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Algorithms and the Neo-Darwinian Theory of Evolution

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According to the "dogma" the whole of genetic information should consist of a rather limited set of words in an alphabet of 20-odd letters. Then the only evolutive mechanisms which are ever mentioned are what might be called "typographic changes," i.e., suppression, duplication, transposition, and substitution of letters or blocks of letters, subject to short-range and eventually periodic constraints. Thus there is a striking similarity between these assumed blueprints of living organisms and the formal systems which underlie both programming languages and the simplest non-trivial models of natural ones. It must be emphasized that this framework implies an extremely special net of proximity (of derivability) relations on the set of all words considered. This we may call the "syntactic topology."

From another point of view, organisms are related by another topology which simply results from their being physical objects in space-time. Although this second topology is far harder to formalize, it is the basis of systematics, and it is objectively studied when observing the developmental effects of variations in the milieu. We call it "phenotypic topology."

In my view, we are faced in biology with the same crucial difficulties as in theoretical programming:

1) With respect to the problem of origins, the impossibility of sifting (within less than 10^{100} cycles, say, for non-trivial cases) from mere typographic variants the ones which are syntactically correct, except by using algorithms in which the very concept of syntactic correctness has been incorporated.

2) Granted such a syntactic device, the present lack of a conceivable mechanism which would insure within an interesting range the faintest amount of matching between the two above mentioned topologies (this is said notwithstanding claims to the contrary of some "artificial intelligence" teams).

In other words, I believe that an entirely new set of rules is needed to obtain the sort of correspondence which is assumed to hold (one way—Darwin, or the other—Lamarck) between neighboring phenotypes and which is needed in similar theories of evolutions. If these new principles, or deductions from old ones, were to be postulated, it would seem then a subsidiary point to discuss how much of random mutations and selections are at work in conjunction with them.