Beyond Fragmentation: Ill-structured Domains, Networks, Complex Systems, and Biofunctional Science

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The most outstanding feature of 20th Century research in psychology was fragmentation. Widespread signs in the literature now suggest the momentum favors integration. We critically examine what is known in support of the bold claims that (a) the natural level for understanding integration is the biofunctional level, (b) the common denominator for successful integration is the *how in the functioning* of the physical nervous system, (c) researchers would do well to step away from the reductionist beating-around-the-bush stances on static-knowledge or passive-behavior structures and instead address head on (d) the biofunctional dynamics of the physical nervous system in the global context of a pervasive ecosystem of systems, and (e) the details of such a biofunctional theory are already in the literature waiting to be examined by researchers. We describe the evolution in the last quarter of the century of this comprehensive biofunctional science approach in line with (a)-(e) above.

Throughout the 20th Century, topics like learning, perception, attention, knowledge, memory, or problem solving were investigated in piecemeal studies done for the most part in the separate behavioral, cognitive, social, and neural camps. Consequently, psychological science had many of its growing pains in the cold and cruel grips of fragmentation. Piecemeal work was tolerated, often justifiably, for various reasons like we must build a science of the observable; and psychological topics are too complex and their basic components take long to isolate for understanding (Bartlett, 1932; Iran-Nejad, McKeachie, & Berliner, 1990).

Widespread indications in the literature for the past three or so decades suggest that the tide is now rising for integration. Of these, the emergence of the interdisciplinary field of cognitive science is the most obvious. A number of multiple-discipline constructs like association, schemas, information processing, and constructivism crossed disciplinary lines, densely populated the broader field of psychology, and enjoyed popularity in disciplines as diverse as neuroscience, engineering, computer science, and artificial intelligence (Iran-Nejad, 2000). However, to shake off fragmentation, cognitive science had to do more than circulating free-standing constructs. Absent was a global coherence context—a wholetheme, for lack of an existing term—for psychological research and practice (Iran-Nejad, 1994, Iran-Nejad, Clore, & Vondruska, 1984). The last two decades of the 20th Century were especially productive in this regard. Calls for integration grew more steady and widespread, forcing underground or even melting disciplinary fences in favor inclusion (Rosch, 2000). As a result, the number and scale of all-encompassing concepts are on the rise today. Examples currently enjoying popularity are complex systems (Jacobson & Wilensky, 2006) and system of systems (Sage, 2005).

This presentation reviews the literature on the perceived shift from fragmentation to integration, and describes the transitional landmarks involved in its evolution. We further discuss the comprehensive biofunctional perspective on how the physical nervous system functions in the wholetheme context of the biofunctional ecosystem of systems, review its existing empirical base, and outline its implications for deeper cross-disciplinary integration in cognitive science.

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