

Archeopathology[#]

Professor Daniel Serrão

Abstract

The author reflects upon the meaning of “being ill”, which according to him is a biographic event. Thus, illness can only be understood within the frame of the two evolutionary guidelines of mankind: the biological and the cultural. Each patient shares with all living nature an archaic biological structure with millions of years, which is shaped by cultural factors.

Man declares himself ill when he feels that the relationship

body-environment is altered in homeostatic balance.

Considering these grounds, the author explains some common diseases such as myocardial infarction and bronchial metaplasia, from the point of view of archeopathology.

Key words: archeopathology, biology, phylogenetic evolution, ontogenetic evolution, left ventricular infarction, metaplasia.

As a result of a longstanding debate on the mystery of being sick, and the attempts to actively interpret modern Biology by reference to the great explanatory synthesis of man, this text outlines a theoretical speculation that I have formulated in regard to clinical activity.

Firstly, I shall discuss the mystery of being sick, how this mystery challenges us as physicians and biologists, how it demands a response from us that satisfies our intelligence and, at the same time, guides and justifies our professional practice.

The analysis of this subject leads us to a fundamental question: is being sick an absurdity, or does it make sense? Is it a meaningful, logical occurrence? And what is the sense and the logic involved?

My answer to these fundamental questions is contained in the concept of archeopathology, a concept that I seek to define in this work.

One might say: to be sick is to have a disease. And I would reply: this is meaningless tautology, a semantic error that we all commit, using the noun sickness as if it corresponded to a real object that a person may or may not have. On the contrary: the word sickness,

even when represented by a name - pneumonia, for example - is always a concept that is abstracted from the physical reality; it is an entity of the thought; as the scholastics would say, it refers to an ideal object, according to the philosophical language of the theory of objects.

To put it a less erudite manner: nobody can have a sickness because sickness does not exist. It is not a physical reality that can be caught (no one literally “catches” a cold) or that can be freely used. Doctors do not have a catalog of sicknesses that are stored somewhere, each one with this strange ability to harm humans; the task of the doctor is not to look up the name of a sickness in the catalog in order to remove it from a patient’s body more easily. Only a “naive” surgeon would believe that a sickness can be removed from an individual’s body with scissors or a scalpel.

Human sickness - as I have written and said so many times - is a biographical event. It is a way of being that reveals how humans exist in the world.

Man is a physical object of the natural world, an element of the planetary ecosystem, like minerals and other living beings, plants or animals, whether unicellular or multicellular. Human beings will cease to exist if they are unable, for example, to use the heaviest of all metals – iron – in an ionizable form.

Man is a natural being. As a natural, living being, man integrates with other living beings in the biological subsystem and occupies defined ecological niches in this subsystem: man is an air-breathing, homeothermic, heterotrophic, land animal. Yet these characteristics of human life are the very constrictions that limit and condition man: in the Paleolithic period,

[#]Lecture given at the VII Jornadas de Medicina Interna do Porto, 1988
Professor of Pathological Anatomy of the Porto School of Medicine

the natural, i.e. wild human life was only possible within a limited environmental thermal scale, with available drinking water and spontaneous access to the universal food chain.

But man has evolved to become a cultural being, that is, an animal capable of using a new quality — reflective intelligence — and of making use of it, recognizing the constraints of the ecological niche and the eco-planetary system, and overcoming them.

Man is in the world, but his relationship with the world is not natural, it is cultural. By this I mean — and some will find this controversial — that man, at least in this civilizational Judeo-Christian world, is acculturated soon after conception, because the sociocultural characteristics of the procreating pair have already influenced the development of the conception product, and he continues to be acculturated, from birth until he reaches full maturity as an individual. Throughout the process of individuation, and after it, until somatic individual death, every human being is necessarily a cultural agent, whatever the level of their knowledge, because without the use of basic cultural instruments, human survival in the natural world is impossible nowadays.

Man interrupting the spontaneous functioning of natural systems — the so-called natural law — has become a prisoner of the cultural system that he himself created. This system was once very simple: the domestication of some animals, the cultivation of some plants with nutritional value, the making of rudimentary tools, the construction of temporary shelters, the production manufacture of equipment for bodily protection, etc. But, over some thousands of years, this cultural universe has expanded so quickly that today, the amount of things each human being must learn in order to survive in an ecological niche constituted of advanced technological characteristics, and to exploit all that this niche has to offer, has led to the full individuation of young people being delayed by many years, and is beginning to become a cause of distress for many, and the cause of their denying their own lives and committing suicide.

During a human's formative years, therefore, two processes are at work, both of which are developed over time: the biological evolutionary process, from the egg, and the cultural evolutionary process, from the beginning of the conscious intellectual activity of the individual.

The biological evolutionary process is governed

by a program stored in the DNA code of the egg or zygote. This is not a rigid “software” program, like that found in computers, but rather, a sequential program that prepares the egg, immediately after its first division into two cells, to respond to outside stimuli. The biological development of a multicellular being like man, with organs and specialized systems, is the result of differentiation. What, then, is differentiation? It is the development of new structures — which may be as simple as a membrane receptor — as a result of the interaction of information stored in the DNA with external information or stimulus.

Physiologists have known for many years that the universal law of biology, if not the essential characteristic of life itself, is the law of stimulus-response. And today we know that what we call function - of the cell, system, organ, and individual - is the result of the stimulus-response, and that the entire structure is the physical foundation of a stored function.

Thus - and it is now common consensus - the information of the entire evolutionary process that today enables the development of a man has been gradually acquired and stored for millions of years - hundreds of millions of years, that have been consumed by the evolution of living beings and their development into the human species we see today.

In conclusion, all current functions of human physiology have an evolutionary history, and all the physical structures of human morphology that ensure these functions also have an evolutionary history. The logic of human biology can only be extracted from the knowledge of structures and functions that has been gained through evolution, over time. In other words, the logic of normal human biology is archeological, and the biology of development and differentiation is also archeological.

But mankind is also, undeniably, the result of a cultural evolutionary process. Our concrete man, who is sitting in the chair in the outpatient department to see the doctor, is the product of a complex process of acculturation resulting from the exercise of a global function of stimulus-response-memorization, which is the learning function. The learning function is ensured, in the postnatal period, by contact areas — the skin, and the respiratory and digestive mucosa — by the immune system - with its highly selective ability to differentiate between self and non-self - and by the nervous system, supported by specific sensory organs, such as the visual, auditory and olfactory systems.

Integration results from all this information and the memorization of this information creates, in man, an internal image of the outside world, through a mechanism that has yet to be fully elucidated by neurophysiology. This internal image coordinates and controls all the vital, essential functions with almost total autonomy, and controls the instinctive behaviors, which are focused on the well-being of the individual as an element of a species that is adapted to a specific ecological niche.

However, for man, now evolved into *homo sapiens* (which only started some fifty thousand years ago), part of this internal image of the outside world has become conscious, i.e. it has assumed a symbolic representation, and modern man, through a laborious evolutionary process, has managed to translate these inner symbolic representations into vocal sounds, then into ideographic signs and, later, into conventional signs, like the alphabet, which enabled the written representation of sounds, or phonography. It was only after the creation of written language and its use as a communication code among humans - which occurred among people in the Eastern Mediterranean region less than 3000 years ago — that human intelligence built a cultural universe outside itself, which is formed by the symbolical representation of knowledge of the world, and by the invention of the world: the invention of the responsibility to freely exercise human reflective intelligence.

Let us return to the man sitting in a chair in the outpatient department, waiting to see a doctor. This individual is surrounded by cultural objects (the chair, the table, the paper and pen, the stethoscope); the language the individual will use to translate the contents of his consciousness is cultural; his understanding of the words the doctor will say to him is cultural.

This individual has a basic biological structure that is common to all other beings of the same species, the development of which, as mentioned previously, is phylogenetically archaic. But this basic biological structure is influenced, from the outset, by factors of cultural modeling that affect the differentiation of its cells, the development of the organs, the biological adaptation to the biological ecosystem (all other living beings) and psycho-affective maturation until full individuation. It is, therefore, evidently, a product of its individual cultural growth, and the way it adapted to the acculturation process it has undergone.

In short: the development of a biological being, from an human egg, repeats the essential levels of the evolution from unicellular organisms to large metazoans, i.e. ontogenesis repeats the essential part of phylogenesis — and it is universal; the acculturation of each human being repeats the cultural evolution of hominids and it is individual, varying, of course, according to the ecological niche. Human biology is, therefore, archeobiological.

Whether or not he is conscious of this fact, the individual sitting in the outpatient department carries and expresses, in many ways, millions of years of biological experience and thousands of years of cultural evolution. The individual is sick. And what does it mean to be sick, for the doctor who will see him?

At the start, I said that being sick is a way of being that reveals how the human being exists in the world. I have tried, here, to convey my understanding of how humans exist in the world. I now can add that the human-world relation is a cultural relationship and that each person makes an individual reading of this relationship. When our reading of the signs of the relationship of our body with the world does not cause any feeling of strangeness, surprise us or warning, we feel healthy; we feel good. For a young girl who has never heard about the physiological condition of menstruation, vaginal blood loss will represent a sickness that will be cured as soon as she has the corresponding understanding of the condition.

An individual gets sick, or claims to be sick, when his inner reading of the body-world relation - which is an activity that we all perform, all the time, consciously or unconsciously - throws up some disturbance. Man is a being that can be easily disturbed and the form and nature of these disturbances that we experience is cultural; they are expressed and valued in a cultural context. A physical event, such as a rectal bleeding, as a disturbance in the body-world relationship, is read by the individual according to their level of knowledge and, thus, it may immediately lead the individual to the emergency room, or it may be quietly forgotten.

When we analyze this body-world relationship more closely, as an ecological relationship, we understand that it is a complex relationship that can be grouped into three subsystems, and its reading by the individual is very rudimentary and misleading; the more complex the relational system involved becomes, the more difficult this reading becomes. For

this reason, each of us, even doctors, finds it difficult to perform an individual reading of disturbances in the body-world relationship, which may reflect an actual sickness, and we often attach too much value to meaningless disturbances.

The first of these relational subsystems is the balance subsystem, as we all know. Within this subsystem, stimuli are absorbed without response, and the only possible response is breakdown. This subsystem is, essentially, the ability to mechanically resist the stimuli from natural physical forces.

The reading of the disturbance in one of these subsystems, and its identification as a pathological condition seems extremely easy and simple. The application of excessive mechanical force, higher than the absorption capacity of the subsystem, can cause bones to break, the skin to tear, and the spleen to be lacerated. But the truth is that any breakdown in a system of balance has only one explanation, which is archeobiological. The primordial ectoblast can both lead to a moist, permeable respiratory structure, such as the skin of amphibians, almost without mechanical resistance, or it can produce the shell of a turtle, which has considerable mechanical resistance. In man, the primordial ectoblast produced skin that was appropriate to the mesological human conditions. I would go as far as to say that the same occurred with the bones and their wonderful adaptation for bipedal standing and walking. But biological evolution cannot integrate with the cultural evolution of hominids, and this is what leads to the disruption of systems of balance. Apart from natural disasters, which are outside the scope of the evolutionary process due to their random nature, disruptions to the systems of balance systems are cultural in nature. The skin cannot resist a sharp knife or a bullet; bones may not resist the violent shock of a car crash, or falling from a high place, and they will never “learn” to resist these things. None of these conditions represents a sickness, rather, they are accidental disruptions of structures, which human culture has submitted to forces that exceed the resistance limit provided by archeobiology for the performance of a natural function.

Pathology resulting from mechanical violence is, therefore, almost entirely cultural in origin, therefore, it is not utopian to consider it is avoidable.

The second subsystem, which truly explains the majority of sicknesses, is the homeostatic relationship between man and the world. Within this relational

subsystem, stimuli are identified and absorbed, and cause a change in an effector component of the subsystem, this type of relationship puts the system to a state of sine wave vibration, above and below the line of balance that will be achieved within a certain period, and which varies according to the circumstances.

Homeostasis — the balanced response to a stimulus — is the fundamental biological process in an individual, since, for example, all enzyme activities are homeostatically regulated, and it represents, in ontogeny, the process that was, and still is, the fundamental biological process of phylogeny.

This revolutionary concept, that the mechanism of phylogenetic evolution is homeostatic, finds significant support in the notion that the genotype is, itself, a complex interacting system consisting of introns, exons and subjacent sequences, and that important part of the human genome is currently inactivated. Moreover, comparative analysis of the molecular changes that have occurred during evolution, particularly in polypeptides with hormonal functions, has made a significant contribution to our understanding of phylogenesis and its homeostatic nature. Finally, the discovery of the action of reverse transcriptase has made it possible to document a possible mechanism of modeling interaction on the genome, with inclusion in the nuclear information of the DNA, carried by an RNA carrier, known as viral information.

Phylogenesis was homeostatic, just as ontogenesis was homeostatic, and the current relationship of each person with their physical, chemical and alive circumstances is also homeostatic.

A specific example of the homeostatic relationship is that which occurs between humans and alive agents such as viruses and bacteria. No-one would deny that we carry, in our bodies, millions of bacteria of various species, and numerous types of viruses, and no one doubts that the relationship of commensalism that we establish with them is a balanced, homeostatic relationship between microbial growth and mechanisms that inhibit this growth. Infection occurs when one of the branches of the homeostatic subsystem is unable to perform its function, which immediately deregulates all the stimulus and response systems with which it is associated. On a normal epidermis, microbial infection is almost impossible; on a necrotic epidermis, microbial infection is almost inevitable.

This situation of homeostatic commensalism

between humans, and viruses and bacteria, has an archeobiological origin, and in some regions of the body, such as the gut, the commensal flora is essential for the normal functioning of the organ. Incidentally, the theory of the origin of cellular mitochondria in a post-phagocytosis endosymbiotic mechanism (mitochondria being a bacteria that carries a highly developed system of oxidative phosphorylation in the membrane, which, when phagocytosed, allowed the survival of ancestral eukaryotic cells from which all animals and plants are derived) is a good example of a form of homeostatic regulation that has remained effective for billions of years.

But I am forgetting the man sitting in his chair waiting in the outpatient clinic, hoping the doctor will be able to identify his sickness. And the doctor, having found no easily-observable signs of breakdown in the man's systems of balance, remains steeped in the complex world of homeostatic systems and their multiple vectors of stimuli collection and response creation, and will now attempt to name the sickness that explains the symptoms. Let us suppose that the doctor has found an infarct in the anterior wall of the left ventricle. Here, the doctor's interest as a physician and classic pathologist will end. But for the archeopathologist, this is a fascinating condition.

Wilhelm Doerr demonstrated that the human heart, between the fourth and seventh weeks of embryonic development, shows an alteration in the morphogenesis of the heart chambers, generating a left heart attached to the right heart. This morphogenetic evolution reproduces the evolution that occurred in the Devonian and Cretaceous period with the evolution of reptiles. Now, morphofunctional study has shown that the relationship between the "capillary surface and the surface of the muscle fibers" is 33% more favorable in the right heart, or archeomyocardium, than in the left heart, and it has also shown that the right heart has a coronary artery with greater perfusion efficiency than the left heart. It is undoubted that the right coronary artery, which is the oldest, nourishes the key areas for cardiac function such as the centers of generation of automatism and the His bundle, present only in the "old" area. In short, the right side of the cardiac system is phylogenetically older and homeostatically balanced; the left side — despite its current importance as a pump — is a recent acquisition; its homeostatic balance is more unstable and it is, therefore, the area more likely to

suffer an infarct, which is the natural product of the imbalance between oxygen demand and supply by the vascular system.

According to this archeopathological interpretation, our present-day heart is the result of an evolutionary journey that perhaps occurred too quickly for the slow processes of natural adaptation, from the vegetative existence of reptiles to the agile, active life of mammals, and then to the intellectual life of hominids, requiring increasing amounts of blood pumped per unit of time. The creation of the powerful left ventricular muscle mass, which contracts forty million times a year, keeping around 5 liters of viscous fluid in constant motion, is only possible with some sacrifice of safety, and a true homeostatic balance has not yet been reached. The archeopathological explanation of higher frequency and severity of an infarction in the left ventricle gives us hope that the development will be completed, and the risk reduced in the future.

This example of archeopathological analysis of a myocardial infarction illustrates how much is expected from this method of analyzing morphological lesions. Given that the current normal structure of organs is the result of evolution over time, the pathological change to this structure often occurs by a regression to structural forms that were functionally useful in earlier stages of phylogenetic development, performing other functions in other conditions of the ecological environment.

The fact that much of the information in the DNA, which I mentioned earlier, lies dormant, indicates that the cells know how to do many more things than they in fact do and that they may, at any time, reactivate parts of this dormant DNA.

When we, pathologists, speak of metaplasia, what are we referring to? That a bronchial epithelium that was supposed cubical, ciliated, and mucus-secreting, but became, for example, squamous, stratified and keratinizing. What does this transformation mean in archeopathological terms?

This is also a fascinating question.

Air respiration probably evolved from branchial respiration. The latter is an effective means of gaseous exchange between the two fluids, water and blood, but not between air and blood, i.e. between gaseous and liquid forms, or fill our stomach with air, has always concerned me. Archeopathy of the branchial derivatives provides, for this apparent evolutionary defect of the aero-digestive confluent, a full explana-

tion that there is no room to explain in detail here. But I will mention the main aspects.

Aerial respiration is a particular case related to food and follows, in the phylogeny evolution, the development of the structures for capturing and crushing food. 370 million years ago, when lobe-finned fish (crossopterygians) — the sole surviving species of which is the coelacanth — ventured onto dry land, they used a mechanism developed to survive in waters with low oxygen at greater depths, but more oxygen near the surface. This mechanism was a diverticulum of the esophagus, where surface water rich in oxygen, swallowed at the surface, was stored. This is the archeobiological origin of the human lung. In the third week of the embryonic life, what occurred three hundred million years ago still occurs today; primordial lung sacs are formed on the ventral wall of the digestive tract, coated with squamous epithelium, which receive fluid and perform branchial respiratory function, until the marvelous and emotional moment when the baby announces to the world, with a triumphant cry, the acquisition of aerial respiration.

When, instead of air, we constantly breathe a polluted mixture, with solid micro particles, as is the case with smokers, the ciliated cylindrical cube-like epithelium, homeostatically developed to act as an interface with the oxygen from the air, returns to its squamous form, which is the appropriate interface for contact with a polluted mix. This is the archeopathological meaning of squamous metaplasia of the bronchial epithelium and, by using a primordial mechanism, there is a risk of neoplastic transformation.

Smoking is, in fact and in archeobiological terms, a bad eating habit, which is the direct result of gustatory pleasure; it is a perversion of the enjoyment of eating, and not from the enjoyment — more subtle and more modern in archeobiological terms — of breathing.

I could give a thousand examples of the development of the archeobiological concept in pathology and clinical practice. But I would just like to leave a message to internists that in their clinical practice, they should never view the individual who is sitting in a chair in the outpatient department as a mere object of the natural world, or his complaint a mere consequence of a linear relationship of cause and effect.

Our patient is a complex creature. He is a physical and biological universe, and a structural and cultural organization full of meaning. And what he has to tell

us, when he believes himself to be sick, is a history that goes back millions of years, his knowledge of which is limited to the past few hours or days. The archeopathological development and the extremely rich information it provides us with today will help us understand, in each individual case, the mystery of being sick, and to associate an individual's sickness with their historical and individual biography.

Being a physician, and practicing medicine is, for this reason, an exciting task, but it requires all our efforts: in terms of knowledge, feeling and performance. It is not just a profession, nor is it just a way of existing in life: is a way of being. And for the mystery of being I can offer no archeobiological explanation. ■