

REFLECTIONS ON THE CONSEQUENCES OF BIOCOSMOLOGY IN MODERN BIOLOGY

Georges CHAPOUTHIER

***Abstract.** The Biocosmological stance can be further expounded by several illustrations in biology. Genetic and anatomical arguments, and the description of the brain and thought, suggest that complex living structures are built as “mosaics” or as entities where, at each level, properties of the “whole” leave a large degree of autonomy to the properties of the component parts. These biological rules could be proposed as the general (cosmological) rules of complexity. Another argument is that knowledge becomes possible because the “laws” of our brain are the same as the laws of the universe, and so it is possible for our brain to simulate the universe. Finally several examples of “triunity”, formerly described in the medical field, can also be found in the functioning of organisms. These arguments validate the usefulness of the Biocosmological stance in biology.*

My reflexions are derived and inspired from Konstantin Khroutski’s views and especially from his article on “All-embracing (triune) medicine of the individual health: a Biocosmological perspective” (Khroutski, 2010). The topics of the article in based mainly on medicine, and are thus related to biology, my field of research. But the scope of these ideas is indeed much larger, and encompasses philosophy, my second area of research. Several other authors have also already extended Khroutski’s view to other fields. In the spectrum of an all-embracing science, I have also thought extensively over what a present day biologist could add to these philosophical arguments.

A Biocosmological approach in medicine

In a new Aristotelian stance, Khroutski argues that there should not be laws ruling the cosmos, on one hand, and different laws ruling living beings, on the other, but instead there should be only one set of “universal cosmic laws”, ruling both the cosmos and living beings.

Modern medicine is neglecting this global approach and emphasizes only on the material and local (analytical) causes of diseases and not the ones which could be linked to the general (global) evolution of the being (ontogeny). In Aristotelian terms, modern medicine, despite its technical success, is based on material, formal or efficient causes and neglects entelechy and final causes. It is not the first time that modern medicine is criticized for its absence of a global view point, that brings it too far away from organisms in general, and human beings in particular. This is not the first time either that modern medicine is criticised for being too technical and for its inability to treat chronic non-infectious diseases and chronic non-traumatic diseases. The great merit of Khroutski is to relate these defects of modern medicine to a rejection of Aristotelian philosophy: “the aetiology of modern medicine makes insufficient reference to Aristotle” (p 66).

Extension to other fields

These views can easily be extended to other fields. Ugolev and Ivashkin (Ugolev and Ivashkin, 1992) proposed a theory of elementary functional blocks where “complex functions could be reached due to the recombination and transposition of a large though limited set of molecular machines realizing elementary biological operations.”, and so extending the Biocosmological views to information processing. Khroutski’s Biocosmological stance has also been applied by Guja (Guja, 2008) to informational anthropology since “a human being as the system/interface may be considered a fundamental component of her/his human society and the nature/cosmos system as well, just like a hydrogen atom is the elementary constituent of matter under the material form” (p 5). Indeed a dialectical relationship between the whole and its parts is clearly seen in Guja’s model which is set in the unitary Biocosmological system. In sociology, Sorokin (Sorokin, 1965) calls for a “new sociology” that can reconcile mutually exclusive or contradictory theories. Sorokin argues that their “sound parts can be unified and incorporated into a more multidimensional and more adequate integral theory... (an) integral sociology to come”, and underlines again the possible dialectical relationship between the parts and the “whole”. Finally Modell (Modell, 2009) suggested that the same principles could also be applied to healthcare, taken as a global complex structure.

Universal laws in biology

What could be the consequences of Biocosmology in biology itself? My first observation would be that, if the general laws of the universe (which include of course the general laws underlying complexity), apply to living beings, then the very study of living beings (that, to a certain extent, we know better than the cosmos) should allow us to discover some of these laws. So on the question of: “what does the cosmos, in its complexity follows as biological rules?”, we should also reply “what do the living beings teach us as universal rules or principles, which are likely to be found in the universe?”.

In former papers (Chapouthier, 2008, 2009), I have proposed two of these principles, which, lead biological structures to complexity: “juxtaposition” and “integration”. Juxtaposition is the addition of identical entities, like pearls on a pearl necklace. Integration is the modification, or specialisation, of these entities, leading to entities on a higher level, which use the previous entities as units or parts (e.g. a necklace of strongly modified “pearls” used as a container or a tool, or a more complicated structure).

Several concrete examples of these processes have been given (Chapouthier, 2008, 2009). At the genetic level, there is silent duplication and integration of introns, which explains the origin of complex organs. At the anatomical level, the application of the two principles can be found in unicellular organisms (that develop into “juxtaposed organisms”, e.g. *Gonium*, and then into “integrated organisms”, e.g. *Volvox*). In more complex didermic species, juxtaposition produces colonies of polyps and the integration of these polyps produces integrated siphonophores. In tridermic organisms, the juxtaposition of metamers produces the earthworm, whereas

integration leads to the bee, the octopus or the chimpanzee (or the human being). At higher levels, juxtaposition and integration become social, with the grouping of identical individuals (crowds) or the specialisation (or integration) of their roles (colonies of bees or societies of primates).

For these structures, where integration at one level leaves the units at a lower level in a state of relative autonomy, the metaphor of the "mosaic" could be used. In complex living beings, as in a mosaic, the properties of a given level, taken as a whole, leave the autonomy of the component parts intact.

Similar processes can be described in the most complex structures known at present, i.e. the (human) brain and mind. The brain-mind distinction, i.e. the precise relationship between the functioning of the brain and the functioning of the mind, will not be discussed here.

Several parts of the human brain are clearly built as mosaics: the entire brain is built from five encephalic vesicles, first juxtaposed during embryonic life, then integrated to produce the complex brain of the adult. On the other hand, the numerous areas of the neocortex are one of the best possible examples of mosaic structures, with several areas responsible for a given function: sensory perception, e.g. touch, sight, hearing, taste, smell, motor control, the expression and/or understanding of oral language, the expression and/or understanding of written language etc. While these areas have a functional specificity and a degree of autonomy, they still act harmoniously as part of the whole neocortex. The two hemispheres can provide another example of a mosaic, but with only two components. Here again, the two hemispheres have different functions, with, in the classical situation of the right-handed subject, analytical and discrete functions in the left hemisphere, and global and synthetic functions in the right hemisphere. Except for pathological cases of rupture in the connections between the two hemispheres (split-brain patients), each of the two hemispheres has functional specificity and a degree of autonomy, while both act harmoniously as part of the whole brain. In all these cases, the functioning of the "whole" does not counteract the autonomy of the parts.

Similar observations can be made for essential mind functions such as consciousness, language and memory. Specialists of consciousness emphasize that, though perceived as a whole, our consciousness is actually a mosaic of several states of consciousness. Examples can be found with split-brain subjects, where two states of consciousness (two decision centres) exist and sometimes compete, or with the distorted consciousness of the dream state in normal subjects. In language expression, successive semantic units in the sentence (the parts) combine to render the definitive meaning (the whole), but only at the end of the sentence. An example can be cited with the following haiku by Jean Monod (Antonini, 2003).

*The absent of all
bouquets here she is
says the appearing dawn.*

In the first verse, one understands that it is about a human being (in the French text, it is clearly a woman); the second verse suggests a flower, but only the last verse

provides the complete meaning (the whole): it is about the appearing dawn, which does include, as parts, the poetic reference to the woman and to the flower.

Finally, we often see human memory as a single whole, but it is actually a mosaic of several different memories (habituation, conditioning, spatial memory, cognitive memory etc.) which were gradually acquired by our animal ancestors and have retained a certain degree of autonomy within the whole. Three very essential psychological functions – consciousness, language, memory – can therefore be described as mosaics where the properties of the whole do not preclude the autonomy of the properties of the component parts.

To summarize this point, genetic and anatomical arguments, and the description of the brain and thought all suggest that complex living structures are built as “mosaics”, or as entities where, at each level, properties of the “whole” leave a large degree of autonomy to the properties of the component parts. In the course of the evolution of species, this situation seems to have been achieved through repeated applications of the two general principles leading to complexity: juxtaposition and integration. If we adopt a Biocosmological stance, these biological rules could be proposed as the general (cosmological) rules of complexity.

Why is knowledge possible?

In referring back to the Biocosmology link to biology, we can focalise on the brain, which is an important structure in the complexity of the universe. And if we ask the following question – "How is it possible that the brain can acquire knowledge of the external (material) world ?", we would probably conclude that the answer to the aforesaid question could be found in the proposition that “Since we are part of the cosmos, we must therefore be built with the same elements as the cosmos and similarly, we must also follow its universal laws”. In that way, we can understand why the brain is able to mimic, to simulate the laws of the universe and finally understand them.

The fact that the nervous system of the animals is structured as part of the universe allow us to perceive how it can comprehend the functioning of other parts of the universe that are functioning in the same manner. This simulation of the external world by the brain (Chapouthier, 2008), which is already significant in more complex animals such as vertebrates or cephalopod molluscs, reaches a summit in the ability of human beings to develop a scientific knowledge of the world they are living in. In other words, since we, living beings, are determined by the four Aristotelian causes (material, formal, efficient and final), it logical that we can understand other systems of the universe, which are also determined by the same causes.

Furthermore, as noticed by Khroutski, and as proven by biology, complex species tend to “cephalization”, that is to concentrate, in the front part of their body, in the direction of movement, a highly sophisticated organ, which gathers sensory information and processes it in complex manners, including reasoning and memory (Chapouthier, 2008). By this general process, observed in vertebrates, but also in insects and in molluscs, simulation of cosmic laws by animals and humans become more and more sophisticated.

To summarize this point, since both the cosmos and the biological systems are built in the same way and follow the same Aristotelian causes, and since they are thus likely to reach the same patterns of complexity, parts of the cosmos (animal and/or human brains) can simulate and understand other parts of the cosmos. Since “human consciousness is exactly a means – a tool function” (Khroutski, p 72) for cosmic evolution, it explains why human consciousness can understand the laws of cosmic evolution.

“Triunity” in living beings

In his article, Khroutski gives a few biological examples of triunity: sympathetic (sub) systems: “The (one) vegetative (super) system: the parasympathetic, sympathetic and metasympathetic (sub)systems” (p 70), but also sleep-waking cycles, systole-diastole. It should be here remembered that the occidental medicine, largely based on simple dichotomies, emphasizes the opposition between sympathetic and parasympathetic systems, and tend to neglect the autonomous action of the “free” ganglions of the metasympathetic system, responsible, for example of the spontaneous rhythmic activity of the heart. An activity which is permanent, even without the action of the sympathetic and parasympathetic systems. An activity which, to a certain extend, integrates the opposing and occasional actions of the sympathetic and parasympathetic systems. Similarly, between sleep and wakefulness exists a state of waking up which allows the synchronous existence of the two poles, though both of them can appear in alternation. This reflects the “law of polarization” as defined for socio-cultural processes by Pitirim Sorokin (Sorokin, 1937–41), according to whom alternation of the two poles induces macro-evolutionary spirals.

In biology, this triunity seems to me to have a much broader aspect, provided it is linked with the changes, occurring with time, in the metabolism and finally leading to the ontogenetic development of the beings. Here again the modern scientific way of thinking will first emphasize the dichotomy between two opposing entities, such as opposite reactions in a biochemical equilibrium, or opposition between synthesis and repression in the regulation of hormones, or effects on behaviour of higher animals of the two hemispheres, right and left, of the brain. Indeed, for simplicity reasons, division in two is frequent among living beings. Likewise the movement of animal induces a right and a left side, roughly symmetrical, leading for example to the two brain hemispheres.

When dealing with two opposing actions, we must not forget however to emphasize the stage where these actions find a balance. In a further stage of the ontogeny, the two opposing actions lead to a more stable state, as mentioned by Khroutski: “overruling each other by turns” (p 72), a state of “oneness of the two autonomous poles (bipolar unity)” (p 73). A temporary conclusive and unitary stage of the opposing actions create a triadic unity, which again, can be a departure point for further triadic developments.

This triunity could, to a certain extend, be compared to dialectics, if one does not refer natural dialectics to the over-simplistic examples given by Engels in the “Dialectics of nature” (Engels, 1979). With the poor biological knowledge of his

time, Engels chooses his examples in the physical world: measure of movement, tides, heat, electricity ... His request for a dialectics of nature is thus not very convincing. Referring to biological examples, such as the complex ontogeny of the living beings, or the evolution of species, would indeed give clearer and stronger arguments to the triadic development of this (biological and terrestrial) side of the universe. A triadic development which is thus more likely to fit the prerequisite for dialectics as proposed by Hegel, but applied here on concrete nature instead of on thought.

Biocosmological stance leads us to conclude that this triadic movement is, of course, not specific to living beings, but can be transferred to the very complexity of the cosmos. To summarize this point, evidence for triadic development of the living beings makes it possible to predict triadic development in other entities of the cosmos.

Conclusion

Finally it is important to stress here that both Khroutski's stance and mine expressly preclude the possibility of evolution centred on humans alone, as in the notorious "anthropic principle" (Carter, 1974), which sees complexity solely in the specific case of human beings. Both Khroutski and I see universal laws that are categorically opposed to the anthropic principle, which remains an anthropocentric, and not the Aristotelian-way cosmo-centric approach. Khroutski speaks of the "predetermined inherent functionalist destination" (Khroutski, p 72), of living beings. It is indeed similar to what I have called, in a former article (Chapouthier, 1995), devoted to the organisation of biological systems "finalism by construction", a process noticed by all philosophers interested in living organisms and that Aristotle called "entelechy".

References

- Antonini, J. (editor) (2003). *Anthologie du haïku en France*. Aléas, Lyon, France, p 45.
- Carter, B. (1974). Large number coincidences and the anthropic principle in cosmology. In D. a. R. Longair (Ed.), *Confrontation of cosmological theories with observational data*, pp. 291–298. International astronomical union, Paris.
- Chapouthier, G. (1995). L'évolution de la vie: un déterminisme finalisé par sa construction. *Ethique, la vie en question* 4, 19–27.
- Chapouthier, G. (2008). The Biocosmology of Konstantin S. Khroutski: A Philosopher's Reflections on Biology. *Eubios Journal of Asian and International Bioethics* 18(6), 168–170.
- Chapouthier, G. (2008). Le cerveau, simulateur dans tous ses états. *Revue philosophique* 133(3), 347–354.
- Chapouthier, G. (2009). Mosaic structures, a working hypothesis for the complexity of living organisms. *E-Logos: Electronic Journal for Philosophy* 17, <http://nb.vse.cz/kfil/elogos/biocosmology/chapouthier09.pdf>.

- Engels, F. (1979). *Dialectics of nature*. International publishers, New York.
- Guja, C. (2008). BioCosmology and Informational Anthropology: Some Common Aspects. *E-Logos: Electronic Journal for Philosophy*. *E-Logos: Electronic Journal for Philosophy*, 1–12
<http://nb.vse.cz/kfil/elogos/biocosmology/guja08.pdf>.
- Khroutski, K. (2010). All-embracing (triune) medicine of the individual health: a Biocosmological perspective. *J. Future Studies* 14(4), 65–84.
- Modell, S. (2009). Aristotelian Train of Thought in BioCosmology. *E-Logos: Electronic Journal for Philosophy*, 1–16.
<http://nb.vse.cz/kfil/elogos/biocosmology/modell09.pdf>.
- Sorokin, P. A. (1937–41). *Social cultural dynamics*, Vol. 1 to 4. American Book Company, New York.
- Sorokin, P. A. (1965). Sociology of yesterday, today and tomorrow. *American sociological Review* 30(6), 833–843.
- Ugolev, A., and Ivashkin, V. (1992). Theory of universal functional blocks and fundamental biomedical problems. *Klin. Med.* 70(2), 8–14.