common and unique logic of natural codes, it was logical to expect (it was probable) that De Saussure's contribution to understanding the common characteristics of all natural codes, expressed in the structure of hierarchical systems be viewed: from the simplest to the most complex element; from the constituent at least to the greatest complexity, all the way to natural spoken language with voices from the least to the greatest openness (Box 3).

Box 3. The excerpt from: Ferdinand De Saussure, Cours de linguistique generale

"On classe généralement les sons d'après le lieu de leur articulation. Notre point de départ sera différent. Quelle que soit la place de l'articulation, elle présente toujours une certaine *aperture*, c'est-à-dire un certaine degré d'ouverture entre deux limites extrêmes qui sont: l'occlusion complète et l'ouverture maximale. Sur cette base, et en allant de l'aperture minimale à l'aperture maximale, les sons seront classés en sept catégories désignées par les chiffres 0, 1, 2, 3, 4, 5, 6. C'est seulement à l'intérieure chacune d'elle que nous répartirons les phonèmes en divers types d'après le lieu de leur articulation propre" (De Saussure, 1985, p. 76).

[5] It was only with the deciphering of the human genome, and the insight into the greater importance of epigenetics, that it was realized that Johansen's genotype-phenotype model was at least insufficient.

Self-censorship. B.M. Kedrov, a chemist and philosopher, the scientist who most thoroughly researched the Mendeleev Archive, testified in his book (1977) that he did not come across any document or paper from which it would be seen what methodology Mendeleev used in his researches. In the said book, Kedrov also enclosed 16 photocopies from the Archive (between pages 128 and 129, a kind of Small Archive), of which 14 refer to PSE. After a long insight into those photocopies, I concluded that in almost all photocopies Mendeleev also deals with the issue of the relationship of PSE with the series of natural numbers and the specific laws of that series. In my opinion, those are the facts, and Mendeleev neither spoke nor wrote about those facts. He was silent, which was a kind of self-censorship. [Mendeleyev's photocopies can be found on my website (www.rakocevcode.rs) (Mendeleyev's Archive), as well as in the Proceedings "Harmony of Genetic Code, Vol 2" in OSF Preprints (DOI 10.31219/osf.io/89uah). In the mentioned Proceedings are also my works on universal consciousness in relation to the universal code of nature.]

Darwin was also silent (MMR, 2017c). In their time (the time of Darwin, Mendel and Mendeleev), if any researcher referred to the possible correspondence of anything with natural numbers, he would be immediately accused of Pythagorean numerology (today it is even worse in that respect). [Andrea, I. Woody, a chemist and philosopher from the University of Washington, also testifies to this in his highly studious work on Mendeleev (MMR, 2020b, footnotes 8 and 10).]

De Saussure was also mostly silent, but, as we have seen (Box 3), he distanced himself from current linguistics with at least one statement ("Our starting point will be different"), pointing out that the whole system of phonemes should be considered first, and only then in parts of the system explore the hierarchy in the articulation of voices.

In the silence of the Moravian Monastery, of which he was abbot, Gregor Mendel performed his genetic experiments on the garden peas (mostly silent about current science) and drew his own unexpected, that is "improbable" conclusions (Mendel, 1866). So unexpected that when current science, 44 years later, discovered his work, and with all praise repeated his experiments, it left out, at least for the next 110 years, his most important result, the result concerning the universality of natural codes – the quartet sequence 1-2-3-4 in the form 1^2–2^2–3^2–4^2 (1^2 – 2^2 – 3^2 – 4^2) (Box 2).

Quartet sequences. How much consciously, and how much unconsciously, is now less important, but the fact is that the analogous quartet sequence was discovered almost 120 years later by R. Swanson in the genetic code (Swanson, 1984). To make the matter be more improbable to the end, I gave myself the freedom to associate her quartet sequence with De Saussure's, a formally identical quartet sequence of the language code, in the form of a logical square: 0-1-2-3 (MMR, Fig. C2, p. 42). For the sake of not only truth,[6]

[6] "Reasoning should retain its rights everywhere and always: and the right is to see in that subject and elsewhere, what *the truth* shows to it (to the Reasoning)" (Michel de Montaigne = Mišel de Montenj, 2001,

but also beauty,[7] I made Darwin's silent and hidden, as well as "double", quaternary sequence: [9 (10 – 26) 27] / [9 (8 – 17) 27], in which "duality" there is also a connection between the genetic and chemical code (MMR, Tab. C2, third quadrant, p. 39).

Scenario by atlas. The first Supplement to the article on the analogies of the genetic and chemical code (MMR, 2020b as S1) brought new quartet sequences, contained in both codes, in such an unexpected ("improbable") way, that it almost escapes the possible usual interpretation of their relations. Finding no other option, I opted for the Atlas of Illustrations, among which the scenario of generating sequences finds its place, both in Supplement 1 and in this essay.[8]

A predictive hypothesis. The final act in Supplement 1 was performed via Table S1-14. Two and two quartet sequences (one smaller and one larger) are given separately: in the upper part for the genetic code (GC) and in the lower part for the chemical code (CC): (2-4-6-8 / 48-50-52-54) versus (16-18-20-22 / 62-64-66-68). The difference between the members of the larger and smaller sequence is the same in both cases and is 46 (48 - 2 = 46; 62 - 16 = 46). My hypothesis for further research is that it will be shown that this "46" has to do with "23" in the Standard GC Table. (The number 46 is twice the value of the number 23; only doubled can it enter into the relations of quartet sequences of even numbers.).

Preliminary proofs for the hypothesis are given in the Atlas. First, Survey 1 presents the uniqueness of the sequence 62-64-66-68, in that its distance from the beginning and end in the set of four even two-digit numbers is such that the ratio is 1: 2, which corresponds to "symmetry in the simplest case" (Marcus, 1989). Then, in Surveys 2 & 3, the uniqueness of the sequence 0,1,2,3 in the Periodic Table of Numbers is shown (starting from S1-Tab. A4); which sequence represents the beginning of both a series of natural and a series of Fibonacci numbers.[9] The position of numbers in the system of Generalized Golden Section (Table 1 in relation to Figure 1) is also in support of the hypothesis.

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p. 178; italics: MMR). Michel de Montaigne was the first to introduce the essay genre into literature. Later, a philosophical essay was written, and, finally, a scientific essay. The text I am writing here, and handing it over to the reader without hesitation, is my way of writing a scientific essay.

[7] "Beauty is truth, truth is beauty – that is all Ye know on earth, and all ye need to know" (John Keats, 1795 – 1821): The last two verses of the poem *Ode on a Grecian Urn*, about which the most has been written in literary criticism and literary analysis.

[8] The illustrations in this essay are marked as usual: Figure 1 – Figure 2; Table 1 – Table 4; Survey 1 – Survey 4; Scenario 1. The illustrations in Supplement 1 are referred to as follows: Table S1-1, Table S1-2, …, Table S1-14; Table S1-A1, Table S1-A2, …, Table S1-A10; Table S1-B1, Table S1-B2, …, Table S1-B9; Survey S1-1, Survey S1-2, …, Survey S1-14. All other references to previous works are given in the usual way.

[9] Tidjani Negadi dedicated an entire article to the uniqueness of number 23, from the aspect of arithmetic, algebra and other mathematical disciplines (Negadi, 2011). If the reader is wondering why I have the right to see the number 23 in the neighborhood of numbers 2 and 3, then I ask him to look at Table S1-1 where it

Box 4. Several important quantities in Tables 2, 3 and 4

Table 2: The number 204 as the number of atoms in 20 amino acid molecules (in their "bodies", i.e. side chains), and the number 180 as the number of atoms in 20 AAs "heads"; in total, it is 384, which quantity we find in Plato's geometric progresion, as well as in the specific ratio of codon octets on the 6-bit binary tree of GC (S1-Table B4 in relation to S1-Table B3). Quantity 530 as the sum of the first three perfect numbers (6+28+496 = 530).

Table 3: The last quantity in Schcherbak's Table of Multiplications of Number 37 is 27 x 37 (Shcherbak, 1994, Table 1), and here we went one step further: 28 x 37. Number 530 as the sum of the first three perfect numbers. The number 476 represents the sum of the numbers in the last octet on the 6-bit binary tree (56 + 57 + ... + 63 = 476); 384 as 284 + 100 where 284 is the second friendly number; 628 as a pair member of numbers 627 and 628 which together give the total number of nucleons in 20 AAs (1255).

Tabela 4: The only novelty is the result (2 x 530) + 204, where 204 is the number of atoms in the side chains 20 AAs.

Final comment. With Survey 4 again ("on the small door") we enter Supplement 1, exactly at S1-Surv. 4, because of two things. First, to correct the error that crept in there;[10] and, second, to test the relationships between the sequences from the aspect of system that we have previously proved for GC in at least two cases. The first time in (MMR, 2011b, Fig. 6, p. 832) and the second time in the Table given in (MMR, 2017d, Tab. 4, p. 13) which Table is attached in this essay as Figure 2. Starting therefore from Survey 4, the relationships of the quartet sequences GC and CC are given further in Tables 2, 3 and 4. The test results are the most important quantities (determinants) of both genetic and chemical code that are generated from the relationships of the given sequences and are contained in the Tables themselves (Box 4). With the presentation of these results, we end this first part of the essay, so that in the second part we can move on to the details, one fine day, I hope in the near future (and this is more a time of hope than security).

is shown how the Fibonacci sequence 2-3-5-8-13 "dresses" in a decade spirit and becomes 20-30-50-80-130. Numbers 2 and 3 are one-digit numbers, but they can be further decadically combined, which is what we find in natural codes.

[10] The difference between 62 and 42 is not 60 but 20, as it is accurately written here now in Survey 4.

Eseji o prirodnim kodovima: verovatno i neverovatno (I)

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В сисстемах небесных сфер ... вероятно, совершались и совершаться продолжают изменениия, подобные тем, какие перед нами протекают при химических реакциях частиц ... Грядущий Ньютон найдет законы подобных изменений. В химии они хотя и своебразны, но, конечно, представляют только вариации на общую тему гармонии, царствующей в природе.

Д.И. Менделеев (Периодический закон, 1958, с. 554)

Apstrakt. Tekst predstavlja kazivanje o kazivanju. Najpre je napisan članak o analogijama genetskog i hemijskog koda (MMR, 2018b), a onda i njegov Suplement 1 (MMR, 2020b); oba članka napisana standardnim naučnim jezikom, bez asocijacija i konteksta koji bi odvodili do drugih tema i drugih naučnih disciplina. Pokazalo se, međutim, nužnim da se u ovom trećem koraku učini i jedno i drugo, što je zahtevalo esejistički način kazivanja. Tek takav način omogućio je (sa nadom da sam u tome uspeo) da se direktno kaže u kom grmu leži zec: postojeće paradigme u tekućoj hemijskoj i biološkoj nauci jesu razlog sprečavanja uvida u analogije i svojevrsno jedinstvo prirodnih kodova.

Uvodna napomena. Zašto eseji, i zašto ovaj prvi sa naslovom "Verovatno i neverovatno"? Pretpostavljam da čitaoci mojih radova o prirodnim kodovima (genetskom i hemijskom, pre svega, ali i o kodu prirodnog govornog jezika; ujedno rečeno – o univerzalnom kodu prirode) znaju da ti radovi odstupaju od *paradigme* važeće u tzv. "tekućoj nauci". Ali, niko od njih – mojih čitalaca – u eventualnim komentarima, nije pominjao paradigmu, niti sam ja to činio, iz jednostavnog razloga da ne bih dovodio u pitanje objavjivanje članka. Sada se to više ne može odlagati, ako se hoće puna istina da iskaže (bar kako je ja vidim). A da bi se to moglo, nužan je drugačiji žanr narativa, upravo esej,[11] kome evo pristupam.

[11] "Esej nikuda ne odvodi nego, naprotiv, privodi bilo koju najsmeliju ..., zapanjujuću hipotezu i koncepciju koja mu padne na pamet – u stvarnost iz koje su one (te hipoteze i koncepcije) proizašle" (Mihail Epštejn, 1997, str. 17) [U enciklopedijama se danas ime M. Epštejna stavlja u istu ravan sa Noamom Čomskim i Umbertom Ekom.] Uprkos slobodi i komociji u postavljanju hipoteza i koncepcija, esej, paradosalno, zahteva precizniji jezik u kazivanju od standardnog naučnog. Otuda moja odluka da ove eseje pišem dvojezično; original napisan na maternjem (srpskom) jeziku da prevedem na engleski, tako da čitalac ne bude u nedoumici šta sam hteo da kažem, ako ponekad i ponegde moj engleski posustane. Ovo važi za

Da bi se bolje razumelo o čemu govorim, navešću primer. Nakon četrdesetogodišnjeg istraživanja,[12] dva moja rada, objavljena u Elzevirovim časopisima pre dve godine (MMR, 2018a,b), predstavljaju na izvstan način epilog svih mojih istraživanja: sadrže u sebi novu paradigmu! U prvom slučaju predočavanjem da su za razumevanje genetskog koda (GC), osim pojma kôd, nužni i pojmovi šifra koda i ključ šifre; a u drugom slučaju stav, iz koga sledi – da bi se razumeo periodni system hemijskih elemenata (PSE), nužno je shvatiti da je PSE zapravo hemijski kod. U Suplementu 1 za članak (MMR, 2018b) otišao sam korak dalje od izvornika: novootkrivene pravilnosti u izotopiji više su od trenda: "It is not just a trend only, but an *unexpected* agreement of experimental results with an *unexpected* model." Neočekivana saglasnost, sa neočekivanim modelom. Taj iskaz sadrži u sebi i smisao naslova ovog eseja: *neočekivano* kao neverovatno i obrnuto.

Moć paradigme. U Boxu 1 imamo svedočenje o suštini paradigme tekuće hemijske nauke: iz 1970. i 2015. godine. Oba puta se kaže, da je reč o konvencija kad se postavi pitanje šta je uopšte suština hemijske nauke, i, posebno, suština PSE. Pri tome Prof. Grdenić ističe da je tokom sto godina važenja paradigme o flogistonu, iako netačne terorije, hemmijska nauka ipak napredovala u svom razvoju. Na izvestan način, kako ja vidim stvari, ponovila se slična situacija i u naše vreme, tokom poslednih sto deset godina, od vremena 1911. godine do danas. Naime, nakon otkrića da atom nije jednostavna i nedeljiva već čestica složene structure (Raderford, 1911), prestalo je interesovanje za one radove Mendeljejeva u kojima se istražuje moguću veza redosleda hemijskih elemenata u PS sa nizom prirodnih brojeva i specifičnim zakonitostima tog niza. Sa otkrićem structure atoma ptraktično je *Periodni system* Mendeljejeva nestao iz hemije, a na njegovo mesto je došla *Periodna Tablica*, permanentno nadalje mogdifikovana i u svojim verzijama narasla na preko stotinu varijanti. Sve vreme je, dakle, na sceni *hemija epruvete*, umesto *sistemske hemije* (MMR, 2019b, 2020a).

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osnovni tekst eseja, ali ne i za legende ilustracija koje izvorno pišem na engleskom, jer se tu, zbog taksativnog kazivanja u legendama, nejasnoće uglavnom ne očekuju.

[12] Krajem 1980. godine moj magistarski rad iz oblasti *nastave hemije* bio je završen i u formi magistarske teze ukoričen. … Moji profesori–mentori smatrali su da, idući istim smerom u istraživanjima, za relativno kratko vreme mogu uraditi i doktorat, takođe iz *nastave hemije*. Međutim, u međuvremenu meni je bljesnula nova ideja, osetio sam da u rukama konačno imam fundamentalnu temu, te sam mojim mentorima predložio da uradim doktorat iz biohemije ("Informacioni pristup istraživanju biohemijske osnove genetičkih procesa"). I, tako, evo već 40 godina ne prestajem da se bavim istraživanjem genetskog koda, da bih, u međuvremenu, područje istraživanja proširio i na univerzalni kod prirode.

Box 1. Sadržaji iz kojih se dâ videti važeća paradigma u tekućoj hemijskoj nauci

„Prema Th. S. Kuhnu, znanstvenom se revolucijom mijenja paradigma, uzor ili obrazac, prema kojoj znanstvenici izvode istraživanja i tumače svoja otkrića (Kuhn, 1970) ... Flogistonska teorija bila je kemijska paradigma kojoj su kemičari prilagodili sva svoja opažanja i otkrića, sve dok je Lavoisier nije odbacio 1789. godine.[13] Bila je to znanstvena revolucija u kemiji kojom su bili uvedeni pravi kemijski elementi. Pri tome definiciju kemijskog elementa nije trebalo mijenjati. Nakon Lavoisier kemičari su se suočili s atomistikom. Lavoisieru su atomi bili pitanje filozofije, a ne kemije jer nije vidio načina da ih dokaže eksperimentom. ... U ljeto godine 1970. u Snowmass-at-Aspenu, Colorado, Sekcija za nastavu kemije Američkog kemijskog društva u suradnji s Međunarodnom unijom za čistu i primijenjenu kemiju (IUPAC), priredila je Konferenciju o nastavi kemije. Među ostalim pitanjima raspravljalo se o tome što je kemija 1970. i kakva će biti u bliskoj budućnosti. Opsežni izvještaj o Konferenciji objavljen je u siječanskom broju časopisa *Journal of Chemical Education* 1971. Sudionici Konferencije, među njima istaknuti američki fizikalni kemičar G. Hammond (rođ. 1921) i britanski anorganski kemičar Sir Ronald Nyholm (1917–1971), složili su se da nastava kemije ovisi o nastavnikovu shvaćanju kemije i njene zadaće. Zbog toga je najbolje reći "da je kemija ono čime se bave ljudi koji sebe zovu kemičarima". Naposljetku su ipak prihvatili definiciju: „Kemija je cjelovit studij priprave, svojstava, strukture i reakcija kemijskih elemenata i njihovih spojeva, kao i sustava koje oni čine." Ustanovili su da od 1850. do danas nije bilo bitnih promjena u odgovoru na pitanje što je kemija"“ (Drago Grdenić, Povijest kemije, Zagreb, 2001, Novi Liber i Školska knjiga).

*

"Ciljna Grupa ne namerava da preporuči upotrebu Periodne Tablice sa 32 kolone ili 18 kolona. Ovakav izbor koji je više konvencija, a ne naučni, treba prepustiti pojedinačnim autorima i nastavnicima. Ciljna Grupa će se samo brinuti oko konstitucije grupe 3. Jednom kada se to uspostavi, svako je slobodan da predstavi Periodnu Tablicu u 18 ili 32 kolonskom formatu." (*“Project Details The constitution of group 3 of the periodic table”* (IUPAC document): "Project No.: 2015-039-2-200; Start Date: 18 December 2015; Division Name: Inorganic Chemistry Division; Division No.: 200")

[13] Na ovom mestu Prof. Grdenić objašnjava kako je došlo do zasnivanja flogistonske teorije: "Godine 1669. Johann Joachim Becher (1635-1682) za kemijske elemente predložio je tri ‘zemlje’ – masnu, staklenastu i živinu, a Georg Ernst Stahl (1659 – 1734), godine 1723. masnu je zemlju nazvao flogiston i njime tumačio gorenje i ostale kemijske promjene". Prema tome, računica pokazuje da je "hemijski elemenat", najpre nazvan *masna zemlja*, a kasnije *flogiston*, na naučnoj sceni bio čitavih 120 godina.

Box 2. Izvod iz: MMR, 1994a, str. 176

Mendelian concept includes both geometrism and the unit change law; in other words, it is a concept that immediately must correspond to the genetic code (*Prediction* 11.1). But, we`ll quote Mendel himself: „Bezeichnet *n* die Anzahl der characteristischen Unterschiede an den beiden Stammpflanzen, so gibt 3^n die Gliederzahl der Kombinationsreihe, 4^n die Anzahl der Individuen, welche in der Reihe gehören, und 2^n die Zahl der Verbindungen, welche konstant bleiben. So enthält z.B. die Reihe, wenn die Stammarten in 4 Merkmalen verschieden sind, 3^4 = 81 Glieder, 4^4 = 256 Individuen und 2^4 = 16 konstante Formen; oder *was dasselbe ist*, unter je 256 Nachkommen der Hybriden gibt es 81 verschiedene Verbindungen, *von denen* 16 konstant sind" (Mendel, 1866, p 22; underlined by M.R.). According to Mendel, in given example, the 16 „Verbindungen" that represent the 'phenotype' at the same time belong to the „Verbindungen" of the 'genotype' which number is 81 totally. But, it is more important that, according to Johannsen, a system of the hybrid cross is determined only by the two entities ('phenotype' and 'genotype') while, according to Mendel such system is determined by the four entities: 1^n–2^n–3^n–4^n (n=1,2,3 ...): Stammarten – Konstante Formen – Glieder – Individuen; viz. in modern language: Parent–type – Phenotype – Genotype – Individual–type. The Johannsen`s model does not correspond to the genetic code in any way from the aspect of code characteristics as already explained in this study. The Mendelian model, however, represents in fact the union of Trinity–Quaternity in a sense that only the first entity (Stammarten) is allowed to be separated from the Quaternity system (note that Mendel only uses the term Stammarten, i.e. Stammpflanzen for the first entity but not the mathematical expression 1^n which we use for the explanation of the Mendelian idea). The Mendelian model also represents the performance of the unit change law on the two levels as it is immediately selfevident. Finally, it is possible to demonstrate that the codons in the system of 64 codons in the genetic code can be classified according to the Mendelian model of „four entities" (that makes a sense of *Prediction* 11.1) (*see* Addendum 3).

Sestrinske paradigme.[14] Da zlo bude veće, dogodilo se, nekim čudnim koincidencijama, da su paralelno i u biologiji izbrisane moguće veze sa mogućim *redom stvari* u Prirodi (korespondentnim sa nizom prirodnih brojeva) i na naučnu scenu su se ustoličile paradigme slučajnosti i randomiciteta. Mendelov rad kojim je zasnovana savremena genetika (Mendel, 1866) ponovo je pronađen, i, u njemu opisani eksperimenti sa baštenskim graškom, ponovo su izvedeni 1900. godine. Uprkos tome što je Mendel tako

[14] Uvođenjem pregršt međunaslova paralelno sa šakom boxova ovaj esej svojom strukturom ulazi i u jedno specifično područje esejskog žanra, u *listić žanr*. ("Klasika ovog žanra je *Opalo lišće* Vasilija Rozanova. Ali, meni je bliža druga slika: lepljivi prolećni listići ... kao zameci misli koje se još nisu razlistale ni u kakav veliki 'lišćar', otvorene prema budućnosti. ... Listić je žanr, na sredini između [beleške] i eseja: to je razvijena [beleška] ili sažeti esej. Naravno, postoje razni listići: sitni su brezovi, krupni - klenovi, srednji – hrastovi, lipovi, brestovi. U gaju reči, u koji se poziva čitalac, pred njim će se ukazati različiti oblici i veličine listića." (M. Epštejn, *Lepljivi listići*, 2015, str. 5)).

jasno i nedvosmisleno opisao genetički *output* korespondentan sa nizom prirodnih brojeva (1-2-3-4) (Box 2), Johansen je sve sveo na dva pojma: *genotip* i *fenotip*. Umesto da se istraživači pozabave Mendelovom "čudesnom" četvorkom, lakše je bilo sve zamagliti jednostavnom proizvoljnošću;[15] samo je nedostajalo pa da se kao u hemiji kaže: "da je genetika ono čime se bave ljudi koji sebe zovu genetičarima." [Na izvestan način uvođenje pojmova genotip-fenotip analogno je uvođenju pojma "atomski broj" u hemiji, kao zamenu za "redni broj" elementa, kako je izvorno bilo kod Mendeljejeva. Još je neverovatnije to da je uspostavljena konvencija prema kojoj se ne uzima prirodna jedinica mase – masa jednog vodonikovog atoma, nego dvanaestina izotopa C-12?!]

Što se darvinizma tiče sve je ostalo na tome, kao da je Darwin video (i uvideo) samo puke slučajnosti, a nije video *red poteza* (selekcionih koraka) kojima se održava jedinstvo "kodonskog ringa" i "mutacionog ringa", kako će R. Swanson predočiti nekoliko decenija kasnije (Swanson, 1984). A, zapravo je video, da uprkos slučajnostima, biološki taksonomski ishodi strogo korespondiraju sa nizom prirodnih brojeva, i sve to do krajnjih granica sofisticirano izrazio u jedinoj ilustraciji (dijagramu) unutar svoje neponovljive knjige *The Origin of Species*, o čemu sam detaljno pisao u nekoliko navrata (MMR, 2017c).

U traganju za zajedničkom i jedinstvenom logikom prirodnih kodova, bilo je logično očekivati (bilo je verovatno) da će biti zapažen i De Sosirov doprinos u sagledavanju zajedničkih karakteristika svih prirodnih kodova, izraženih u ustrojstvu hijerarhijskih sistema: od najjednostavnijeg do najkomleksnijeg elementa; od konstituenta najmanje do najveće složenosti, pa sve do prirodnog govornog jezika sa glasovima od najmanje do najveće otvorenosti (Box 3).

Box 3. Izvod iz: Ferdinand De Sosir, Opšta lingvistika

"Obično se zvuci klasifikuju prema mestu njihove artikulacije. Naša polazna tačka biće druga. Ma koje da je mesto artikulacije, ona uvek pokazuje izvesnu *otvorenost*, to jest otvorenost između dve krajnje granice: potpuno zatvaranje i maksimalna otvorenost. Na toj osnovi, polazeći od minimalne otvorenosti i idući ka maksimalnoj, glasovi će biti klasifikovani u sedam kategorija, označenih šiframa 0, 1, 2, 3, 4, 5, 6. Mi ćemo samo unutar svake od tih kategorija rasporediti foneme na razne tipove prema mestu njihove artikulacije" (De Sosir, 1989, str. 57).

Autocenzura. B.M. Kedrov, hemičar i filozof, naučnik koji je najpotpunije istraživao Arhiv Mendeljejeva, u svojoj knjizi (1977) svedoči da nigde nije naišao ma na kakav dokument ili papir iz koga bi se videlo kojom se metodologijom Mendeljejev služio u

[15] Tek sa dešifrovanjem humanog genoma, i uvidom u veći značaj epigenetike, shvatilo se i to da je Johansenov model genotip-fenotip u najmanju ruku nedostatan.

svojim istraživanjima. U rečenoj knjizi Kedrov je priložio i 16 fotokopija iz Arhiva (između 128. i 129. stranice, svojevrstan Arhiv u malom), od kojih se 14 odnose na PSE. Već davnim uvidom u te fotokopije, zaključio sam da se u skoro svima odreda Mendeljejev bavi i pitanjem odnosa PSE sa nizom prirodnih brojeva i specifičnim zakonitostima tog niza. Po meni, to su činjenice, a o tim činjenicama Mendeljejev nije ni govorio, niti pisao. Ćutao je, što je bila svojevrsna autocenzura. [Fotokopije Mendeljejeva mogu se naći na mome sajtu (www.rakocevcode.rs) (Mendeleyev's Archive), kao i u Zborniku radova "Harmony of Genetic Code , Vol 2" u OSF Preprints (DOI 10.31219/osf.io/89uah). U pomentom Zborniku su i moji radovi o univerzalnoj svesti u relaciji sa univerzalnim kodom prirode.]

Ćutao je i Darvin (MMR, 2017c). U njihovo vreme (u vreme Darvina, Mendela i Mendeljejeva), ako bi se bilo koji istraživač pozvao na moguću korespondenciju bilo čega sa prirodnim brojevima odmah bi bio optužen za pitagorejsku numerologiju (danas je u tom pogledu još i gore). [O tome u svom visoko studioznom radu o Mendeljejevu precizno svedoči i Andrea, I. Woody, hemičar i folozof, sa Univerziteta u Vašingtonu (MMR, 2020b, fusnota 8 i 10).]

De Sosir je takođe uglavnom ćutao, ali se, kako smo videli (Box 3) bar jednim iskazom ogradio od tekuće lingvistike ("Naša polazna tačka biće druga"), predočivši da najpre treba sagledati celinu *sistema fonema,* pa tek potom, u delovima sistema istraživati hijerarhiju u artikulaciji glasova.

Gregor Mendel je u tišini Moravskog manastira, čiji je iguman bio, izvodio svoje genetičke eksperimente na baštenskom grašku (uglavnom ćuteći o tekućoj nauci) i izveo svoje za tadašnje i prethodeće vreme, neočekivane, to jest "neverovatne" zaključke (Mendel, 1866). Toliko neočekivane, da kad je *tekuća nauka*, 44 godine kasnije, otkrila njegov rad, i uz svaku pohvalu ponovila njegove eksperimente, izostavila je, bar za narednih 110 godina, njegov najvažniji rezultat, rezultat koji se tiče univerzalnosti prirodnih kodova – kvartetnu sekvencu 1-2-3-4 u formi 1^2–2^2–3^2–4^2 (1^2 – 2^2 – 3^2 – 4^2) (Box 2)

Kvartetne sekvence. Koliko svesno, a koliko nesvesno, danas je manje važno, ali je činjenica da je analognu kvaternernu sekvencu skoro 120 godina kasnije otkrila R. Swanson u genetskom kodu (Swanson, 1984). Da bi stvar bila do kraja neverovatna, dao sam sebi slobodu da njenu kvartetnu sekvencu pridružim De Sosirovoj, formalno istovetnoj kvartetnoj sekvenci jezičkog koda, u formi logičkog kvadrata: 0-1-2-3 (MMR, Fig. C2, p. 42). Zarad ne samo istine,[16] već i lepote[17] učinio sam i to da se savim u blizini nađe i

[16] "Rasuđivanje treba svuda i svagde da zadrži svoja prava: a pravo je da u tom predmetu, kao i drugde, vidi ono što mu *istina* prikazuje" (Mišel de Montenj, 2001, str. 178; kurziv: MMR). Mišel de Montenj je prvi uveo esejističk žanr u književnost. Kasnije je nastao filozofski esej, i, najzad, naučni esej. Tekst koji ovde pišem, i bez oklevanja predajem čitaocu u ruke, jeste moj način pisanja naučnog eseja.

[17] "Beauty is truth, truth is beauty – that is all Ye know on earth, and all ye need to know" (John Keats, 1795 – 1821): Poslednja dva stiha pesme *Ode on a Grecian Urn*, o kojoj je u književnoj kritici i književnoj analizi najviše pisano.

Darvinova ćutajuća i skrivena, uz to i "dvostruka", kvartetna sekvenca: [9 (10 – 26) 27] / [9 (8 – 17) 27], u kojoj "dvostrukosti" se nalazi i veza genetskog i hemijskog koda (MMR, Tab. C2, treći kvadrant, p. 39).

Scenario putem atlasa. Prvi Suplement članku o analogijama genetskog i hemijskog koda (MMR, 2020b kao S1) doneo je nove kvartetne sekvence, sadržane u jednom i drugom kodu, na takav neočekivan ("neverovatan") način, koji skoro da izmiče mogućoj uobičajenoj interpretaciji njihovih odnosa. Ne nalazeći drugu mogućnost, opredelio sam se za *Atlas ilustracija*, među kojima svoje mesto nalazi i scenario generisanja sekvenci, kako u Suplementu 1, tako i u ovom eseju.[18]

Predikciona hipoteza (Predictive hypothesis). Završni čin u Suplementu 1 izveden je putem Table S1-14. Dve i dve kvartetne sekvence (po jedna manja i jedna veća) date su razdvojeno: u gornjem delu za genetski kod (GC) i u donjem delu za hemijski kod (CC): (2-4-6-8 / 48-50-52-54) versus (16-18-20-22 / 62-64-66-68). Razlika između članova veće i manje sekvence je ista u oba slučaja i iznosi 46 (48 – 2 = 46; 62 – 16 = 46). Moja je hipoteza za dalja istraživanja da će se pokazati da ovo "46" ima veze sa "23" u Tablici standardnog GC. (Broj 46 je dvostruka vrednost broja 23; tek udvostručen on može ući u odnose kvartetnih sekvenci parnih brojeva.) Preliminarni dokazi hipoteze daju se u Atlasu. Najpre se u Surveyu 1 predočava unikatnost sekvence 62-64-66-68, time što je njena udaljenost od početka i kraja u skupu četvorki parnih dvocifrenih brojeva tolika da je odnos razdaljina 1:2, što odgovara "simetriji u najjednostavnijem slučaju" (Marcus, 1989). Potom se u Surveyima 2 & 3 pokazuje unikatnost sekvence: 0,1,2,3 u Periodnom sistemu brojeva (polazeći od S1-Tab. A4), koja predstavlja početak kako niza prirodnih, tako i niza Fibonačijevih brojeva.[19] U prilog hipotezi je i pozicija brojeva u sistemu Generalisanog zlatnog preseka (Table 1 u relaciji sa Figure 1).

[18] Ilustracije u ovom eseju označene su uobičajeno: Figure 1 – Figure 2; Table 1 – Table 4; Survey 1 – Survey 4; Scenario 1. Na ilustracije u Suplementu 1 poziva se na sledeći način: Table S1-1, Table S1-2, …, Table S1-14; Table S1-A1, Table S1-A2, …, Table S1-A10; Table S1-B1, Table S1-B2, …, Table S1-B9; Survey S1-1, Survey S1-2, …, Survey S1-14. Sva ostala pozivanja na prethodne radove daju se na uobičajeni način.

[19] Tidjani Negadi je čitav jedan članak posvetio unikatnosti broja 23, sa aspekta aritmetike, algebre i drgih matematičkih disciplina (Negadi, 2011). Ako bi se čitalac zapitao otkud meni pravo da u susedstvu brojeva 2 i 3 vidim i broj 23, tada ga molim da pogleda Table S1-1 gde je pokazano kako se Fibonačijeva sekvenca 2-3-5-8-13 "oblači" u dekadno ruho i postaje 20-30-50-80-130. Brojevi 2 i 3 jesu jednocifreni brojevi, ali se nadalje mogu dekadno kombinovati, što i nalazimo u prirodnim kodovima.

Box 4. Nekoliko bitnih kvantiteta u Tabelama 2, 3 i 4

Tabela 2: Broj 204 odgovara broju atoma u 20 aminokiselinskih molekula (u njihovim "telima", tj. bočnim nizovima), a broj 180 odgovara broju atoma u 20 AAs "glava"; ukupno je to 384 koji kvantitet nalazimo i u Platonovoj geometrijskoj proporciji, kao i u specifičnom odnosu kodonskih okteta na 6-bitnom binarnom drvetu GC (S1-Table B4 u relaciji sa S1-Table B3). Kvantitet 530 kao suma prva tri savršena broja.

Tabela 3: Poslednji kvantitet u Shcherbakovoj Tablici umnožaka broja 37 jeste 27 x 37 (Shcherbak, 1994, Table 1), a ovde se otišlo jedan korak dalje: 28 x 37. Broj 530 kao suma prva tri savršena broja. Broj 476 predstavlja sumu brojeva u poslednjem oktetu na 6-bitnom binarnom drvetu (56 + 57 + ... + 63 = 476); 384 kao 284 + 100 gde je 284 drugi prijateljski broj; 628 kao parnjak broja 627 koji zajedno daju ukupan broj nukleona u 20 AAs.

Tabela 4: Jedina novost je rezultat (2 x 530) + 204, gde je 204 broj atoma u bočnim nizovima 20 AAs.

Finalni komentar. Sa Surveyem 4 ponovo ("na mala vrata") ulazimo u Suplement 1, tačno kod S1-Surv. 4, zbog dve stvari. Prvo, da ispravimo grešku koja se tamo potkrala;[20] i, drugo, da odnose između sekvenci testiramo i sa aspekta cikličnosti sistema koju smo za GC bar u dva slučaja ranije dokazali. Prvi put u (MMR, 2011b, Fig. 6, p. 832) i drugi put u Tabeli datoj u (MMR, 2017d, Tab. 4, p. 13) koja se u ovom eseju prilaže kao Slika 2. Polazeći dakle od Surveya 4, odnose kvaternernih sekvenci GC i CC dajemo nadalje u Tables 2, 3 and 4. Rezultat testa su najvažniji kvantiteti (determinante) kako genetskog, tako i hemijskog koda koji se upravo iz odnosa datih sekvenci generišu i sadržani su u samim Tabelama (Box 4). Sa predočavanjem tih rezultata završavamo ovaj prvi deo eseja, da bismo u drugom delu prešli i na detalje, jednog lepog dana, nadam se u skoroj budunosti (a ovo je više vreme nade negoli sigurnosti).

[20] Razlika između 62 i 42 nije 60 nego 20, kako je ovde sada u Surveyu 4 tačno napisano.

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ATLAS OF ILLUSTRATIONS

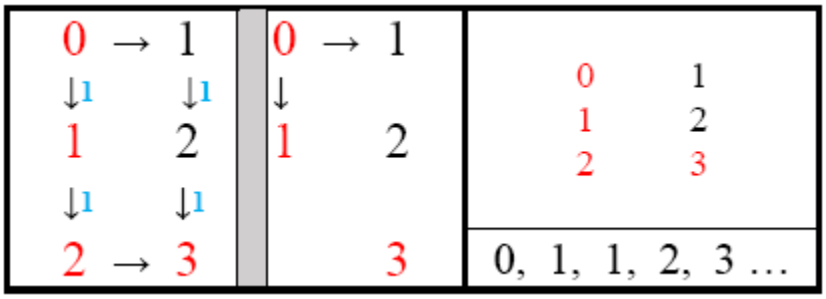
Scenario 1. Generating of quartet sequences

Illustrat.	Sequences
S1-Tab. 3	62-64-66-68
S1-Tab. A2	48-50-52-54
S1-Tab. 13	16-18-20-22
S1-Surv. 4	42-44-46-48 72-74-76-78

Survey 1. The uniqueness of Sequence 62-64-66-68

	2	**2**	2	2	**2**	2	2	**2**	2	
	48	**58**	68	50	**60**	70	52	**62**	72	
…	50	**60**	70	52	**62**	72	54	**64**	74	…
	42	**32**	22	40	**30**	20	38	**28**	18	
	92	**92**	92	92	**92**	92	92	**92**	92	

Survey 2. The uniqueness of relations among 2 & 3 and 23/32 (I)



Survey 3. The uniqueness of relations among 2 & 3 and 23/32 (II)

(0)	-10	-09	-08	-07	-06	-05	-04	-03	-02	-01	00
(1)	01	02	03	04	05	06	07	08	09	10	11
(2)	12	13	14	15	16	17	18	19	20	21	22
…											
(0)	**0**	**1**	2	3	4	5	6	7	8	9	
(1)	**1**	**2**	3	4	5	6	7	8	9	10	
(2)	**2**	**3**	4	5	6	7	8	9	10	11	
…											

Survey 4. Quantity relations in chemical and genetic code (I)

42	44	46	48	2	4	6	8	
20	20	20	20	40	40	40	40	60 + 40 = 100
62	64	66	68	42	44	46	48	62 - 42 = 20
10	10	10	10	**06**	**06**	**06**	**06**	14 & 06
72	74	77	78	48	50	52	54	
10	10	10	10	**14**	**14**	**14**	**14**	180
62	64	66	68	62	64	66	68	204
60	60	60	60	60	60	60	60	↓
2	4	6	8	2	4	6	8	384
5 x 284				2 x 582				582 = 592 - 10
240	250	260	270	156	166	176	186	296
100	100	100	100	120	120	120	120	298
340	350	360	370	276	286	296	306	↓ 594
[(296 + 00), (296 + 10), (296 - 10), (296 - 20)] [296 = 496 – 200]								

Table 1. The integer and non-integer solutions of Generalized Golden Mean (MMR, 2004b)

n		h	c_1	c_2	n		h	c_1	c_2
0	$0^2 + 1^2 =$	1	0	$\sqrt{1}$	0	$0^2 + 1^2 =$	1	0	$\sqrt{1}$
1	$1^2 + 2^2 =$	5	4	$\sqrt{9}$	1	$(x_1)^2 + (x_2)^2 =$	2	1	$\sqrt{3}$
2	$2^2 + 3^2 =$	13	12	$\sqrt{25}$	**2**	$(x_1)^2 + (x_2)^2 =$	**3**	**2**	$\sqrt{5}$
3	$3^2 + 4^2 =$	24	24	$\sqrt{49}$	3	$(x_1)^2 + (x_2)^2 =$	4	3	$\sqrt{7}$
	...								

Table 2. Quantity relations in chemical and genetic code (II)

2	4	6	8		2	4	6	8			
46	46	46	46		60	60	60	60			
48	50	52	54		62	64	66	68			
14	14	14	14		30	30	30	30	30	30	30	30
62	64	66	68		92	94	96	98	14	14	14	14
46	46	46	46		44	44	44	44	44	44	44	44
16	18	20	22		48	50	52	54				
14	14	14	14		14	14	14	14				
2	4	6	8		2	4	6	8				

130	140	150	160		206	216	226	236	006 028 496 ↓ 530	204 180 ↓ 384
120	120	120	120		148	148	148	148		
250	260	270	280		354	364	374	384		
2 x 530					(384-00), 384-10), 384-20), 384-30)					

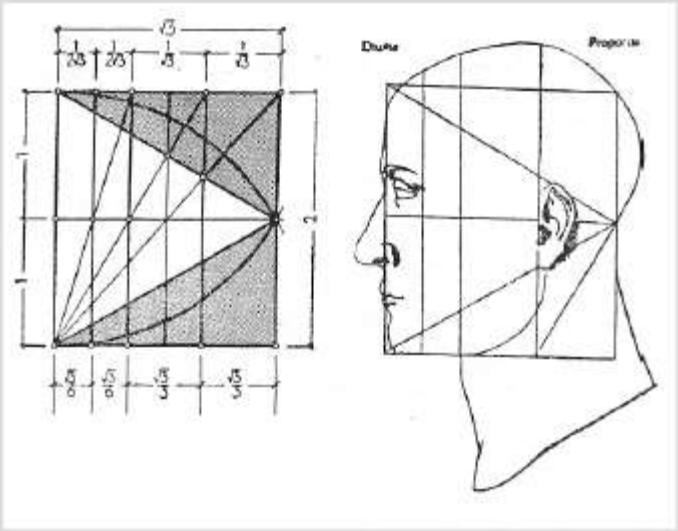
Table 3. Quantity relations in chemical and genetic code (III)

2	4	6	8	2	4	6	8	2	4	6	8
40	40	40	40	46	46	46	46	60	60	60	60
42	44	46	48	48	50	52	54	62	64	66	68
20	20	20	20	14	14	14	14	30	30	30	30
62	64	66	68	62	64	66	68	92	94	96	98
46	46	46	46	46	46	46	46	44	44	44	44
16	18	20	22	16	18	20	22	48	50	52	54
14	14	14	14	14	14	14	14	14	14	14	14
2	4	6	8	2	4	6	8	2	4	6	8
28 x 37				2 x 530				476 + 1000 4 x 384) - 60			
124	134	144	154	130	140	150	160	206	216	226	236
120	120	120	120	120	120	120	120	148	148	148	148
244	254	264	274	250	260	270	280	354	364	374	384
(244+384 = 628), (254+374 = 628), (264+364 = 628), (274+354 = 628)											

Table 4. Quantity relations in chemical and genetic code (IV)

2	4	6	8	2	4	6	8	2	4	6	8
40	40	40	40	46	46	46	46	60	60	60	60
42	44	46	48	42	44	46	48	62	64	66	68
				06	**06**	**06**	**06**				
				48	50	52	54				
20	20	20	20	**14**	**14**	**14**	**14**	30	30	30	30
62	64	66	68	62	64	66	68	92	94	96	98
46	46	46	46	46	46	46	46	44	44	44	44
16	18	20	22	16	18	20	22	48	50	52	54
14	14	14	14	14	14	14	14	14	14	14	14
2	4	6	8	2	4	6	8	2	4	6	8
28 x 37				(2 x 530) + 204				476 + 1000 4 x 384) - 60			
124	134	144	154	172	184	196	208	206	216	226	236
120	120	120	120	126	126	126	126	148	148	148	148
244	254	264	274	298	310	322	334	354	364	374	384
(244+384 = 628), (254+374 = 628), (264+364 = 628), (274+354 = 628)											

Box 2. The first Luca Pacioli's triangle



This Luca Pacioli's triangle appears as the first triangle in the right side of Table 1. The right side of Figure follows from original Pacioli's picture, while on the left side there is a Zloković's mathematical analysis (Zloković, 1955).

Figure 1. The first Luca Pacioli's triangle (MMR, 2004b, Box 2)

		119			
G 01	**N 08**	**L 13**	**M 11**	**(33)**	120
A 04	D 07	K 15	F 14	(40)	
V 10	**S 05**	**R 17**	**Y 15**	**(47)**	
P 08	T 08	Q 11	W 18	(45)	117
I 13	**C 05**	**E 10**	**H 11**	**(39)**	
G 01	N 08	L 13	M 11	(33)	
24/13	**18**/23	**40**/39	**37**/43	118/**119**	
(37)	**(41)**	**(79)**	(80)	117/**120**	
		118			

Figure 2. "A specific protein amino acids arrangement. The first row is repeated at the bottom, and thus one cyclic system is obtained. There are 117 atoms in two outer columns; at even positions 118, at odd 119; in two inner columns 120 atoms. On the other hand, in the lower half of the Table there are 117 atoms ones more; in the lower diagonally "wrapped" area 118, and in the upper 119; in the upper half of Table 120 atoms. The repeated four AAs at the bottom of the Table make to achieve a diagonal balance with a difference of only one atom; moreover, to establish a sequence from the series of natural numbers: 117, 118, 119, 120. (About generating the Table see in the text.)" (MMR, 2017d, Tab. 4, p. 13).