

Noise in the System: Redefining Clinical Psychological Phenomena

Harvey J. Lieberman

South Beach Psychiatric Center

Recent efforts in neuroscientific research are redefining the nature of clinical psychological phenomena. Therefore, as an area of scientific inquiry, clinical psychology must realign its boundaries with neighboring disciplines. In this regard, noise, a term originating from information theory, has the potential of becoming a magnet concept guiding the formulation of major trends in the relationship between physiological and psychological explanations for clinical phenomena and human behavior. To explore the effects that noise reinterpretations of clinical phenomena may have on clinical psychological thinking, the concepts of self-concept and culture are used. Numerous consequences of the expected transcendence of the physiological over the psychological in explaining human behavior are foreseen. Feasible future directions for scientific clinical psychology in light of these developments are offered.

The time is coming closer to when the boundaries of clinical psychology, as an area of scientific inquiry, must be realigned with relating disciplines. Clinical psychology, as a specialty, has traditionally investigated phenomena within the disciplinary space between physiology and sociology in regard to individual adaptive functioning. When the perimeters of bordering disciplines change, clinical psychology must respond. Much of the pressure for redefining clinical psychology comes from physiologically related ventures in the new multidisciplinary field of cognitive science, specifically from neuroscientific efforts (Gardner, 1985; Hirst, 1988; Mandler, 1985).

This paper explores the technical and metaphorical ramifications of one representative concept from neuroscience with the intent of illustratively anticipating the significant transformational capacity that reformulations from neuroscience can have on the understanding of clinical phenomena. The con-

The author would like to express his gratitude to Joan E. Hanvey, Administrative Aide, for her extensive editorial assistance. Requests for reprints should be sent to Harvey J. Lieberman, Ph.D., Director, Treatment Services, South Beach Psychiatric Center, 777 Seaview Avenue, Staten Island, New York 10305.

cept under review, noise, is derived from the information theory base that has fueled many developments in cognitive science. Although noise can be used to describe phenomena in many of the disciplinary components of cognitive science, its breadth of applicability within the neurobiological segment of the neurosciences indicates that noise has the potential of becoming a major magnet concept, attracting and organizing data from the various disciplines it touches.

With this possibility in mind, this work should be regarded as an alert and preliminary extrapolation—considering the potential impact that noise and associated concepts may have on clinical psychological thought. Since the domain of knowledge surveyed in this prospectively and speculatively oriented foray is very broad, not only primary but well-respected secondary sources are used when the technical complexity of matters under consideration exceeded the author's immediate competence. It is hoped that these comments will be sufficiently trenchant to stimulate scientific clinical psychology's timely address of what might be a key revolutionary trend.

Current Status of the Noise Concept

A definitional statement is important to distinguish between technical meanings of noise within information theory and its common usage. Although a number of differing classification approaches exists to clarify the role of noise in various communication formats, there is general agreement regarding a definition of noise from which all further discussions stem. That is, noise is the part of the output of a system that is not influenced by input (Meetham and Hudow, 1969). With information usually being described as having three levels of complexity, the syntactic, semantic, and pragmatic (Hyvärinen, 1970)—noise can be manifested differently depending upon the information level under consideration. One description of noise phenomena (Nauta, 1972) identifies four broad types: interference, distraction, randomness, and disorganization. This arbitrary categorization scheme is but a clustering of a large number of somewhat discrepant, specific definitions. While this paper is concerned with the concept of noise in its various forms, its particular focus is on the broad effects of the misidentification of syntactic noise as semantic and pragmatic information.

The spectrum of applicability of the concept of noise to clinical psychology is broad. It ranges from the study of correlates of neurobiologically caused noise on various psychological levels to the investigation of effects of pathological learning experiences which lead to dysfunctioning on various psychological and physiological levels. Of primary interest to this paper is the bottom-up perspective that originates at the mind-body boundary where, increasingly, precursors of any but controlled conscious thought processes

are regarded as byproducts of noise in the hard wiring of the biocognitive computer.

Typically, but not exclusively, under review are explanatory formulations for psychological and particularly psychopathological phenomena which have a long history of cycling between the poles of purely psychological and physiological attributions. Noise conceptualizations are themselves neutral in regard to source. However, there is an increase in the frequency of separate and unintegrated neuroscientific findings being interpreted either explicitly or implicitly as the equivalent of noise from which psychological representations are made. On the broadest basis, for example, Churchland (1986) sponsors the idea that poorly detailed or inchoate neural noises may relate to or be translated as mental phenomena. More narrowly, noise formulations are implicit in models of schizophrenia, depression, and anxiety that emphasize both information processing and physiological deficits in cognitive and arousal mechanisms (Cohen and Ross, 1983; Fowles, 1984). Many symptoms associated with psychopathology in this framework can be translated as the psychological representations of neurobiological noise. Perhaps, most tellingly, is the suggestion by Crick and Mitchison (1983) that dreams are the psychological concomitant of noise in the human cognitive computer as it engages in neurophysiologically oriented maintenance operations during physical rest periods.

The General Appeal of Noise Formulations

The attractiveness of noise as a concept derives from its origin in information theory and easy application to systems theory. These theories are so appealing because of their potential for integrating diverse phenomena from many disciplines (Dretske, 1981; Von Bertalanffy, 1968). At the very least, they offer the fantasy that some synthesis is possible between physical, biological, psychological, and sociological systems. Already within cognitive science itself, information theory provides a common language to bridge vocabulary differences between related disciplines.

It is worth noting that efforts to create harmony between psychological models and newly transcendent technologies are not an infrequent occurrence (Gentner and Grudin, 1985). Freud by imbuing his early work with the spirit of the then prominent thermodynamic-derived technology exemplified this process (Adams, 1962). The borrowing of physical laws and concepts not only made psychoanalytic theory appear modern but also served to complete a technological cycle of change by providing a reconstructed psychology to go with a reconstructed world. Less influential theorists, such as Lewin (Hall and Lindzey, 1957) and Bateson (Ruesch, 1987), who applied field theory and communication theory in their respective works, also illustrate

the pervasive effects of the outside influence on psychology. However, because conceptualizations such as these have never fully captured the professional and popular imagination, there has not yet been a new psychology to enduringly supplant or revolutionize psychoanalytic thought and consume the attention of the current age (Farrell, 1981).

A grand unification theory for psychology that can tie together the forces and dimensions of concern within a reworked conceptual structure may be as appealing to psychologists as it has been for physicists (Baars, 1986). To this end, the information theory noise formulations under scrutiny here can represent a significant first step. Noise formulations may have the potential to organize the findings of neuroscience in a fashion that can create startling clinical psychological hypotheses which a priori appear to have reasonable probabilities for bases in reality. Minimally, noise formulations offer three benefits which will be discussed in more detail below:

1. They provide an overall, preliminary, simple two-category classification scheme (information/noise) regarding the relationship between neuroscientific data and psychological phenomena.
2. As noise itself can be classified into many subcategories, noise concepts are capable of further elaboration and sophistication.
3. Noise, as does information theory in general, can potentially provide a concrete pairing between physiological and psychological events, acting as a tracer between physiological processes and psychological and sociological phenomena.

While it is far too soon to have a complex understanding of the details and rules of noise transmission and representation across disciplinary levels, the concept of noise with its general association with information flow interference, irrespective of content, appears to be frequently definable in narrow instances and to be useful for heuristic and exploratory purposes. Within information theory, noise can be defined as present when there is less than 100% accurate information transmission. As with any associate of inefficiency in physics—whether friction or resistance—noise, with its broad applicability, almost demands an investigative pairing with all major human phenomena to determine its relevance. Noise as a concept may have the power of easy clarification because it allows for defects to exist in the human apparatus in undefined ways. While care must be taken not to misattribute signs of organized processes as noise, perhaps before serious study of any clinical mental phenomenon is undertaken, Occam's razor should be applied: that is, first demonstrate a phenomenon is not noise before exploring further.

Since, in terms of prediction and control, the behavioral sciences generally yield constructs with no more than a moderate relationship to behavior (Anastasi, 1982), discussions of physiological mechanism functioning are attractive in that they support cause and effect. Whether or not such discussions

are the mere product of frustration and the need to escape from the ambiguities of psychological science, concerns for physiological mechanism tend to be prominent when new technology offers the possibility of methodological advances. Indeed, one of the promises of the concept of noise is that noise is but a simplification for which there is some potential for uncovering a neurobiological functional equivalent. For instance, noise may be the conceptual equivalent to an axis rotation or transformation in mathematics where numbers, which have no apparent relationship to known patterns on inspection, are rationalized through mathematical processing so that their relationship to the known patterns is easily detected. Historically, other conceptual simplifications long taken for granted, such as energy in physics, have served a similar purpose. Rather than identifying moving animate or inanimate objects, such as rocks and airplanes, as having a special individualized manifestation of some property, their association with external, clearly defined physical dimensions and constants has allowed scientists to escape from the dead end of looking for meaning in what may be irrelevant and unmeasurable (Kuhn, 1970).

Implications of Noise Attributions

Often the effects of information-age technology have been analyzed in terms of their impact on the generalized constructs of self-concept and culture (Conference Board, 1972; Turkle, 1984). The value of these concepts has been their sensitivity to change and their direct relationship to how we experience our lives. These two concepts feed back and are intertwined into each other: self-concept mediates between internal phenomena and cultural possibilities; culture provides a significant portion of the external environment for the developing self-concept while being a unique aggregate of component selves functioning within a socio-historic context (Marsella, DeVos, and Hsu, 1985; Western, 1985). For tracing the effects of neurobiological noise across human systems, self-concept and culture are useful conceptual markers.

Noise and Self-Concept

Self-concept is composed of an evaluative amalgam of an individual's information regarding perceptions of the external world in relation to the mind and body. Self-concept has strong historical antecedents in family and cultural experiences. All functional spheres—the cognitive, affective, and behavioral—and the sensory information that stimulates the involvement of each sphere of operation participate in the formulation of self-concept. While rooted in a biophysical package, the self-concept of a typical adult frequently bears only a modest positive relationship to consensually agreed upon realities (Fisher,

1986). Our self-concepts are very much related to our identity although the latter concept seems to involve a narrower definitional base (Lee, 1982; Lifton, 1976). In summary, self-concept is a psychological construct par excellence.

The primary issue regarding the influence of noise-related reinterpretations of clinical psychological phenomena on self-concept concerns what aspects of self-concept are prone to alteration as the result of such revisionist thinking. The areas, where relabelling is most likely, include, but are not limited to, those derived from psychological phenomena that are connected with ambiguities in interpretation. While it is still too soon to know how many traditional and esteemed phenomena will eventually and convincingly be labelled noise derivatives, there is an apparent progressive tendency for neuroscientists to investigate the possibility of a noise designation for mental phenomena that are not overtly goal-directed or survival oriented. Minimally, dysphoric states and psychopathology of various degrees, dreams, behavioral manifestations of supposedly unconsciousness processes, and parapsychological claims are all targets for redefinition. Since some of these mental phenomena are often associated with a sagacious mysticism whether or not they are induced by natural or pathological states (Freud, 1900/1953; Laing, 1965), their linkage with physiological noise may trivialize their value in the eyes of many. Although previous meanings and assessed values of noise-associated states may still exist, the acknowledgement of any psychological process as secondary to neurobiological or physiological processes places physiological interpretations in ascendance over psychological constructions in the formation of self-concept and in the way people regard their personal existences. In response, a conservative approach to the psychological is likely in which the mind plays a secondary role directly facilitating physiological functioning.

Should any psychological processes be relabelled as noise derivatives, then a likely conclusion would be that human responses to these processes have been projective in nature. Those who find cherished beliefs being challenged as a psychological response to meaningless stimuli may experience loss, anger, and the need to revise their self-concepts. Consideration then needs to be given as to whether or not these functionally reactive projective tendencies can be externalized and objectified for more constructive purposes. In this regard, many commentators have suggested that computers are fruitful models for the human mind and the self (Cathcart and Gumpert, 1985; Turkle, 1984).

While computers are ambivalently viewed with suspicion as well as admiration, their value as models for psychological processes is that they are perceived as simulating human cognitive processes, are tangible, and are significant symbols of logic and functional modernity. Acceptance of computer paradigms of the self on an individual and cultural basis is adaptive and results in enhanced cognitive flexibility, for implicit is their rapidly evolving nature. Relatively little emotional investment need be placed in outdated computer

designs for they are being routinely upgraded as hardware and software improve. As Turkle's projective "second self," this artifact allows us to have an image of ourselves that is technologically current. Its obvious limitations will not be a source of disappointment since the intrinsic expectancy of temporary model usefulness is ameliorated by anticipated new model improvement. For those who seek a less protean self with more durability, this viewpoint satisfies less, leaving theology or economics for longer term guidance in formulating a self-concept.

Cultural Perspectives

When mental representations of physiological noise are identified, their role in the development of consciously or unconsciously formed mental processes will change. Additionally, the role that behavioral, affective, and cognitive responses to physiological noise play in our culture will be forced into awareness for examination by relevant fields of study. When the effects of mis-evaluated neurobiological noise are translated across boundaries of the mental to cultural levels, any psychologically misinterpreted noise becomes equivalent to faulty software programming for human cultural operations. At the most abstract conceptual levels, this cultural misprogramming has the capacity to generate strong noise-related metaphors (Johnson, 1987). Proper identification of the cultural derivatives of noise may therefore have dramatic consequences for every aspect of our personal and social lives.

The long-term cultural outcome of the identification of the psychological mislabelling of neurobiological noise is likely to be complex. One main direction can be speculatively elaborated upon by adopting Messer and Winokur's (1984) comparative and descriptive philosophical and literary analysis of psychoanalytic and behavioral orientations as a model. Using, as do Messer and Winokur, Schafer's (1976) four basic culture-permeating "visions of reality"—the romantic, ironic, tragic, and comic—the potential impact of the noise-reinterpreted content of clinical psychology on commonly held psychological paradigms can be classified. Certainly, it is too soon to determine what exact combination of Schafer's themes might characterize the long-term response to noise-derived concepts as they rework primary cultural attitudes toward clinical psychological phenomena. However, since noise as a concept originates from the imperialistic discipline of cognitive science, technologically oriented romantic and comic visions are probable. These themes translate into culturally applauded heroic attempts to significantly reconstrue the previously unsatisfactorily defined mental world into an orderly cause and effect system.

In trying to anticipate specific cultural outcomes of noise reinterpretations, the current ambivalent popular images of clinical psychological material must be conceded. On one hand, there is continuing fascination with clinical

phenomena; on the other, psychological explanations are negatively construed as adding complexity to worldviews without providing solutions to the problems they raise (Skinner, 1987). Contrastingly, while the physical and life sciences have recently yielded new technologies beyond the detailed comprehension of lay persons, they have also produced concrete innovations of revolutionary consequence. The growing respect neuroscientific data are having within the mental sciences (Cooper, 1985; Reiser, 1988) is suggestive of the potential for noise relabelling of clinical phenomena to play a significant role in the cultural evaluation of the physiological over the psychological. Should this noise relabelling occur in a consistent fashion, it is likely to be accompanied by new terminology describing irrational thought processes and related affective and behavioral responses. The appearance of new terminology would be followed by our society's altered perception of the locus of control over individual behavior. The nature of the social control over individual behavior would also be prone to reassessment as the source of non-normative behaviors will be presumed physiological in origin until proven otherwise.

Since the intent of this paper is to be suggestive rather than exhaustive, only a few concrete issues will be mentioned regarding the specific implications of the above trends. Many social critics (Burnham, 1987; Lasch, 1978, 1984; Lifton, 1976) who are concerned about the relationship between culture, technology, and general character development suggest that the pairing of technology with a body focus encourages sensation-seeking narcissism without guiding personal values. Accommodations to the increasing significance of the body in mind-body oriented clinical and nonclinical interventions directed toward stress management are indications of this direction. Whether or not the techniques used in the consultation room or in fitness clubs and discussed in professional journals and newspapers are genuine technological advances, caveats must be issued (Glassner, 1988; Morgan and Goldston, 1987).

Not only might noise interpretations, by changing the meaning attributed to the psychological, alter culturally supported personal values—they may modify public policy. An example of this is the metaphoric translation of what can be designated as noise-related personal problems of chronic mental patients to the social systems level where not only their behaviors but the patients themselves are regarded as noise, interfering with the efficient overall operations of society. Proposals for removal of the mentally-ill homeless from the streets of cities (Staff, 1987) or outpatient commitment to treatment (Appelbaum, 1986), may well be viewed from the perspective of equating patients to electronic interferences to be filtered out of system operations.

The identification of noise-related influences on cultural attitudes and the use of noise-derived metaphors may provide some positive new modes of constructive problem solving or valuable reconceptualizations on many levels. Nevertheless, care must be taken to avoid an overly restrictive approach

toward the consideration of potentially irrational noise-related social phenomena to cultural deliberations and particularly art forms. On the individual or social level, noise imaginably can become a euphemism for taboo within whatever system to which it is relevant. Although some may see noise by itself as leading to constructive system developments (Von Foerster, 1960), there is a danger of extreme reactions originating out of noise redefinitions which bring to mind Jungian concerns regarding rebound effects and the restoration of personal and cultural balances (Jung, 1953). On the metaphoric level, noise formulations can easily have an excessive focus on culturally defined outcome over process which ignores the possibility that cultural reality can shift without individual or social awareness. To the extent that as a society we rely on judgements from evidence drawn from culturally defined low-noise states, we are prone to make major mistakes in decision making that can lead to cataclysmic realignments.

Whither the Clinical Psychological?

As the impact of noise and neuroscientific endeavors directs the focus of our culture toward explanations rooted in physiology to account for human functioning, the explorations of scientific clinical psychology will be channeled similarly. Intrinsic to noise conceptualizations is the position that certain clinical psychological phenomena—many yet to be identified—can no longer be regarded as pure internal voice. While logical alternate hypotheses that shift figure-ground exist, they ring hollow. Only a staunch ideologue waiting for changing cycles of fashion will personally support the notion that projective responses to neurobiological noise are noteworthy as quintessential psychological phenomena.

Unfortunately, judging from recent modes of addressing mind-body issues (Davis, Rosenzweig, Becker, and Sather, 1988; Pribram, 1986; Thagard, 1986), concepts such as noise are prone to be commonly held as removing, by reinterpretation, the value of psychological phenomena that have been associated with much that is human in our lives. Because this idea of alienation of individuals from themselves by technology is experientially real and a state for which a high technological solution might not be desired (Skinner, 1986; Woolfolk and Richardson, 1984), there will be a continued need for clinical psychological thinking. Doubtless, certain modifications in substance and style of clinical psychological approaches will take place. Likely, the sphere of the clinical psychological will generally concern itself with clinical human adaptive issues in realms for which interpersonal solutions are preferable.

Based on current developments, the following are some of the additional areas to where future scientific clinical psychological investigations may be well directed:

1. The study of the effects of intentionally induced psychological states on noise-related phenomena.
2. The study of the effects of environmental factors on noise-related phenomena.
3. The study of psychological phenomena as indicators of noise-related phenomena.
4. The study of the effects of noise-related phenomena on family and organizational settings.
5. The study of individual differences in the ability to discriminate between noise with physiological and environmental origins.

In order to adequately assess the possibilities for and readjustments required by scientific clinical psychology in the forthcoming years, some preliminary planning should be encouraged by organizations of concern—especially those representing a broad array of scientific and professional psychological specialties and the disciplines from cognitive science. Often, it is easier to anticipate the negative outcomes of change than the opportunities. Since the field of clinical psychology is filled with critical self-evaluations, in this situation a balanced assessment would be valuable to anticipate and guide future developments.

References

- Adams, H. (1962). The dynamo and the virgin. In S. Bradley, R. Beatty, and E. Long (Eds.), *American tradition in literature* (pp. 1136-1146). New York: Norton.
- Anatasi, A. (1982). *Psychological testing*. New York: Macmillan.
- Appelbaum, P.S. (1986). Outpatient commitment: The problem and the promise. *American Journal of Psychiatry*, 143, 1270-1272.
- Baars, B.J. (1986). *The cognitive revolution in psychology*. New York: Guilford Press.
- Burnham, J.C. (1987). *Paths into American culture: Psychology, medicine, and morals*. Philadelphia: Temple University Press.
- Cathcart, R., and Gumpert, G. (1985). The person-computer interaction: A unique source. In B. Ruben (Ed.), *Information and behavior* (Vol. 1, pp. 113-124). New Brunswick: Transactions.
- Churchland, P.S. (1986). *Neurophilosophy*. Cambridge: MIT Press.
- Cohen, S., and Ross, R. (1983). *Handbook of clinical psychology and pathology* (Vols. 1 and 2). Washington, D.C.: Hemisphere.
- Conference Board. (1972). *Information technology: Some critical implications for decision making*. New York: Author.
- Cooper, A.M. (1985). Will neurobiology influence psychoanalysis? *American Journal of Psychiatry*, 142(12), 1395-1402.
- Crick, F., and Mitchison, G. (1983). The function of dream sleep. *Nature*, 304(5922), 111-114.
- Davis, H.P., Rosenzweig, M.R., Becker, C.A., and Sather, K.J. (1988). Biological psychology's relationships to psychology and neuroscience. *American Psychologist*, 43(5), 359-371.
- Dretske, F. (1981). *Knowledge and the flow of information*. Cambridge: Bradford Books/MIT Press.
- Farrell, B.A. (1981). *The standing of psychoanalysis*. Oxford: Oxford University Press.
- Fisher, S. (1986). *Development and structure of the body image*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Fowles, D. (1984). Biological variables in psychopathology: A psychobiological perspective. In H. Adams and P. Sutker (Eds.), *Comprehensive handbook of psychopathology* (pp. 77-110). New York: Plenum Press.

- Freud, S. (1953). The interpretation of dreams. In J. Strachey [Ed. and Trans.], *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 4). London: Hogarth Press. (Original work published 1900)
- Gardner, H. (1985). *The mind's new science*. New York: Basic Books.
- Gentner, D., and Grudin, J. (1985). The evolution of mental metaphors in psychology: A 90 year retrospective. *American Psychologist*, 40(2), 181-192.
- Glassner, B. (1988). *Why we look the way we do*. New York: Putnam.
- Hall, C.S., and Lindzey, G. (1957). *Theories of personality* (pp. 206-256). New York: John Wiley & Sons.
- Hirst, W. (1988). *The making of cognitive science*. New York: Cambridge University Press.
- Hyvärinen, L.P. (1970). *Information theory for systems engineering*. New York: Springer-Verlag.
- Johnson, M. (1987). *The body in the mind*. Chicago: University of Chicago Press.
- Jung, C.G. (1953). *Collected works*. New York: Pantheon Books.
- Kuhn, T.S. (1970). *The structure of scientific revolutions* (Second edition). Chicago: University of Chicago Press.
- Laing, R.D. (1965). *The divided self*. Baltimore: Penguin.
- Lasch, C. (1978). *The culture of narcissism*. New York: W.W. Norton.
- Lasch, C. (1984). *The minimal self*. New York: Norton.
- Lee, B. (Ed.). (1982). *Psychosocial theories of self*. New York: Plenum Press.
- Lifton, R.J. (1976). *The life of the self*. New York: Simon and Shuster.
- Mandler, G. (1985). *Cognitive psychology: An essay in cognitive science*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Marsella, A.J., DeVos, G., and Hsu, F.L.K. (1985). *Culture and self*. New York: Tavistock.
- Meetham, A.R., and Hudow, R.A. (Eds.). (1969). *Encyclopedia of linguistics, information, and control*. New York: Pergamon Press.
- Messer, S.B., and Winokur, M. (1984). Ways of knowing and visions of reality in psychoanalytic therapy and behavior therapy. In H. Arkowitz and S.B. Messer (Eds.), *Psychoanalytic therapy: Is integration possible?* (pp. 63-100). New York: Plenum Press.
- Morgan, W., and Goldston, S. (1987). *Exercise and mental health*. Washington, D.C.: Hemisphere/Harper & Row.
- Nauta, D. (1972). *The meaning of information*. Hague: Mouton.
- Pribram, K.H. (1986). The cognitive revolution and mind/brain issues. *American Psychologist*, 41(5), 507-520.
- Reiser, M.F. (1988). Are psychiatric educators "losing the mind"? *American Journal of Psychiatry*, 145(2), 148-153.
- Ruesch, J. (1987). *Communication: The social matrix of psychiatry*. New York: Norton.
- Schafer, R. (1976). *New language for psychoanalysis*. New Haven: Yale University Press.
- Skinner, B.F. (1986). What is wrong with daily life in the western world? *American Psychologist*, 41(5), 568-574.
- Skinner, B.F. (1987). Whatever happened to psychology as the science of behavior? *American Psychologist*, 42(8), 780-786.
- Staff. (1987). NYC program for mentally ill homeless. *Clinical Psychiatry News*, 15(12), 1.
- Thagard, P. (1986). Parallel computation and the mind-body problem. *Cognitive Science*, 10, 301-318.
- Turkle, S. (1984). *The second self*. New York: Simon and Shuster.
- Von Bertalanffy, L. (1968). *General systems theory*. New York: Braziller.
- Von Foerster, H. (1960). On self-organizing systems and their environments. In M. Yovits and S. Cameron (Eds.), *Self-organization systems*. Interdisciplinary Conference on Self-Organizing Systems. Elmsford, New York: Pergamon Press.
- Western, D. (1985). *Self and society*. New York: Cambridge University Press.
- Woolfolk, R.L., and Richardson, C. (1984). Behavior therapy and the ideology of modernity. *American Psychologist*, 39(7), 777-786.