Relonics Properties of Living Systems

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Abstract

Relonics is a new complete exact science of control, regulation and coordination in complex, super – complex, and in systems with infinite complexity. It has its own ontology, epistemology, epistemics, methodology, relonic languages, fully operational generic domain-free platform technology and tools. Relonics offers a new way of knowing which generates a novel type of structural/ relational information which cannot be mined out by any other existing modalities, tools or technologies. Application of Relonics to Living Systems reveals their non- trivial novel and counterintuitive properties: Relonic Reality, Non-Euclidity, Prerequisite Self-Organized Dynamic Orderness, Infinite Complexity, Complexity Transfer and Relonic Communications.

Introduction

Relonics is a new complete exact science of control, regulation and coordination in a complex, super-complex systems, and in systems with infinite complexity [Kvitash, 2002c]. Its subject matter is Relons and their counterparts which are different kinds of systems-specific relational universals [Kvitash, 2001]. Relonics contains a set of axioms, its own ontology and epistemology, epistemics, basic and advanced Relonic Languages, fully operational generic domain-free platform technology and tools [Kvitash, 2004a, 2002g, 2002h, 1999, 1985].

Relonics stems from ancient Hellenic idea of law and order in flux of natural phenomena, Tektology, Organismic Philosophy, Cybernetics, Artificial Intelligence, General Systems, Parametric General Systems and Living Systems Theories.

Relons (R.), anti-relons (D., I.), and anti-anti-relons (Ri, Di, Ii) are distinct types of systems-specific relationships. They are relational universals and basic indivisible and irreducible units of systems [Kvitash 2001]. They are informational entities, computable by relonic calculus. Relons are not a balance, not an equilibrium and not a symmetry in a physical sense [Jaros, 2005]. However, those terms can be used metaphorically to get intuitive insights into the nature of relons.

Results

Application of Relonics to medicine reveals non-trivial, novel and counterintuitive properties of Living Systems which, at first glance, may look paradoxical.

Relonic Reality. Living Systems possess a special type of reality – relonic reality. Relonic reality identified, detected, and objectified by measurements and visualization. Relonic reality penetrates, interconnects and ties together all macro-, micro-, and nano- realities into individual organisms and allows Living Systems to overcome physical and chemical constraints imposed by natural laws.

Non-Euclidity. Living Systems are not just complex, non-linear, and unique but fundamentally non-Euclidean in their architecture, organization and functions, although they are often dangerously oversimplified and presented in a quasi-Euclidian linear manner.

Prerequisite Self-Organized Dynamic Orderness. Relonics shows that no disorders exist in Living Systems as long as they are alive. What usually seems as a disorder or is perceived as a loss of order, is actually a flux of transformations and permutations of differently shaped orders of structural organizations which cease to exist only at the end of the life-cycle of an individual living organism. To avoid common logical errors in the form of categorical mistakes, order and disorders should be only correctly applied for dealing with rigidly designed physical systems. In living organisms, only death can destroy existing prerequisite dynamic orderness. Living organisms always maintain a high level

of orderness in health and disease. Only their orderness is that which makes diseases recognizable and diagnosable.

Infinite Complexity. Living Systems are infinitely complex in their relonic systems-specific relationships. Theoretically that infinite complexity requires only three of R., D., I., Ri, Di, Ii. in any of their combinations. However, each individual organism contains much more than that critical mass of three relons, anti-relons and anti-anti-relons, and in fact, have built-in an infinite array of relonic systems-specific relationships. Infinite Complexity can be precisely measured by different measurement criteria provided by relonics and can be effectively used for pragmatic and theoretical purposes.

Complexity Transfer. Living Systems preserve their complexity by complexity transfer among relons and their counterparts.

Relonic Communications. Living Systems maintain control, regulation and coordination through flow of patterns of structural relonic networks.

Medical application of relonics revealed that among 12 basic biochemical variables (ALB - albumin, CAL - calcium, PHO - phosphorus, SGO - SGOT or AST, GLU - glucose, ALK - alkaline phosphotase, LDH, T.B - total bilirubin, BUN, UR - uric acid, CHO - cholesterol, T.P – total protein) exists an extreme diversity of highly organized and uniquely structured patterns of relons, anti-relons and anti-anti-relons. Figure 1 demonstrates prototype patterns of network structures of only D. anti-relons in five unselected diseases.

Living Systems possess infinite garden-variety patterns of relonic structures which need to be operationally languagized to have tools for interrogating relonic complexity. To effectively communicate a new relonic sense, these languages should be definite, compact, clear, distinct and unambiguous as mathematical formalisms. [Miller, 1999].

On Figure 2, three basic relonic languages are presented. Relonic structures are described as Primary (Chains, Fans or Stars, Loops, Webs and Spheres), as Secondary (formed by ≥2 different types of primary structures) and as Tertiary (formed by ≥2 of the same types of primary structures).

Six Primary structures can be considered as the restricted relonic alphabet. Secondary and Tertiary structures can be considered as words in the unrestricted relonic vocabulary. Total structures of given concrete systems can be considered as relonic sentences with empirically embedded meaning.

Primary, Secondary and Tertiary relonic structures also can be represented by condensed notations which allow much greater flexibility for algebraic, combinatoric and topological manipulations. Secondary and Tertiary relonic structures can be represented in the form of structural formulas.

However, complex dynamics of serial relonic events cannot be completely captured, represented and communicated only by basic relonic languages. There is a clear need to enrich basic relonic languages with high level resolution to adequately represent continuity and discontinuity of complex non-locomotive dynamics, and to be able to track dialectics of relonic processes with refined expressivity. Seriality of relonic events are better expressed by Advanced Relonic Languages labeled as ARL-1, ARL-2 and ARL-3.

On Figure 3, relonic dynamics among 12 basic metabolic variables in an actual patient with end-stage AIDS are represented by ARL-1, 2, 3, and shows intricate dialectics of diminishing complexity of R. structures in the sequential emergence of radically distinct and highly ordered transient relonic novelties. ARL-1, 2, 3 of anti-relons and anti-anti-relons (which are not presented in the Figure 3) reveal drastic increase in complexity in their structures which represent transfer of complexity from relons to their counterparts.

Significance

Relonics was instrumental in the description of three new clinically significant syndromes: Creativity Syndrome [Kvitash, 2003], Novel Stress Syndrome [Kvitash, 2002d], KEG Syndrome [Kvitash et al, 1994], and the discovery of extra-immunological psycho-destructive role of low Total Immunoglobulin E in development and personality disorders [Kvitash, 2004b] as well as psycho-protective function of high Total Immunoglobulin E in atopic females [Kvitash, 2002e].

Relonic evaluation of seemingly normal basic biochemical tests in patients with Clinical Depression for the first time revealed patterns strongly associated with different forms of Clinical Depression, as well as specific patterns associated with different responses to antidepressants. That information can contribute to a better understanding of biological factors responsible for psychiatric diseases, and can improve treatment options prior to prescribing anti-depressant medications [Kvitash and Gorodetsky, 2003a, 2003b].

Relonics identified highly ordered patterns which allowed categorical prediction of outcome in acute chest pain [Kvitash, 2002b] and also made reliable prediction of progression of immune dysfunction in healthy older patients [Mahler et al., 1993].

In twenty different types of hepato-biliary diseases, relonics identified patterns which can be used for early diagnosis, precise monitoring of treatment responses, and for individualized treatment adjustments [Kvitash, 2002a]. This opened up the possibility to eliminate the necessity of a currently common practice to perform liver biopsy for making definitive diagnosis of liver diseases. Relonics was indispensable in discovering new sub-types of known diseases by providing highly sensitive and specific diagnostic pattern cognition/recognition [Kvitash, 2002f, 2002i].

Conclusion

Relonics identified six distinct types of basic irreducible living systems relational universals, and revealed novel non-trivial properties which can be attributed to all forms of Living Systems: Relonic Reality, Non-Euclidity, Prerequisite Self-Organized Dynamic Orderness, Infinite Complexity, Complexity Transfer and Relonic Communications.

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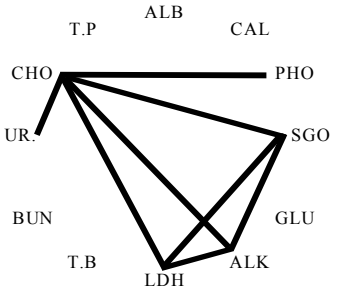
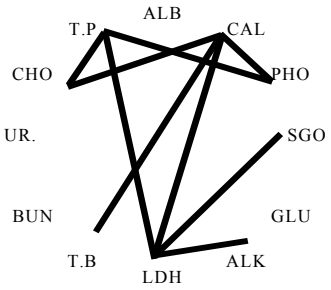
Figure 1. **Patterns of Network Structures of Type D. Anti-Relons in Five Diseases.**

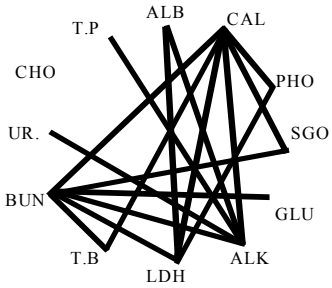
Carcinoma of the Pancreas



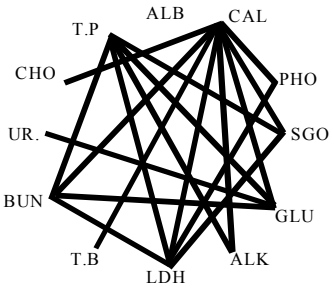
Hodgkin's Disease



Addison's Disease



Sarcoidosis



Cushing's Syndrome

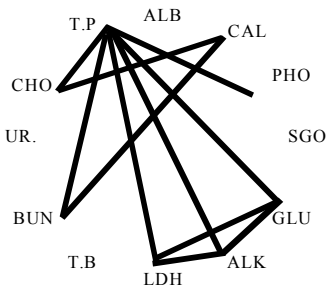
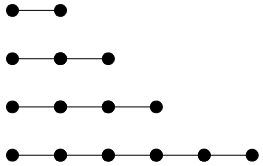


Figure 2. Basic Relonic Languages

Primary Structures

Chains

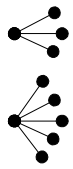
Minimal involvement: 2 parameters
Notation: $C_2, C_3,\ldots,C_n$
Structural Formula: $[C_n]$
Examples:



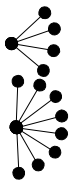
$[C_2]$
$[C_3]$
$[C_4]$
$[C_6]$

Fans or Stars

Minimal involvement: 4 parameters
Notation: $F_4, F_5,\ldots,F_n$
Structural Formula: $[F_n]$
Examples:



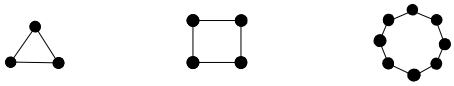
$[F_4]$
$[F_6]$



$[F_5]$
$[F_9]$

Loops

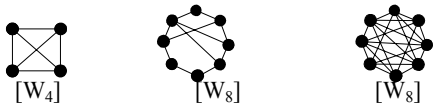
Minimal involvement: 3 parameters
Notation: $L_3, L_4,\ldots,L_n$
Structural Formula: L_n
Examples:



$[L_3]$ $[L_4]$ $[L_8]$

Webs

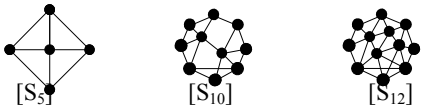
Minimal Involvement: 4 parameters
Notation: $W_4, W_5,\ldots,W_n$
Structural Formula: $[W_n]$
Examples:



$[W_4]$ $[W_8]$ $[W_8]$

Spheres

Minimal Involvement: 4 parameters
Notation: $S_5, S_6,\ldots,S_n$
Structural Formula: $[S_n]$
Examples:

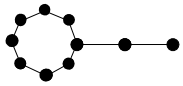


$[S_5]$ $[S_{10}]$ $[S_{12}]$

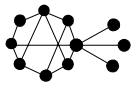
Secondary Structures

Definition: Secondary Structures are complex structures which are formed by two or more of different types of primary structures.
Examples:

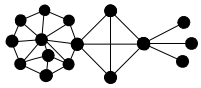
$[C_4 - F_4]$



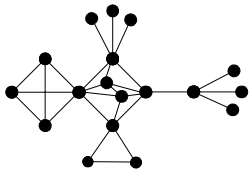
$[L_8\text{-}C_3]$



$[W_8\text{-}F_4]$



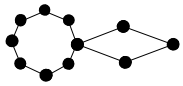
$[S_{10}\text{-}W_4\text{-}F_4]$



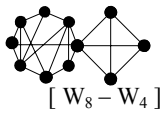
$$\begin{bmatrix} F4 \\ | \\ W4 - S6 - C2 - F4 \\ | \\ L3 \end{bmatrix}$$

Tertiary Structures

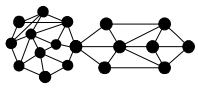
Definition: Tertiary Structures are complex structures which are formed by two or more of the same type of primary structures.
Examples:



$[L_8 - L_4]$



$[W_8 - W_4]$



$[S_{11} - S_8]$

Fig 3. Advanced Relonic Languages