Open Access Library Journal
2022, Volume 9, e8504
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Can Irrationality in Mathematics Be Explained by Genetic Sequences as in the Square Root of Ten?

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How to cite this paper: Ölmez, T. (2022) Can Irrationality in Mathematics Be Explained by Genetic Sequences as in the Square Root of Ten? *Open Access Library Journal*, **9**: e8504.
https://doi.org/10.4236/oalib.1108504

Received: February 20, 2022
Accepted: March 27, 2022
Published: March 30, 2022

Abstract

One of the irrational numbers is the square root of ten number. This article researches whether there is a link between the square root of ten number and the genetic sequences. At first, the square root digits of the number ten after the comma are summed one by one. Secondly, the result of the addition corresponds to the nucleotide bases. Thirdly the results thus obtained are expressed as nucleotide bases (A, T, C and G). (A) Adenine, (T) Thymine, (C) Cytosine and (G) Guanine. From this point of view, approximately when the first four hundred digits of the square root of the number ten after the comma are calculated, the resulting gene sequencing is as follows: [*ATA*AGTC*ATA*AGTGTATTAGTTTAAAACTG]. Fourthly, at this time, some repetitions were detected exactly like this: as "AGT" and "ATA". Fifthly, after searching this sequence in NCBI (National Biotechnology Information Center), the search result was similar to bony fish, especially *Danio aesculapii*. Lastly, *Danio aesculapii* species is closely related to Zebra fish. In summary, With these results, not only the square root of ten in mathematics, but also many other irrational numbers (as explained by the similar QUANTUM PERSPECTIVE MODEL in previous articles), adding a common perspective to these different sciences; the connection between genetic codes in biochemistry and irrational numbers in mathematics is meaningful and has revealed very valuable results. In other words, with this novel research, a new window has been opened that can lead to new interdisciplinary discoveries.

Subject Areas

Biochemistry, Mathematics, Number Theory

Keywords

Quantum Perspective Model, Danio Kyathit, *Danio aesculapii*, The Square

Roots of Ten and NCBI (National Biotechnology Information Center)

1. Introduction

Prior to this study, Kevser Köklü had published articles on the Quantum Perspective Model, not only about the square of the speed of light numbers [1], but also with Pi numbers with nucleotide base coded [2]. In addition to these; Pi numbers once again extended version [3], golden ratio numbers [4], Euler numbers [5], square root of two numbers [6], square root of three numbers [7], square root of five numbers [8], square root of seven numbers [9] and Fibonacci numbers [10] were also published by Tahir ÖLMEZ. In summary, the codes of all these irrational numbers (mentioned above) explained by a genetic sequence can be found in this diagram. One of these codes is [ATAAGTCATAAGTGTATTAGTTTAAAACTG] for **the square root of ten number**. In sum, this paper attempts to explain whether there is a relationship between **the square roots of ten and genetic codes or not?** Let's try to explain these similarities and relations of irrational numbers according to genetic sequences.

2. Methods and Discussion

2.1. Methods

In this work, the chemical formulas of nucleotide bases are calculated with regards to atomic numbers of elements. The chemical structures of bases include **Carbon (C), Nitrogen (N), Oxygen (O), and Hydrogen (H).** Calculation of bases with chemical atoms (See also Table 1) (Ölmez T, 2020) [4].

The atomic numbers of them: Carbon (**C**): 6, Nitrogen (**N**): 7, Oxygen (**O**): 8, Hydrogen (**H**): 1 (Wieser E M *et al.*, 2013) [11]. The chemical structures of bases (**A**, **T**, **C** and **G**) are shown at below (Ölmez T, 2020) [4].

(**A**) Adenine: $C_5H_5N_5$: **70**; (**T**) Thymine: $C_5H_6N_2O_2$: **66**, (**C**) Cytosine: $C_4H_5N_3O_1$: **64**, (**G**) Guanine: $C_5H_5N_5O_1$: **78** (Lodish H *et al.*, 2018) [12].

2.2. Discussion

First of all, a paper about Golden Ratio numbers was researched [4]. Then, according to the Quantum Perspective Model, the connection between the

Table 1. Representation of nucleotide bases (A, T, C, G) in chemical atoms.

ATOMS/NUCLEOTIDE BASES	C = 6	H = 1	O = 8	N = 7	SUM
ADENINE: $C_5H_5N_5$	5	5	-	5	70
THYMINE: $C_5H_6N_2O_2$	5	6	2	2	66
CYTOSINE: $C_4H_5N_3O_1$	4	5	1	3	58
GUANINE: $C_5H_5N_5O_1$	5	5	1	5	78

square root of the two [6]/three [7]/five [8]/seven [9] numbers articles were published. Nextly, the relationships between the Pi numbers [3] and Euler's Identitiy [13] and and genetic codes were published. Now, the square root of the number ten and its genetic codes are calculated by this paper.

Based on the square root of 10, it can also be obtained as follows: the square root of two [6] is multiplied by the square root of five [8]. The genetic sequence of the square root of the two number is [GGATGACTACGGG**TTT**AGAAA] [6]. The genetic sequence of the square root of the five numbers is [A**TTT**ATTCAATACATAACCCCATTGA] [8]. But the genetic sequence of the square root of the ten number is [ATAAGTCATAAGTGTATTAG**TTT**AAAACTG]. The common feature of these sequences is "**TTT**". Now, According to Standard Dna Codon Table, it is Phenylalanine amino acid [14].

3. Calculation of the Square Root of Ten Numbers and Genetic Codes

The first three hundred digits of the square root of ten after the comma are here:
The square root of 10 =
3.162277660168379331998893544432718533719555139325216826857504852792
59443863923822134424810837930029518734728415284005514854885603045388
00146905195967001539033449216571792599406591501534741133394841240853
16929577090471576461044369257879062037808609941828371711548406328552
99911859682456420332696160469131433612894979189026652954361267617878
13500613881862785804636831349524780311437693346719738195131856784032
3124179540221830804587284461460025357757970282864402902440 [15].

At first, the first group of the square root numbers of ten after comma was taken. For example 1, 6, 2, 2, 7, 7, 6, 6, 0, 1, 6, 8, 3, 7, 9… and so on. Secondly, all decimal numbers are subjected to the addition process, respectively.
(1+6+2+2+7+7+6+6+0+1+6+8+3+7+9 = 71). The sum of the first group of the root square numbers of ten after comma is "**71**". Just like as in (**A**) Adenine: 70 (See also **Table 1**).

The **first** group of the root square numbers of ten after comma:
1+6+2+2+7+7+6+6+0+1+6+8+3+7+9 = 71 (**A**) Adenine: 70
The **second** group of the root square numbers of ten after comma:
3+3+1+9+9+8+8+9+3+5+4+4 = 66 (**T**) Thymine: 66
The **third** group of the root square numbers of ten after comma:
4+3+2+7+1+8+5+3+3+7+1+9+5+5+5+1 = 69 (**A**) Adenine: 70
The **fourth** group of the root square numbers of ten after comma:
3+9+3+2+5+2+1+6+8+2+6+8+5+7+5 = 72 (**A**) Adenine: 70
The **fifth** group of the root square numbers of ten after comma:
0+4+8+5+2+7+9+2+5+9+4+4+3+8+6 = 76 (**G**) Guanine: **78**
The **sixth** group of the root square numbers of ten after comma:
3+9+2+3+8+2+2+1+3+4+4+2+4+8+1+0+8 = 65 (**T**) Thymine: **66**

The **seventh** group of the root square numbers of ten after comma:
3+7+9+3+0+0+2+9+5+1+8+7+3 = 57 (**C**) Cytosine: **58**
The **eighth** group of the root square numbers of ten after comma:
4+7+2+8+4+1+5+2+8+4+0+0+5+5+1+4+8 = 68 (**A**) Adenine: **70**
The **ninth** group of the square numbers of ten after comma:
5+4+8+8+5+6+0+3+0+4+5+3+8+8+0+0 = 67 (**T**) Thymine: **66**
The **tenth** group of the square numbers of ten after comma:
1+4+6+9+0+5+1+9+5+9+6+7+0+0+1+5+3 = 71 (**A**) Adenine: **70**
The **eleventh** group of the root square numbers of ten after comma:
9+0+3+3+4+4+9+2+1+6+5+7+1+7+9 = 70 (**A**) Adenine: 70
The **twelfth** group of the root square numbers of ten after comma:
2+5+9+9+4+0+6+5+9+1+5+0+1+5+3+4+7+4 = 79 (**G**) Guanine: **78**
The **thirteenth** group of the root square numbers of ten after comma:
1+1+3+3+3+9+4+8+4+1+2+4+0+8+5+3+1+6 = 66 (**T**) Thymine: **66**
The **fourteenth** group of the root square numbers of ten after comma:
9+2+9+5+7+7+0+9+0+4+7+1+5+7+6 = 78 (**G**) Guanine: **78**
The **fifteenth** group of the root square numbers of ten after comma:
4+6+1+0+4+4+3+6+9+2+5+7+8+7 = 66 (**T**) Thymine: **66**
The **sixteenth** group of the root square numbers of ten after comma:
9+0+6+2+0+3+7+8+0+8+6+0+9+9+4 = 71 (**A**) Adenine: **70**
The **seventeenth** group of the root square numbers of ten after comma:
1+8+2+8+3+7+1+7+1+1+5+4+8+4+0+6 = 66 (**T**) Thymine: **66**
The **eighteenth** group of the root square numbers of ten after comma:
3+2+8+5+5+2+9+9+9+1+1+8+5 = 67 (**T**) Thymine: **66**
The **nineteenth** group of the root square numbers of ten after comma:
9+6+8+2+4+5+6+4+2+0+3+3+2+6+9 = 69 (**A**) Adenine: **70**
The **twentieth** group of the root square numbers of ten after comma:
6+1+6+0+4+6+9+1+3+1+4+3+3+6+1+2+8+9+4 = 77 (**G**) Guanine: **78**
The **twenty-first** group of the root square numbers of ten after comma:
9+7+9+1+8+9+0+2+6+6+5+2 = 64 (**T**) Thymine: **66**
The **twenty-second** group of the root square numbers of ten after comma:
9+5+4+3+6+1+2+6+7+6+1+7+8 = 65 (**T**) Thymine: **66**
The **twenty-third** group of the root square numbers of ten after comma:
7+8+1+3+5+0+0+6+1+3+8+8+1+8+6+2 = 67 (**T**) Thymine: **66**
The **twenty-fourth** group of the root square numbers of ten after comma:
7+8+5+8+0+4+6+3+6+8+3+1+3+4 = 69 (**A**) Adenine: **70**
The **twenty-fifth** group of the root square numbers of ten after comma:
9+5+2+4+7+8+0+3+1+1+4+3+7+6+9 = 69 (**A**) Adenine: **70**
The **twenty-sixth** group of the root square numbers of ten after comma:
3+3+4+6+7+1+9+7+3+8+1+9+5+1+3 = 70 (**A**) Adenine: **70**
The **twenty-seventh** group of the root square numbers of ten after comma:
1+8+5+6+7+8+4+0+3+2+3+1+2+4+1+7+9 = 71 (**A**) Adenine: **70**
The **twenty-eighth** group of the square numbers of ten after comma:

5+4+0+2+2+1+8+3+0+8+0+4+5+8+7+2 = 59 (**C**) Cytosine: **58**

The **twenty-ninth** group of the square numbers of ten after comma:

8+4+4+6+1+4+6+0+0+2+5+3+5+7+7+5 = 67 (**T**) Thymine: **66**

The **thirtieth** group of the square numbers of ten after comma:

7+9+7+0+2+8+2+8+6+4+4+0+2+9+0+2+4+4+0 = 78 (**G**) Guanine: **78**

This sequence can be shown as [**ATAAGTCATAAGTGTATTAGTTTAAAACTG**]. Let me try to explain this sequence with the "**Quantum Perspective Model**". For example, The **first** group of the square root of ten after comma equal to Adenine (A): 71 with the one more "1" Hydrogen bond (**H: 1**). (Remember, See **Table 1**; Adenine (A): 70) This result may mean the sequence of the square root of ten in groups [**ATAAGTCATAAGTGTATTAGTTTAAAACTG**]. The **third** group of the square root of ten after the comma is regarded as with the lack of one Hydrogen bond (**H: 1**) Adenine (A): 69; (Remember, See **Table 1**; Adenine (A): 70) (Because the **deviations** in the calculation of the square root of ten numbers can be derived from the Adenine (A)—Thymine (T) Hydrogen bonds because of Adenine (A) pairs with Thymine (T) by *two* hydrogen bonds. Cytosine (**C**)—Guanine (**G**) pairs with by *three* hydrogen bonds [16]. The reason for the lack of hydrogen bonds: **Hydrogen bonding** is a very versatile attraction. (Ölmez T, 2020) Hydrogen bonds are relatively *weak and easily broken* by increasing hardness (Farrell R E, 2010) [17]. Hydrogen Bonds are critical for the process of genetic identification and are quantum in nature (Penrose Sir Roger, 2008) [18].

4. Results

After searching the square root of the number ten with the National Biotechnology Information Center (NCBI) databases, several associations with bony fish may be found at the end of this search. What makes *Danio kyathit* [19] different from the others is that its strips are divided into rows of small brown spots. This fish species is closely related to zebrafish [20]. *Danio aesculapii* [21] is its distinguishing feature as the number of shared circular scales, which it has in common only with D. Kerri. Also *Danio aesculapii*, the number of dorsal fins with six branched rays, is the only example of its genus. Generally it differs from other Danio species in that it has six dorsal fins [21]. Especially, when sunlight touches the side of this fish species, it shows a variety of colors [22]. Types of bony fishes are based on ***Danio aesculapii*** (See **Figure 1**).

Types of bony fishes are *Paramormyrops kingsleyae*, *Larimichthys crocea* and *Cyprinodon tularosa*.

Types of other living creatures are birds, carnivores, rodents, eudicots, monocots, lizards, bivalves, gastropods, flatworms, beetles, moths, butterflies, walking sticks, bees, butterflies, caddisflies and flies [23] (See **Figure 2**).

5. Conclusion

At first, the summary of this research can be summarized as the expression of

Homo sapiens 3 BAC RP11-784B9 (Roswell Park Cancer Institute Human BAC Library) complete sequ...	Homo sapiens	42.1	42.1	70%	1.1	100.00%	181158	AC109129.3
PREDICTED: Nothoprocta perdicaria ubiquitin specific peptidase 53 (USP53), mRNA	Nothoprocta pe...	40.1	40.1	66%	4.4	100.00%	4720	XM_026034587.1
Scophthalmus maximus chromosome 12	Scophthalmus ...	40.1	40.1	66%	4.4	100.00%	24811384	CP026254.1
Gari tellinella genome assembly, chromosome: 6	Gari tellinella	40.1	40.1	66%	4.4	100.00%	98983066	OV277861.1
PREDICTED: Varanus komodoensis solute carrier family 10 member 7 (SLC10A7), transcript variant X...	Varanus komod...	40.1	40.1	66%	4.4	100.00%	7387	XM_044430844.1
Malus domestica genome assembly, chromosome: 14	Malus domestica	40.1	40.1	66%	4.4	100.00%	32239075	OU745004.1
Malus domestica genome assembly, chromosome: 14	Malus domestica	40.1	76.3	66%	4.4	100.00%	32470335	OU744966.1
Malus domestica genome assembly, chromosome: 14	Malus domestica	40.1	40.1	66%	4.4	100.00%	32241094	OU744555.1
Malus sylvestris genome assembly, chromosome: 14	Malus sylvestris	40.1	110	73%	4.4	100.00%	30380474	OU696516.1
Malus domestica genome assembly, chromosome: 14	Malus domestica	40.1	76.3	66%	4.4	100.00%	31671675	OU696690.1
Sphecodes monilicornis genome assembly, chromosome: 9	Sphecodes mo...	40.1	40.1	66%	4.4	100.00%	27521247	OU565292.1
Ypsolopha scabrella genome assembly, chromosome: 9	Ypsolopha scab...	40.1	40.1	80%	4.4	95.83%	31020244	OU342969.1
Ypsolopha scabrella genome assembly, chromosome: 2	Ypsolopha scab...	40.1	40.1	66%	4.4	100.00%	32863811	OU342962.1
Ochlodes sylvanus genome assembly, chromosome: 19	Ochlodes sylva...	40.1	40.1	66%	4.4	100.00%	11776845	FR990142.1
Pieris rapae genome assembly, chromosome: 16	Pieris rapae	40.1	40.1	80%	4.4	95.83%	10179501	LR990598.1
Danio kyathit genome assembly, chromosome: 1	Danio kyathit	40.1	40.1	66%	4.4	100.00%	78371624	LR812519.1
Danio aesculapii genome assembly, chromosome: 14	Danio aesculapii	38.2	38.2	90%	18	92.59%	56859170	LR812497.1
Danio aesculapii genome assembly, chromosome: 8	Danio aesculapii	38.2	74.3	66%	18	100.00%	55069896	LR812495.1
Pseudochaenichthys georgianus genome assembly, chromosome: 9	Pseudochaenic...	38.2	38.2	63%	18	100.00%	48837966	LR792554.1
Canis lupus familiaris breed Labrador retriever chromosome 10a	Canis lupus fa...	38.2	72.4	63%	18	100.00%	69938001	CP050591.1

Figure 1. The NCBI (National Biotechnology Information Center) result for nucleotide sequence "ATAAGTCATAAGTGTATTAGTTTAAAACTG" [23].

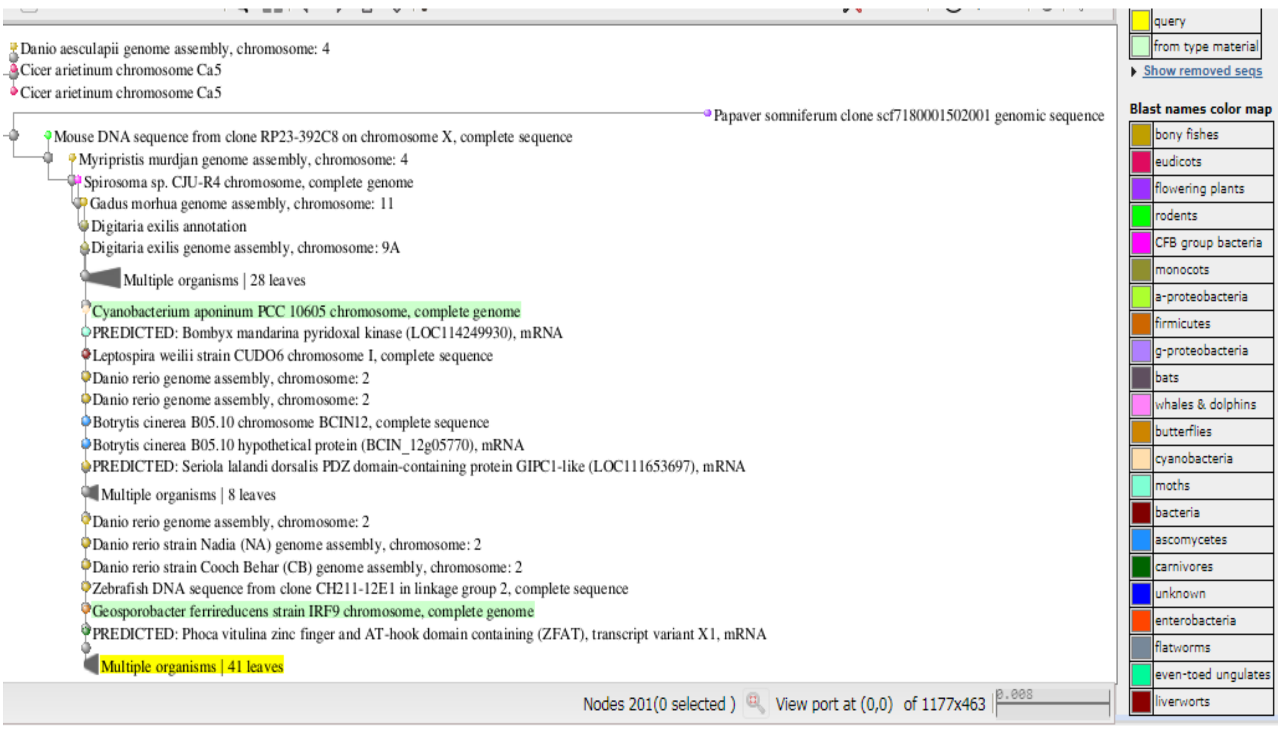

Figure 2. The NCBI (National Biotechnology Information Center) result blast tree view widget for "ATAAGTCATAAGTGTATTAGTTTAAAACTG" nucleotide sequence [23].

the square root of the number ten, about the first four hundred digits after the decimal point, with bases in DNA. Secondly, these found bases in DNA are scanned in the NCBI database and meaningful results are tried to be obtained. A common feature of the NCBI blasts is the result of bony fish, particularly *Danio rerio* (Zebra fish) (Also, See Table 2).

Table 2. The NCBI (National Biotechnology Information Center) summary and genetic sequences of some irrational numbers.

Irrational Numbers	NCBI Results	Genetic Sequence
√2 [6]	*Danio rerio*, Timema, Bony fish	GGATGTCTATTGAGTGACAA
√3 [7]	Denticle Herring, Bony fish, Bats	GGATGACTACGGGTTTAGAAA
√5 [8]	*Danio rerio* (Zebra fish), Bony fish	ATTTATTCAATACATAACCCCATTGA
√7 [9]	*Danio rerio*, *Danio aesculapii*, Bony fish	GATTUCCCAUTAGAGTTAUTAGTTTGATT
√10	Danio Kyathit, *Danio aesculapii*, Bony fish	ATAAGTCATAAGTGTATTAGTTTAAAACTG
Pi Numbers (as a 22/7) [2]	*Danio rerio* (Zebra fish), Bony fish	UTA
Pi Numbers (as an extended form) [3]	*Danio rerio* (Zebra fish), Bony fish, Timema, Danio Kyathit	TCGATTATACTGGTTGGTTGTTAACGGTAC
Euler's Identity [13]	Danio Kyathit, *Danio rerio* (Zebra fish), Bony fish, Timema	AAAGGUCCGUUUAAUAAGUUAAAUUUAGGU
Euler's Numbers [10]	*Danio rerio* (Zebra fish), Bony fish, bat coronavirus	AUGUUGAUAUTAAUCATC
Golden Ratio Numbers (only "618") [4]	Bony fish, Denticle Herring	CAAT Box "GGCCAATCT"; TATA Box "TATAAAA"

Thirdly, *Danio aesculapii* has a similar appearance to Zebrafish [22] (See **Figure 2**). Fourthly, Since Zebra fish have the ability to regenerate heart and lateral hair cells in their larval stages; they can contribute to a replication crisis in biomedical research, providing a useful *scientific model* as an organism [20]. Fifthly, although there is no periodic sequence of irrational numbers, in this paper a periodic sequence has been obtained in terms of genetic sequences, just as in "AGT" and "ATA". Remember, this sequence can be shown as [ATAAGTCATAAGTGTATTAGTTTAAAACTG]. Finally, this study may shed light on the genetic sequences to be obtained, in biochemistry not only to explain the square root of the number ten with genetic codes, but also to explain other irrational numbers with the same property.

Conflicts of Interest

The author declares no conflicts of interest.

References

[1] Köklü, K. (2019) Is Relativity Theory Also Valid in Biogenetics and Mathematics? *NeuroQuantology*, **17**, 53-58. https://doi.org/10.14704/nq.2019.17.3.1999

[2] Köklü, K. (2019) A Quantum Perspective Model to Genetic Codes through Various Sciences. *NeuroQuantology*, **17**, 15-18. https://doi.org/10.14704/nq.2019.17.3.1974

[3] Ölmez, T. (2021) According to Quantum Perspective Model, Are the Numbers of Pi Also Meaningful in Biochemistry? *International Journal of Natural Sciences: Cur-

rent and Future Research Trends (*IJNSCFRT*), **11**, 1-10.

[4] Ölmez, T. (2020) Is There an Aesthetics in Golden Ratio as Regards to the Common Cis-Regulatory Elements versus to Atomic Numbers of Elements with Respect to Quantum Perspective Model? *Neurology and Neuroscience Reports*, **3**, 1-4. https://doi.org/10.15761/NNR.1000119

[5] Ölmez, T. (2020) With Respect to Quantum Perspective Model, Can Euler Numbers Be Related to Biochemistry? *Global Journal of Science Frontier Research*, **20**, 7-14. https://doi.org/10.34257/GJSFRFVOL20IS9PG7

[6] Ölmez, T. (2021) According to the Binary Number Base System, Are the Square Roots of Two Numbers also Significant in Biochemistry? *Open Access Library Journal*, **8**, e7122. https://doi.org/10.4236/oalib.1107122

[7] Ölmez, T. (2021) What Is the Meaning of the Square Root of the Number Three in Biochemistry? *Open Access Library Journal*, **8**, e7123. https://doi.org/10.4236/oalib.1107123

[8] Ölmez, T. (2021) Can Irrational Numbers (Such as Square Root of the Number Five) Be Reached by Analysis of Genetic Sequences? *Open Access Library Journal*, **8**, e7104. https://doi.org/10.4236/oalib.1107104

[9] Ölmez, T. (2022) Are Irrational Numbers (Like the Square Root of the Number Seven) Applicable to Genetic Sequences? *Open Access Library Journal*, **9**, e8513. https://doi.org/10.4236/oalib.1108513

[10] Ölmez, T. (2020) Is There a Similarity between Fibonacci Sequence and Euler's Number with Respect to Quantum Perspective Model? *Global Journal of Science Frontier Research*, **20**, 35-39. https://doi.org/10.34257/GJSFRFVOL20IS9PG35

[11] Wieser, E.M., Holden, N., Coplen, B.T., Böhlke, J.K., Berglund, M., Brand, W.A., *et al.* (2013) Atomic Weights of the Elements 2011 (IUPAC Technical Report). *Pure and Application Chemistry*, **85**, 1047-1078. https://doi.org/10.1351/PAC-REP-13-03-02

[12] Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. (2018) Molecular Cell Biology, 6th Edition, Translation: Geçkil, H., Özmen, M. and Yeşilada, Ö., Palme Publishing, New York, 294-302.

[13] Ölmez, T. (2021) According to Quantum Perspective Model, Is Euler's Identity also Meaningful in Biochemistry? *International Journal of Natural Sciences*: *Current and Future Research Trends*, **9**, 23-28.

[14] https://en.wikipedia.org/wiki/DNA_and_RNA_codon_tables#Standard_DNA_codon_table

[15] https://apod.nasa.gov/htmltest/gifcity/sqrt10.1mil

[16] Fuhrmann, A., Getfert, S., Fu, Q., Reimann, P., Lindsay, S. and Ros, R. (2012) Long Lifetime of Hydrogen-Bonded DNA Basepairs by Force Spectroscopy. *Biophysical Journal*, **102**, 2381-2390. https://doi.org/10.1016/j.bpj.2012.04.006 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3353008/

[17] Farrell, R.E. (2010) RNA Methodologies A Laboratory Guide for Isolation and Characterization. 4th Edition, Academic Press, Amsterdam, 704-710.

[18] Penrose, S.R., Abbott, D., Davies, P.C.W. and Pati, A.K. (Eds.) (2008) Quantum Aspects of Life. Imperial College Press, London, 20-29.

[19] https://en.wikipedia.org/wiki/Danio_kyathi

[20] https://en.wikipedia.org/wiki/Zebrafish

[21] Kullander, S.O. and Fang, F. (2009) *Danio aesculapii*, a New Species of Danio from

South-Western Myanmar. *Zootaxa*, **2164**, 41-48.
https://doi.org/10.11646/zootaxa.2164.1.4

[22] https://en.wikipedia.org/wiki/Panther_danio

[23] https://blast.ncbi.nlm.nih.gov/Blast.cgi