

# Transfer of Genetic Information: An Innovative Model

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**Abstract:** We present a rational introduction to the logical processes that govern, how tokens in a sequence – the DNA – determine the assembly of commutative tokens – the cell's constituents – in a quasi-bijective way. We discuss the relation of sequences to commutative assemblies. We present properties of natural numbers that create logical relations which are concurrently sequential and commutative. The basic concept is that of consolidation of logical conflicts and contradictions into a system of compromises. The main tool we use is known as “cyclic permutations”. The numeric facts that serve as the backbone of the argumentation are to be found in OEIS.

**Keywords:** genetics; information; logic; arithmetic; cycles; permutation; contradiction; consolidation; compromise; tautology

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## 1. Introduction

We present a solution to a riddle. The riddle is how, by which rational reasoning, one can explain in a clear, step-by-step way, the method by which the transfer of genetic information takes actually place.

First, we show what cultural processes have led to the possibility of solving the riddle. Then we highlight, which preconceptions and prejudices we have to disregard. Thirdly, we show concepts that we need to utilize to understand the self-evident truths that link a linear sequence to the properties of a multi-dimensional assembly: the sequenced DNA to the commutative organism.

## 2. Cultural processes that have made the explanation possible

**Width of perspectives:** The FIS community – founded by Prof. Pedro C. Marijuán of Zaragoza, in 1996 – has achieved a width of perspective which does away with tunnel vision. Immortal figures of literature show that a complex riddle can be easily solved once one is ready to think outside of the habitual. Mr. Sherlock Holmes, e.g., has the heartening habit of presenting solutions to riddles. The solutions are striking in their simplicity and at the same time not easy to arrive at, unless one is ready to give up thinking in conventional patterns. The riddle of how Nature manages to transform the information content of a sequence in the DNA of an organism into specific instructions of assembling matter in a nonlinear, biochemically complex environment is a very good example for the necessity of repeated steps of disregarding conventional attitudes. The explanation will encourage cries of “Aha!” and many remarks of the sense that the solution is of course elementary, my dear Watson.

**Availability of computers:** The continuation of works presented by Wittgenstein and Russell was made possible by the use of such tools which were not available to these thinkers. The results presented here can only be observed in multitudes that are generated by computers.

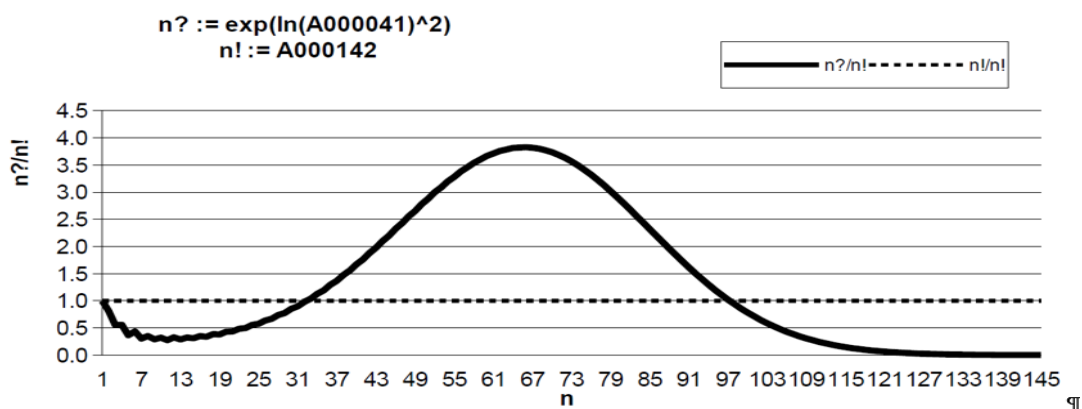
**Advances in social psychology:** The sentence ‘*this* has been defined *such*’ brings forth differing consequences in the technical sciences and in the humanities. The former will arrive at rules that regulate how the concept defined fits within the system of other concepts in a clean fashion, free of

contradictions. In the latter, one will immediately question the social power of the ruling class, and investigate, what advantages have been achieved, and for whom, by de-legitimising alternative concepts to the definition imposed, and whether the elite presently ruling still maintains the credibility of monopolising the interpretation of phenomena observed. The former will achieve a system of explanations that is logically homogenous and free of conflicts; the latter thrives on conflicts and works with the dialectic of alternatives.

### 3. Discontinue using the following concepts

**Infinity:** In biology, nothing supports the idea of infinity. We therefore assume that it is reasonable to use only such concepts that contain a finite number of different things. We have to explicitly point out that the model presented here does not work if ideas of infinite extents or of infinite numbers have to be entertained.

**Dichotomy sequential – commutative:** We refer to the numeric fact, that the two upper limits of sequential and of commutative arrangements of symbols on a collection with a given number of elements (denoted  $n!$  and  $n?$ , respectively) do not agree exactly, and the slack, in-exactitude, between the two upper limits, depends on the number of objects that constitute the collection [1].



**Figure 1.**  $n?$  normed on  $n!$ .  $n? = \exp(\ln(p(n))^2)$ , where  $p(n)$  = number of partitions of  $n$

One has to distance oneself from the quasi-objective impression which the sensual apparatus confers: Our senses lead us to erroneously believe that the property of an assembly to be sequenced or to be commutative are two mutually exclusive categories.

**Rules of commutativity:** Every grown-up can see that  $(a,b) \rightarrow c$  is different to  $(b,a) \rightarrow c$ . This obvious difference is also the reason for the existence of the commutativity rule: if there were no difference between  $(a,b)$  and  $(b,a)$ , it would not be necessary to explicitly issue an ex cathedra dogma that although the difference is evidently there, we do have to actively disregard it.

**Logical system free of contradictions:** Tradition holds that a logical system has to be free of inner conflicts or contradictions. We maintain this rule. The novelty is, that we do allow logical contradictions to enter the discussion and that we show that the existence of contradicting *praemisses* does not *ab ovo* invalidate a logical discussion. The *conclusion* must be free of inner contradictions: this we arrive at by pointing out, that there exist tautologies, compromises and discontinuities, all within the totality of the logical system. Genetics specifically is presented as the ideal case, wherein the tautology, of a given linear sequence translating into a set of resulting properties of a multi-dimensional assembly – and retour -, is maintained. The natural numbers do offer us a way of building a coherent system of logical statements. Let us see, how.

### 4. Introduce using the following

**Cyclic permutations:** Sequencing a collection in two different ways creates contradictory assignments of elements to places. The procedure of successive place changes is known as “cyclic permutation”. The concept is defined in OEIS as a numeric extent, related to  $n$ , the number of

elements, that can be permuted [2] [3]. We propose to use the concept of cycles as the basis for a new understanding of counting [4]. Each of the permutations of  $n$  elements is equally legitimate. The enumeration of elements within the corpus of a cycle is *sequential*, while the symbol designating *which* cycle the element belongs to is a *commutative* one for all elements within the corpus of the cycle.

**Logical compromises:** We accept the existence of logical contradictions within one and the same logical system. If diplomats can deal with contradicting assertions and requirements regarding the same subject-matter, mathematics can surely do likewise. Among the tools which we employ are: pushing into the future, pushing it to somewhere else and leaving it undecided, and, before all else: try building a compromise. If element  $e_1$  is according to rule A on place  $p_1$  and according to rule B on place  $p_2$ , the diplomatic compromise would be that it is presently under way between place  $p_1$  and place  $p_2$ . The compromise allows both rules to exist, and leads to observations that something oscillates or turns, periodically inflates and deflates, etc.

**Standard reorders and central points:** Among the manifold statistics that describe the catalogued reorders, there appears a delineated group of 10 reorders which are well suited to serve as units for counting in terms of cycles. The standard reorders are each consisting of 45 cycles, each containing a corpus of 3 elements, and 1 cycle with a single element, which we propose to call a central element. The additive sum in each of the 45 is for  $a = 18, b=33$ .

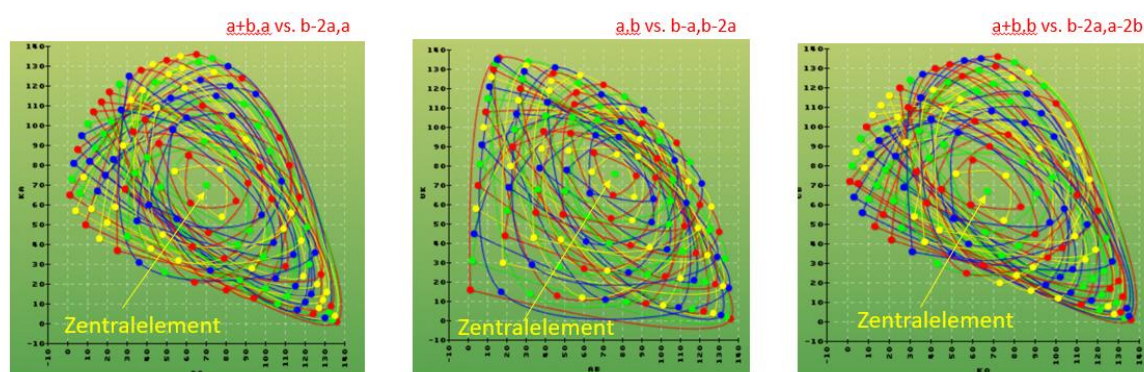


Figure 2. Typical examples of standard cycles with central elements. [5]

**Space concepts:** One can use the standard cycles to construct 2 spaces in 3 dimensions by assembling them, using their common axes. In both of the Descartes-type spaces each of the elements that had been, in a different reading, on a well-defined linear position, possesses 1 well-defined set of spatial coordinates. We propose to call the two spaces, constructed such, Euclid spaces. Of the 2 Euclid spaces, one common space can be constructed, which we propose to call the Newton space, again by using their axes that are common. Here, the elements can have 4 equally legitimate coordinates. Both of Euclid spaces, and the central elements contained in them, are corollaries of simple sequencing operations conducted on natural numbers. There appears no need to introduce an axiom for the concept of a point within a rectangular space, as these concepts arrive as implications of axioms relating to comparisons conducted on natural numbers. Of the remaining 4 standard cycles, 2 planes can be constructed; these transcend the 2 rectangular spaces.

**Information:** We understand the term “information” to deal with the economy of alternatives. This because we understand information to be a description of that what is not the case. Information is then the description of the remaining alternatives. We offer following definition of the term information: “Let  $x = a_k$ . This is a statement, no information contained. Let  $x = a_k$  and  $k \in \{1,2,\dots,k,\dots,n\}$ . This statement contains the information  $k \notin \{1,2,\dots,k-1,k+1,\dots,n\}$ ”.

**Logical language of genetics:** We make use of the arithmetic tool known as cyclic permutations to build compromises among contradictions. Under some, specific, circumstances, the resulting compromises allow for tautologies to exist, which point out that a specific linear position in a sequence is logically the same as a specific agglomeration in a multi-dimensional space being in a specific position. The grammar of the logical sentence stating this tautology consists of words with 3 phonemes, where each of the phonemes can be 1 of 4 possible variants.

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