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DIGITAL SCIENCES SET

Volume 3

Information Organization of The Universe and Living Things

Generation of Space, Quantum and Molecular Elements, Coactive Generation of Living Organisms and Multiagent Model

Alain Cardon

ISTE

WILEY

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coordinated by
Abdelkhalak El Hami

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Introduction

The Universe is a huge expanse of space containing innumerable quantum, molecular and material elements. The physical sciences have discovered space-time and quantum particles, and there exists the possibility of producing scientific theories about the creation and the reasons for the state of the Universe, specifying the generation, the role and the action of all the elements that it contains. We will propose a universe generation model by considering that it is formed in regard to the expansion of an informational substratum possessing great informational energy and applying everywhere a self-organizing law to produce, by emergence, the space and all the material elements in continuous organization.

To understand what the Universe is, we scientifically observe very many elements at multiple scales, compelling us to ask three major fundamental questions and provide precise answers:

– What was the initial state of generation of this universe, a state where there was neither space nor time and where nothing physical existed?

– What is the space of the Universe, how did the space that allows the generation and deployment of all physical elements come to be created?

– What is this organization of the Universe that allowed the creation of atoms, molecules, clouds of physical components, then stars, galaxies and planets with physical and temporal stability, and what is it that allowed the creation of the extraordinary development of life on Earth, up to humans who ask existential questions?

To answer these questions, we can define a truly unifying model for the notions of generation of space, of quantum elements and of all material elements and also of all living organisms. We must posit that there was an empty space available upon the creation of the Universe and then particles in place there, developing and unfolding at random using energy. We need an answer with a conceptual unification of the creation of the space of the Universe, of the quantum particles, of the molecules and of the material aggregates, and we need to define what this energy was which enabled the creation of all that and especially to specify why the physical elements aggregated to constitute such aggregates leading to the suns, to the planets and to life. In fact, it is necessary to make a unifying analysis of the generation of the Universe and not only multiple local analyses, in bottom-up and top-down approaches. It is necessary to define an organizational law that engages in a continuous way the organization of the Universe. We will pose that the unification was realized by an informational substrate of the Universe, under the quantum level, the Universe being then a self-organized emergence on this substrate.

In order to define a unifying generation model of the Universe, we must first define a very singular initial state which engaged the creation of all space and all elements according to a generative hyper-process, then specify how the generative processes unfolded in a continuous and self-organized way. We posit that this singular initial state generator of the Universe is a localized informational system, that it was defined elsewhere and that it produced a quantity of informational elements which also produced some of the same. It was thus a generating system producing elements which in turn generated. We will then develop an informational model where all the structure and all the elements of the Universe will be considered based on informational fields of communication, allowing these fields to generate structures with temporal permanence and forming both informational and material elements. Furthermore the notion of information used will be different from the one defined by the Turing machines that run programs. We will use the notion of organizational information which will in turn use the notion of informational fields of communications, of the type, for example of a photon field but more intense and totally invisible due to operating at a speed much higher than the speed of light, and which will produce a space of dense communicational links everywhere between all the created elements. This space of informational links will be the substrate producing the space of the Universe. Therefore, there is an informational

substrate that will perform incentive control at multiple scales, to continuously produce an emergence that will be the space-time with all the physical elements of the Universe being generated. It will be necessary to introduce a fundamental organizational law that will regulate all the formations and aggregations of generated elements, in order not to have a system randomly generating a set that becomes chaotic with very little structural coherences.

We assume that the generating element is an autonomous and complex informational element which will generate many informational elements which will be very communicative among themselves. This generating element will use informational energy that will be given to it by its builders and which it will diffuse to the elements that it will generate. The informational energy will therefore be the force that will activate all the informational fields and all the generated informational elements. The elements produced by the generating element will be of two types as will the production of these elements: either they will be structural elements and they will then form cells of the empty space which will constitute themselves on the informational links of the communications and which will unify to generate the space of the Universe, or they will be elements of activity, endowed with informational energy and whose actions will be to communicate to form aggregates constituting the material elements of the Universe, and they will duplicate themselves by producing other elements of activity or structure to realize the expansion of the Universe.

The generated elements of activity will contain fermions and will produce, by their informational communications, the quantum-type particles. So, from the initial generating element, there is the beginning of the production of space in the form of empty cells and elements of activity that will constantly produce others that will be elements of activity or structure, thus continuing the generation of space and quantum elements. All the elements of activity, which are of the type of informational fields, will be able to communicate to generate aggregates, that is, to produce atoms, molecules then all physical elements of the Universe. Thus the Universe generates itself, without ceasing its process of organizational deployment produced by the incentive of the organizational substrate which is its incentive controller at the informational level, because it imposes the application of an organizational law allowing the generation of structured aggregations.

We therefore propose a model considering the whole universe as a fundamentally informational and self-organizing system, composed of what we will call informational fields making up the elements of activity in the generated space, the Universe being in constant expansion. The structure of any produced element of activity will thus be considered as both material and informational, and the organizing informational fields will exist at all scales of physical elements. The Universe will thus be an organizational emergence on a substrate of informational energy that produces incentive control, which will be the application of the organizational law that we will define precisely.

In the model describing the generation of the Universe and all its elements, including the living organisms on Earth, by explaining the communicative action of genes, we therefore pose a central hypothesis which specifies that the Universe has an informational substratum, that everything is based on the generation and action of informational fields which use a basic informational energy and that this activity is subject to a law of multiscale incentive organization. We will show that the formation of the Universe can be represented by an informational program which generates its elements and uses a considerable dynamic memory for the control of the operations and which will be its informational substratum.

We will develop the reasons for the creation and evolution of life on Earth. The model will be based on the notion of communication between all the generating and generated elements enveloped by what we will call physical and informational membranes and which exchange information with incentive values specifying morphological modifications in these fields and thus in the generated organs. We will show that the organizational law can produce specific local bifurcations and that it is the case on the planet Earth which produced all living beings. We will show how the control that allows the modification of the organizations is carried out by introducing the notion of a morphological pattern, an informational element that alters the communications, that allows for modifying the action of the genomes and thus for evolution to occur, and that allows the psychic systems of human beings to have fundamental drives and tendencies. This will make it possible to show how and why terrestrial life was constituted, how and why sexuality was formed for the reproduction of organisms and how and why innumerable very sophisticated and intercommunicating species were formed, making up the Gaia system. We can then say that all life on Earth is based on an informational organization and that it is desirable that we

apprehend well this type of information in its domains, in order for humans to position themselves in evolutionary social structures that are really shared by the use of fundamental communications, moving towards ethical, cultural and peaceful societies.

We will therefore present what this generating information is, how the informational fields operate in communications, how the informational envelopes of quantum and molecular elements are formed. We will present the informational law that allows the substrate of informational energy to incite the realization of material aggregates, then of stars and planets. We will see that we can use the notion of agent, which has been deeply developed in computer science, by defining informational agents representing physical elements in the Universe. Then in the second part, we will present how the generation of life on Earth was achieved by explaining why and how there was a continuous evolution of the formation of all species, how reproduction permits the generation of new organisms forming groups and then new species.

The informational model presented is an attempt to unify many scientific fields analyzing all the elements that make up the Universe, starting from the quantum elements and going all the way to the living organisms on Earth.

PART 1

Informational Generation of the Universe

Information Organization of The Universe and Living Things: Generation of Space, Quantum and Molecular Elements, Coactive Generation of Living Organisms and Multiagent Model, First Edition. Alain Cardon.

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The Computable Model, Computer Science and Physical Concepts

We will first specify the foundations of computer science considered as the science of the calculable, and then expose the general physical theories on the situation of the elements of the Universe.

Computer science, as a science, is based on the computable model of functions and compositions of functions, which is the Turing model. In its applicative aspects, computer science today has considerable technological applications that invest all types of production in the world, that have upset the use of communications and the manipulation and processing of the knowledge used. We will present the fundamental model on which the calculable functions are based and we will see that we must go towards another model of information manipulation to conceive at the informational level the generation of the space of the Universe and the elements constituting it.

1.1. The Turning model

Mathematicians and computer scientists have been interested in the classes of functions that can be calculated with algorithms, which are automatic calculation processes understood as sequences of instructions defining the values that the variables of the activated functions take. An algorithm is therefore a sequence of instructions that calculates the value of various specific functions, and is defined by its various steps.

The mathematician Alan Turing, in 1936, before the invention of the first computers, posited the existence of an abstract machine capable of calculating all the values of any mathematical function defined on the integers according to an automatic process. Such a machine consists of an infinite tape for storing data and has two parts – one used to read the new data and the other to store them. These data are numbers, which are interpreted by a reading system and written by a writing system and which transmits the read values to the instructions of the machine which uses them to produce the result, which is another sequence of numbers placed in the memorizing part of the tape (see Figure 1.1). There is thus a reading–writing head which makes it possible to specify the actions for processing the instructions. The machine is, at each step of calculation, in a state which is represented by a certain numerically indexed symbol and it is given a precise quantity of these states during its construction. The program of the machine is a set of instructions processing the read values to produce a numerical result. Each instruction has two parts: its trigger to activate and its action to process the value read from the tape. The correct instruction is activated by the trigger and it reads and processes the digital data that is being accessed on the read tape. Its action is to use and rewrite this value read in the same cell of the tape so that it can be used by other machines and then to move the reading head by one cell or not to move it, and then possibly to change its state to specify another one.

An elementary instruction of the Turing machine thus has the form of the following quadruplet (q_i, S_j, S_k, q_s) with:

q_i is the current state of the machine;

S_j is the piece of data which is read on the reading head;

S_k is the numeric character that will replace S_j;

q_s is the new current state of the machine after the replacement.

However, the machine can also have one of the following two forms, with D and G being the actions of simply moving the read head to the right or left without writing anything on the read–write tape:

(q_i, S_j, D, q_s)

(q_i, S_j, G, q_s)

This machine is totally automatic, and it is the most elementary possible with regard to the calculations to be carried out. It is the most important universal machine in the history of computation. All the algorithms use sequences of instructions and are therefore sophisticated compositions of Turing machines, and the instructions can lead to the request after their execution to place themselves on another instruction to be executed by the famous "Go to" and this repeatedly until meeting the instruction "End" of the end of execution of the instructions of the algorithm.

The functions that the Turing machine computes are called recursive primitive functions and they operate on sequences of natural numbers. They are obtained from basic functions, like identity, projection, successor function, using composition, recurrence and minimization, and they are executed in associations. They define all the usual arithmetic functions by machine associations, like power functions, products and sorts, and they are thus the basic model of what can be defined in mathematics to operate on sequences of integers.

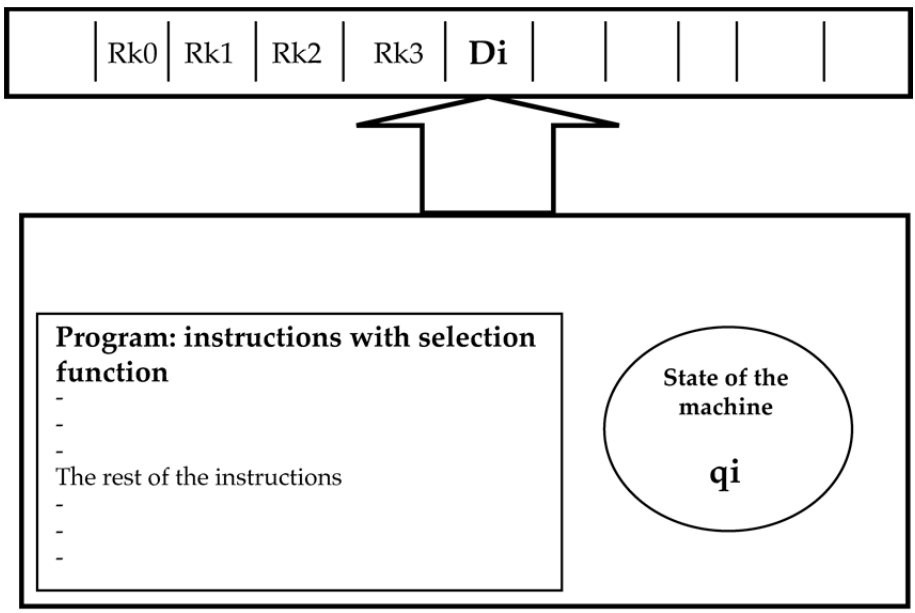

Figure 1.1. *The Turing machine*