

## **THE RELATIVITY OF BIOLOGICAL REACTIONS AND THE FIRST FORMULATION OF AN INTERACTIONIST EPISTEMOLOGICAL PARADIGM FOR MEDICAL SCIENCE AND ITS APPLICATIONS IN CLINICAL RESEARCH AND MEDICAL EDUCATION**

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### **Abstract**

Studies on the interactions between the central nervous, immunitary and endocrinological systems, the mind and behaviour, permit a theory of medical science to be formulated. The variability of immunitary reactions to the experimental possibility offered to animals to escape - or otherwise - conditions of stress determined the obsolescence of Selye's concept of stress and permitted the formulation of a theory on «the determinate relativity of animal coping» while, for the indeterminate human world, a theory on «the indeterminate relativity of human coping» was developed, where biological variables were related to psycho-sociological, anthropological and existential ones. The results of such studies made it possible to introduce a new theoretical paradigm of research and practice to medical epistemology, refounding it on new key words such as «biological reactions», «possibility of coping» and «quality of coping», and overcoming such concepts of the philosophy of science as «biological laws» only definable *a posteriori* by the greater or lesser variability of biological reactions.

Biological reactions in non-humans appear to be subject to a foreseeable determinism that is explained by a theory of «general determinate relativity», while human biological reactions appear to be subject to a theory of «general indeterminate relativity».

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These new theories seem to suggest that research, clinics and medical education should be addressed toward an interactionist, qualitative epistemology, thereby reformulating the concept of health.

**Key Words:** theory of medical science, interactionism, medical epistemology, human coping, kairology.

After the downfall of the positivism under Karl Popper's epistemology (Popper, 1977) which affirms the necessity of theoretical formulations, in order for science to be considered as science, this challenge has also been given to medical science. During the last thirty years experimental research has opened new possibilities to re-consider the epistemological problems of Medicine, before without a theoretical model, in the light of the discovery of the interactions of central nervous, immunitary, endocrinological systems (Felten, Cohen et al., 1991; Belinger, Madden et al., 1994) which gives more consistence to the interactionist approach of Karl Popper and John Eccles (1977) and of F. Beck and John Eccles (1994).

This interactionist perspective gives consistence to a direct link between the subject's world and his biological world. How and with which paradigm can this happen ?

The epistemological analysis of psycho-neuro-immunological studies which showed a variability of immunitary reactions to the experimental possibility offered to animals to escape or not escape stress conditions (Laudeslanger, Ryan et al., 1983), provided important epistemological meaning. It appears that in animal nature biological reactions are relative to coping possibilities of animals, thus introducing new paradigms in research and to consider as out-of-date the Selye's conception of stress.

In the light of these considerations we had the possibility to build a theory of a "Determinate Relativity of Animal Coping" (Equation A), introducing the concept of «biological reaction» different in a philosophical perspective from the concept of «biological law» (Brera, 1996).

The psychological understanding of human coping, positive associations found between psychological treatments and biological variables (Gruber, Hersch, 1986-1993), anthropological, sociological and psychodynamic theories permitted us to discriminate human from animal coping. This gives birth to the «Theory of the indeterminate relativity of possibility of human coping» (Equation B) for the unpredictability of human symbolic, semantic processes, creativity and values. What humans dream and conceive are unpredictable. This fact appears evident in the formulation of scientific hypothesis, in religion and in art, in interpersonal relationships in natural and in political events.

### EQUATION A

$$\frac{Pt(a) = D \times I \times Bh}{Pn(E-) \times (S-)} = \frac{Pn(E+) \times (S+)}{Pn(E-) \times (S-)}$$

Where:

**Pt(a)** = possibility of animal coping at a determinate time

**D** = Drives

**I** = Genetic Individuality

**Bh** = Biological homeostasis

**Pn** = probability of a certain number of positive (+) or negative (-) reactions

**E** = environmental conditions

**S** = social relations

### EQUATION B

$$\frac{Pt(h) = D \times I \times Bh \times HR}{Pn(E-) \times (S-) \times (Sg-)} = \frac{Pn(E+) \times (S+) \times (Sg+)}{Pn(E-) \times (S-) \times (Sg-)}$$

Where:

**pt(h)** = possibility of human coping at a determinate time

**D** = Drives

**I** = Genetic Individuality

**Bh** = Biological homeostasis

**HR** = Human Resources which include:

**Ct** = Culture

**Er** = Economical resources

**L (CA)** = Level of cognitive and psychosensual development

**Af** = Affective bounds

**V** = Ethical and religious values

**M** = Motivations and ideals

**B** = Beliefs

**T** = Technology

**C** = Creativity

**Pn** = probability of a certain number of positive (+) or negative (-)

**(E)** = environmental events (Natural and political events)

**(S)** = Social relations (Interpersonal relationships)

**(Sg)** = Subjective conditions (Intrapsychic and self states, knowledges, behavioral skills)

In Equation B, it appears that the value given to a positive or negative environmental, social, subjective event is relative to human resources while in animals there is no such possibility to look for and to give a meaning to experience, for the outer or biological «Indeterminate Relativity», (Relativity to the indeterminism of human coping) while biological reactions in animals are defined by a relationship with a «Determinate» world of coping possibilities as it appears in natural or experimental conditions (Brera, 1996). The determinism of the possibility of animal coping and therefore of biological reactions are generally relative to these determinate conditions. It has been possible therefore to build the theory of «General Determinate Relativity» valid only for animals : Equation C.

### **EQUATION C**

$$\mathbf{Rb} = \mathbf{Bc} \times \mathbf{Pt} (\mathbf{a})$$

Where:

**Rb** = Biological reactions

**Pt(a)** = Possibility of Animal Coping at a determinate time

**Bc** = Biological constants

The possibility to determine a positive or a negative sense in experience, proper only for humans and unpredictable to an observer, permitted us to introduce in epistemology the idea of the «quality of coping» founding a new hermeneutics of human nature<sup>2</sup> (Brera, 1994).

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<sup>2</sup> The concept of «Quality» is non experimental. Since some parameters have to be requested to define what is qualitative or non-qualitative for human health, we have used the kairologic theory to interpret it. Kairological theory is a new hermeneutic paradigm we have elaborated starting from phenomenological psychodynamics, genetic epistemology, humanistic-existential psychology and clinical experience.

The fundamentals of this theory, are to interpret human nature as a research of objectivity in the person's subjectivity, as it appears in the scientific validation of an hypothesis, giving value of a more or less probable «reality», to results. The same process is seen in the construction of beliefs about subjectivity and aesthetics. Science means to give value of truth to an hypothesis and «truth» permits to give value of reality to scientific creativity. This fact discriminates the possibility for a

In Medicine numerous studies show that many healthy or unhealthy conditions are determined by human behaviours and associated to psychological, sociological and cultural variables (Phipps, Fairclough, 1995; Andrewes, 1992; Jarret, Ramirez, 1992; Brera, 1997). In clinics these dimensions are well present in doctor-patient relationship and consequently are determinant for quality of existential choices for medical doctors and for patients and vice versa, quality of existential choices are essential for quality of doctor-patient relationship.

The idea of « Quality of coping» is not only entrusted to human behaviour but also to the human resources described in Equation B which are linked to biological homeostasis.

This means that motivations, values, religion, beliefs, creativity, history of positive or negative stress and effects of coping styles, are related to biological homeostasis and that quality of coping is determinant for constituting «reality» or «a pseudo-reality», a «human reality», demarcated by a «non-human» one. This «humanity» appears not only an ontological but also biological, for the quality of answering existential questions comprehending the sense given to medical science and profession, appears constitutive of biological reactions (e.g. the motivation-emotion-belief-behaviour system belonging to quality of coping and corresponding to biomolecular reactions.)

For humans Equation C must be rewritten in a inversely proportional form introducing the concept of «Quality of coping».

*When possibilities of coping are non-existent or reduced, to biological research «in vitro», in extreme clinical conditions or at the first levels of logical thinking or at first stages of life, biological reactions are more determined by biological constants.*

*Consequently the less possibilities and qualities of coping are present, the more human life is determined by biological constants.*

These realities permitted us to formulate the theory of « The Quality

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«pseudo-real» world based on false propositions. In this way, because creativity belongs to a subject, science and existence are interconnected. Kairology interprets quality of coping as the person's aware and unaware creative work in constituting «a real world» which obviously includes subjects' lives. Therefore, the subject's personal life in different times can be real or pseudo-real. In this holistic perspective reality belongs at the same time to personality and to biological reactions and this concept is not limited to psychological and biological laws, but to the subject's quality of coping. This means that health is a subject's work on the ground of natural laws but the conception of nature up until now used has to be changed. Human nature and nature appear dependent from this «reality work» which starts from possibilities offered from physical, biological and anthropological, sociological, psychological laws. In the light of human possibilities of coping this is possible in opportune unpredictable times for the unpredictability of human possibilities of coping. Kairos, in fact, in ancient Greek means »opportune time».

Indeterminate Relativity of the biological reactions», the first theoretical model of medical science, founded on the concepts of Biological reactions», «Possibility of coping», «Quality of coping», «Biological constants». (Equation D).

### EQUATION D

$$\text{HmRb} = \frac{\text{Pt8h} \times \text{Qc}}{\text{Bc}}$$

**Where:**

**HmRb** = Human biological reactions

**Bc** = Biological constants

**Qc** = Quality of coping

**Pt(h)** = Possibility of human coping at a particular time

This epistemological approach defined by the physiologist D. Bordin as «the evolutionary equation of the neopallium», (1997) has founded experimental confirmations at an experimental and clinical level (Liu, Diorio, 1997; Sapolsky, 1997; Gottshalk, Fronczek, 1993; Francis, Meaney, 1999).

This new interpretation of human nature allows medicine to acquire a new dignity of human science far from the positivistic reductionism of humans as objects of bio-molecular laws in which the person's subjectivity, relationships and culture are alienated and foreign.

The Cartesian paradigm appears completely out-of- date and the Claude Bernard's experimental foundation of Medicine has to be absolutely demarcated from clinical propositions, in the light of this new constructivistic conception of a human nature based on possibility and quality of realization.

The introduction of the concept of biological reactions gives new light to experimental and clinical work, as these appear as a result of different possibilities the person has for a more or less qualitative coping. In humans, at a clinical level, the biological reality we perceive is a biological reaction result of an interaction between biological constants and a possible, more or less qualitative coping. The concept of «human nature» up to now used is only partially correct in the light of modern scientific knowledge.

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What we can know at a clinical level are only biological reactions relative to possibility and quality of coping. Clinical generalizations from research «*in vitro*» are epistemologically incorrect. Knowledge of biological laws appear as starting not as an arrival point and a qualitative evaluation of human nature appears as a necessary condition. At a scientific level, this requires interactionist research projects.

In experimental studies we can hypothesize biological constants which are only cofactors for both animals and humans submitted to A and B. Since human coping is related to the existential research of meaning (Brera, 1996), the biological reactions we perceive do not just come from the casual determinism of biological variables and cannot be explained by biological constants alone (expression of biological laws), but in the light of possibility and quality of coping. In a certain sense medicine is returned to Hippocrates who, supposing an implicit importance in pathogenesis of quality of «*life style*», asked his patients: »How do you live»?

What is the consequence for medical science of the application to clinical method, to research and to medical education of this theory? The first consequence is the reformulation of the concept of health. Protective factors of health become related to the possibility and quality of coping and their association determines resilience.

The second consequence concerns research. Biomedical research must consider possibility and quality of coping of humans and has to introduce the concept of «*biological reactions*». Any non interactionist scientific result without the introduction of these new concepts can be considered incorrect, because now we know that biological reactions are relative to possibility and quality of coping. Biological laws alone, at a clinical level, do not explain biological behaviour of variables and can appear only in an artificial way.

The third consequence concerns clinical method. Medical doctors who do not introduce in their relationship with patients possibility and quality of coping and the concept of biological reactions, cannot comprehend patient's health and disease. The biomolecular representation of the patient is necessary but non sufficient.

The fourth consequence concerns the medical degree and post-graduate courses. Medical doctors must be re-oriented in clinical methods to an interactionist approach and educated to introduce in their work the comprehension of possibility and quality of patients' coping. This means to have sufficient professional skills to consider the patients' resources, particularly ethical, psychological, cultural and anthropological factors, stress and coping styles. The consideration of the possibilities of medical doctors to promote a patients' more real and human life («*more qualitative*»), represents a new important change in clinics and involves the authenticity of medical doctors. In this way medical doctors can lose the contemporary

tendency to accept the reductive role of life or death bio-technicians.

### *Riassunto*

Le ricerche che si sono occupate dell'interazione tra il sistema nervoso centrale, il sistema immunitario, il sistema endocrino, la mente e il comportamento permettono di formulare una teoria della scienza medica. La variabilità delle reazioni immunitarie alle possibilità sperimentali offerte agli animali di fuggire - o di non fuggire - alle condizioni di stress rendono obsoleta la teoria di Selye sullo stress e permettono di formulare una nuova teoria sulla "relatività determinata del coping animale" mentre, per il mondo umano indeterminato, è stata formulata una teoria sulla "relatività indeterminata del coping umano", dove le variabili biologiche sono correlate alle variabili psicosociali, antropologiche ed esistenziali. I risultati di queste ricerche permettono di introdurre un nuovo paradigma teoretico di ricerca e di clinica all'epistemologia medica, riformulandola su nuove parole chiave come "reazioni biologiche", "possibilità di coping" e "qualità di coping", e superando concetti di filosofia della scienza quali "leggi biologiche", definibili solo a posteriori dalla maggiore o minore variabilità delle reazioni biologiche.

Le reazioni biologiche negli animali appaiono soggette a un determinismo prevedibile spiegato dalla teoria della "relatività generale determinata", mentre le reazioni biologiche umane sembrano spiegabili dalla teoria della "relatività generale indeterminata".

Queste nuove teorie sembrano suggerire che la ricerca, la clinica e l'educazione medica devono orientarsi verso un epistemologia interazionista e qualitativa per riformulare il concetto di salute.

Parole chiave: teoria della scienza medica, interazionismo, epistemologia, coping umano, kairologia.

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