# DNA-RNA and Cl(16) Clifford Algebra of E8 Physics

Frank Dodd (Tony) Smith, Jr. - January 2016 viXra 1601.xxxx

65,536-dimensional Cl(16) not only contains the E8 of E8 Physics (viXra 1508.0157)
but also corresponds to the information content of Microtubules
that the basis of Penrose-Hameroff Quantum Consciousness (viXra 1512.0300)
and to information content of DNA chromosome condensation
and to information content of mRNA triple - amino acid transformations.

In "Living Matter: Algebra of Molecules" (CRC Press 2016) Valery V. Stcherbic and
Leonid P. Buchatsky say: "... DNA structure contains four nucleotides:
adenine A, guanine G, cytosine C and thymine T. ...
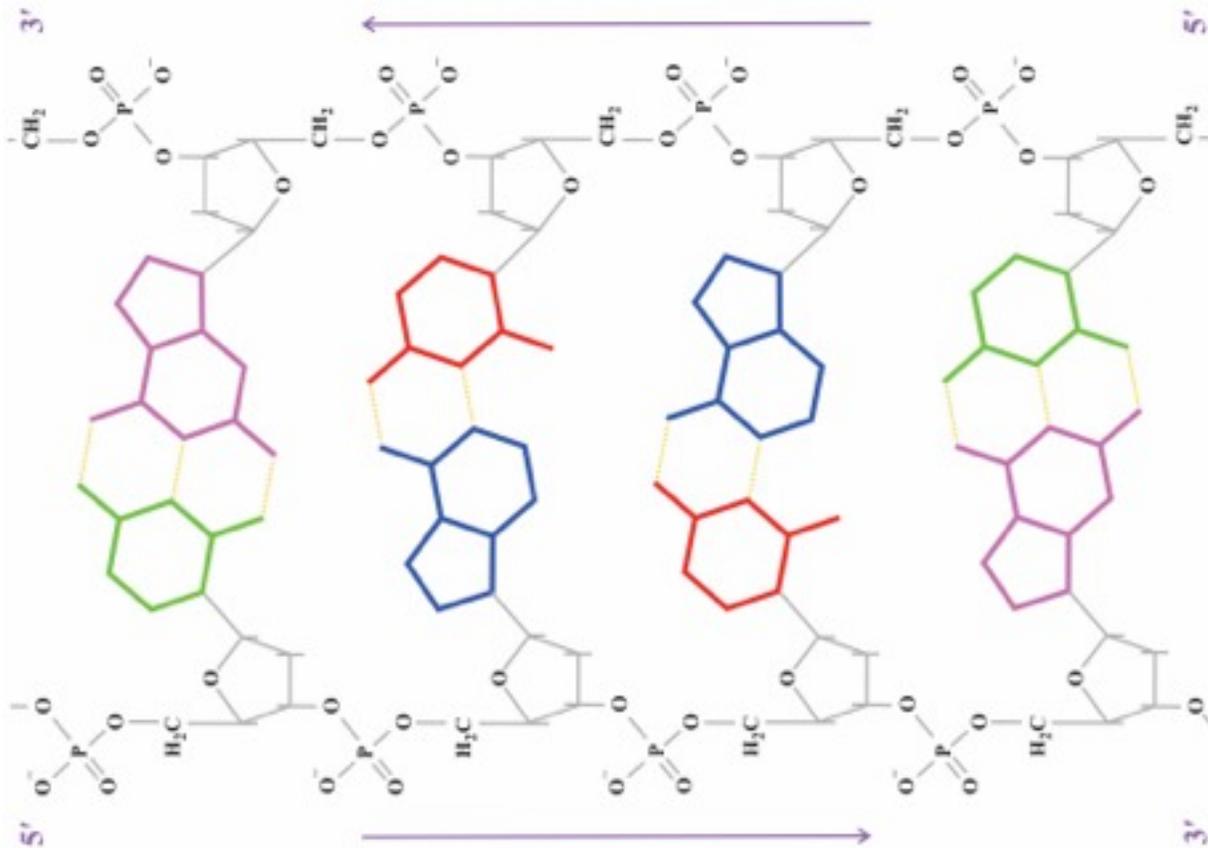
... The Sugar-phosphate group consists of 2-deoxyribose and phosphoric acid residues.
DNA chain orientation is identified by carbon atoms of 2-deoxyribose: (5′)CH2 and
(3′)COH. The biological function of DNA and storage and transfer of genetic information
to daughter cells is based on specific, complimentary pairing of nucleotides:
A is paired with T, and G with C.
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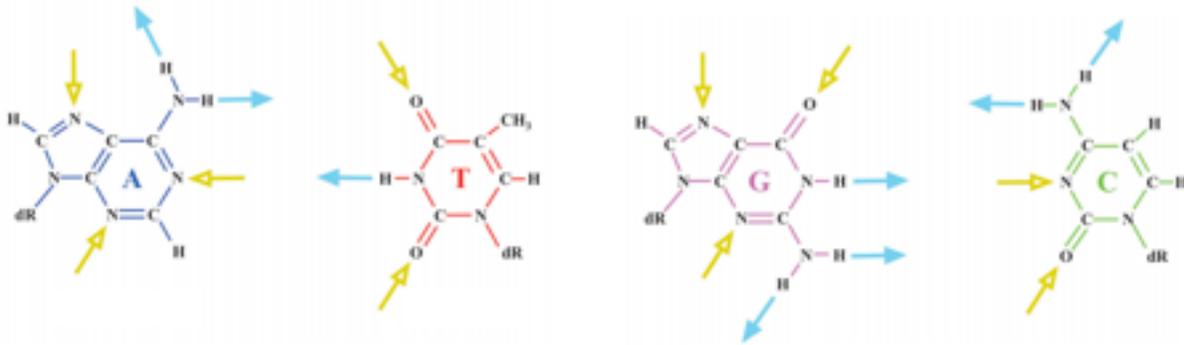
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...

Figure 1.4 Potential vectors of hydrogen bond of DNA nucleotides.
Yellow arrows—acceptors, blue arrows—donors of hydrogen.

The space of DNA nucleotide states contains $T2^3 \otimes C2^4 \otimes A2^5 \otimes G2^6 = 2^{18}$ elements of Clifford algebras. This space reduction to four nucleotides means compression of DNA information by a factor of $2^{18} / 4 = 65536$.
Reduction of the nucleotide state space leads
to DNA compactization and chromosome condensation. ...".

In "Chromosome Condensation and Cohesion" (eLS December 2010) Laura Angelica Diaz-Martinez and Hongtau Yu say: "... The diploid human genome consists of 46 chromosomes, which collectively contain about 2 m of deoxyribonucleic acid (DNA). During mitosis, the genome is packaged into 46 pairs of sister chromatids, each less than 10 μm long. ...".

**The DNA information condensation factor of 65,536 is the dimension of Cl(16)
which is
the Real Clifford Algebra containing 248-dim E8 of viXra 1508.0157 E8 Physics
as 120-dim bivector D8 plus 128-dim D8 half-spinor
and is also the Clifford Algebra
of Microtubule information in viXra 1512.0300 Quantum Consciousness.**

Stcherbic and Buchatsky also say: "... Ribonucleic acid (RNA) can also store genetic information. A single RNA helix is seldom used as a carrier of genetic information (only in some viruses); its main role is storing DNA sites as copies of individual proteincoding genes (mRNA) or in formation of large structural complexes, e.g., ribosomes and spliceosomes. At self-splicing, RNA may perform the function of an enzyme. RNA also performs an important role during DNA replication. So called RNA-primers are necessary to synthesize DNA complementary chains, although this fact is not obvious. RNA contains sugar, ribose, which hydroxyl groups make more reactive than DNA. Besides, RNA contains uracil U, which is somewhat lighter than thymine.
...
At translation of mRNA triplets into genetic code amino acids,
the dynamics of triplets to amino acids transformation should be taken into account.
...
At transition ... functional volume is equal to $3^5 = 243$.
To this volume there should be added the volume of auxiliary spaces,
equal to $13 = 5 + 4 + 3 + 1$.
Accordingly, we get
256 functions of mRNA triplet transformation into amino acids of the genetic code.
Reverse transition ... from amino acids ... to triplet ... needs $5^3 + 3^1 = 128$ functions.
In addition, 128 triplets of mRNA-tRNA pairing should be added to this number. ...".

**The 256 of mRNA triplet to amino acids is represented by Cl(8) Clifford algebra
and
the 128+128 = 256 of amino acids to mRNA triplets is representd by another Cl(8)
so
that the mRNA triple - amino acid connection is represented by the tensor
product Cl(8) x Cl(8) which by 8-Periodicity of Real Clifford Algebras is the
Real Clifford Algebra Cl(16)
which also contains 248-dim E8 of viXra 1508.0157 E8 Physics
and is also the Clifford Algebra
of Microtubule information in viXra 1512.0300 Quantum Consciousness.**