Shye, S. (2014). Faceted Action System Theory (FAST). In: Michalos AC (Ed.). *Encyclopedia of Quality of Life and Well-Being Research*. Dordrecht, Netherlands: Springer, pp 2119-2126.

Faceted Action System Theory (FAST)

Synonyms

FAST, Action systems, Behavioral Systems, Complex systems, Living systems, Holistic approach, Systemic paradigm, Systemic functioning, Systemic Quality of Life model (SQOL), Facet Theory, Facet Analysis, Regional hypotheses

Definition

Faceted Action System Theory (FAST) is a general theory, or meta-theory, which, on the basis of elementary considerations, identifies the generic *functioning modes* of *Behavioral Systems:* conservative, integrative, adaptive, and expressive (Shye, 1985a). The application of FAST to specific system-types (such as human individuals, organizations, etc.), facilitates:

(a) The systematic construction/selection of observational variables for systems' functioning;

(b) The generation of testable hypotheses about the structure of a system, and

(c) A theory-based measurement of systems' functioning effectiveness (systems' quality).

For these purposes, FAST employs basic logical considerations, simple geometry, and elementary algebra as embodied in modern facet approach to research design and data analysis (Shye, 1985b; 1989; 1999; Borg & Shye, 1995; Shye & Elizur, 1994).

In the context of quality of life research, FAST has been applied to systemic analyses and assessments of institutions and entities that bear on human life quality. Among them: the human individual (see Systemic Quality of Life Model), human services, distributive justice, and the psychotherapeutic dyad.

Description

The systemic approach to behavioral research: Background

Systemic thinking arose as a result of the observation that certain objects of investigation are so complex that they cannot be fruitfully studied by reducing them to their constituent components. This observation is often figuratively summarized by the maxim "the whole is greater than the sum of its parts", better re-stated by "the whole is an entity different from the collection of its parts". That is, the whole as such has qualities and parameters of its own, not inferable from its constituent parts. Moreover, it has been noted (e.g., Miller, 1978) that organized systems of different types, possibly pertaining to different disciplines, often demonstrate similar behaviors and seem to be governed by similar lawfulness.

The challenge for *scientific* systemic thinking has been appropriately formulated by one of its pioneers, the biologist Ludwig von Bertalanffy, thus:

> General System Theory, therefore, is a general science of "wholeness" which up till now was considered a vague, hazy, and semi-metaphysical concept. In elaborate form it would be a logico-mathematical discipline, in itself purely formal but applicable to the various empirical sciences. For sciences concerned with "organized wholes," it would be of similar significance to that which probability theory has for sciences concerned with "chance events": the latter, too, is a formal mathematical discipline which can be applied to most diverse fields, such as thermodynamics, biological and medical experimentation, genetics, life insurance, etc. (von Bertalanffy, 1968, p. 36)

Concurrently, trends in sociology culminating in the works of Parsons, have developed a systemic approach to the study of social systems. Parsons' theory makes use of the AGIL scheme of four intuitive concepts to analyze systems: **Adaptation** (society's interaction with its environment), **Goal Attainment** (society's setting goals and making decisions to attain them), **Integration** (society's internal harmony with respect to its values and norms), **Latent pattern maintenance** (society's maintaining its integrative elements, i.e., institutions like family and school, which impart values to the new generation).

Parsons' theory has been widely criticized as being too abstract to be used constructively in any significant empirical research (e.g., Ritzer & Smart, 2001). This criticism is aptly represented by the following:

> Parsons does emphasize the fact that his scheme is analytic and abstract by design and, consequently, that a given empirical phenomenon cannot be equated on a strict one-to-one basis to his analytic scheme … It is precisely this difficulty of building operational bridges from Parsons' highly abstract formulations to the real world that has led so many empirically oriented investigators simply to abandon attempts to do anything with the scheme, despite its obvious attractions as one of the few systematically coherent, comprehensive approaches to the study of system differentiation and integration. (Laumann & Pappi, 1976).

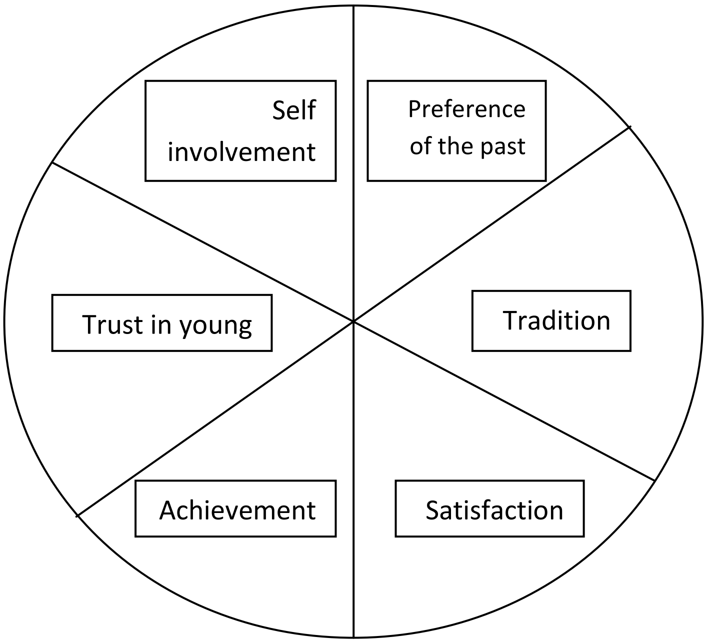
Abu Gosh & Shye (1971) studied the process of democratization of Arab villages in Israel; recognizing this process to be firmly related to villagers quality of life. In their data analysis, the authors employed Faceted SSA, leading to two major insights that proved valuable for developing behavioral system theory as scientific discipline:

1. **The content universe of a behavioral system is continuous**. The mapping of systemic variables into a suitable topological manifold is continuous and has a continuous inverse mapping. In a proper application of Faceted SSA to system

analysis this means that not only every systemic variable is mapped into a point in the topological manifold (as in any MDS analysis) but, moreover, every point in that manifold represents a possible systemic variable, and the mapping is 'homeomorphic'. This is the *Continuity Principle* (Shye, 1971; 1998; 1999; Shye & Elizur, 1994). Intuitively this means that continuity in meanings of system variables is reflected by continuity in the geometric space, and vice versa. The observed variables are regarded as but a *sample* from the infinite universe of variables, as indeed they typically are in behavioral and psychometric research. (This is in contrast with the interpretation of MDS as merely visualizing observed data. See Faceted SSA.)

2. **Faceted SSA of systemic variables reveals types of systemic functioning**. The social attitudinal variables, processed by Faceted SSA yielded a continuum that could be partitioned into circularly ordered sectors representing: traditionality, preference of the past, involvement with local affairs, trusting the young (freedom for the young), achievement orientation, and satisfaction with aspects of life (Figure 1), interpretable in parsonian functional terms.

Figure 1. The Circumplex of Political Attitudes:
The Social System as a Continuum Partitionable into Regions
(Shye, 2009; Adapted from Abu-Gosh & Shye, 1971)



A detailed content analysis of systemic functioning modes has led to the axiomatic formulation of FAST as testable theory (Shye, 1985a).

Foundations of FAST

On the basis of formal definitions proposed for *systems, action systems* and *living systems* (Shye, 1985a), FAST postulates that an *event* (a phenomenon) has two *existence modalities*: *emergence* and *actualization;* and that with reference to a given system each of the two may be *located* either inside or outside the system (Shye, 1985a). Hence in relation to a given system, there are four types of events, each having its characteristic significance for the system. The four event types are presented in Table 1 with their significance for the system and the systemic *functioning mode* they define:

Table 1. Event-Types and their Systemic Significance

Event-Type in terms of loci of event's emergence/actualization (inside or outside system)		**Event's significance for system:**	**Defining system's functioning in mode of:**	**Criterion for effective functioning in this mode:**
emergence	**actualization**			
Out	**In**	System's adherence to its constitutive features (Identity)	*Conservation*	Similarity (stability of externally endowed structure)
In	**In**	Compatibility among system's components	*Integration*	Complementarity (compensatory relations between components)
Out	**Out**	Compatibility between system & its environment	*Adaptation*	Complementarity (compensatory relations with environment)
In	**Out**	System's impact upon environment (growth)	*Expression*	Similarity (authentic external reflection of inner qualities)

FAST modifies and sharpens the parsonian definitions of *functions* and, with **Faceted SSA**, subjects them to scientific hypothesis testing procedures. Thus, the spatial pattern implied by the emergence vs. actualization in/out analysis, presented in Figure 2, has been applied, tested and largely confirmed in various studies in the fields of human quality of life (e.g., Shye, 1989; see also references in Systemic Quality of Life Model); Social work (Wolins et al., 1980; Wozner, 1991); criminology (e.g., Fritzon et al. 2001); Psychology (e.g., Wiener et al. 1997; Ezrachi, 2008); as well as studies of the human condition (Shye, 1985a) and of Distributive Justice (Shye, 1995).

Systemic Hypotheses: Cohesion and Structure

The systemic cohesion hypothesis states that in a population of action systems of a given type that is not selected artificially, the covariance of any two systemic functioning-effectiveness variables (and therefore the correlation between them) will be non-negative.

The systemic cohesion hypothesis reflects, in statistical language, the idea that, overall, a system's subsystems maintain strong and consistent *pattern* of interactions among themselves. The rationale for this hypothesis is that the variables share a Common-Meaning Range (see Faceted SSA). This hypothesis has been generally supported by empirical data in Quality of Life studies as well as in other research domains, with the occasional occurrences of few negative but low correlations.

The notion of *artificially selected population* (and by implication, of *natural* populations) has been introduced by Guttman (e.g., see Gratch, 1973 p. 36) as an intuitive undefined notion. An attempt to characterize natural populations in terms of the observed joint frequency distribution in certain kinds of data is made by Shye (1985b p.111).

The systemic structural hypothesis states that Faceted SSA of variables assessing the functioning effectiveness of a population of systems of a given type would yield a space:

1. Partitionable into separate regions, each containing the variables pertaining to one functioning mode (the conservative, the integrative, the adaptive *or* the expressive).
2. Given that (1) holds, the regions representing the functioning modes would be circularly ordered.
3. Given that (2) holds, the circular order of the regions would be: conservative, integrative, expressive, adaptive. I.e., the expressive would be opposite the conservative and the adaptive opposite the integrative (as in Figure 2).

A heuristic explanation for this spatial configurations could be this: While the *conservative* function determines the action-system's potential for action, the *expression* of this potential in reality is mediated by negotiative processes that take place in two different milieus, the external (*adaptive* processes) and the internal (*integrative* processes).

Empirical studies generally support the systemic structural hypothesis in all its parts, exhibiting the *standard pattern* shown in Figure 2 (see references in Systemic Quality of Life Model). Some studies, however, while supporting parts (1) and (2) of the hypothesis, exhibit a circular mode order different from the one specified by in part (3). There are also cases where the mode order is linear (e.g. conservative, integrative, adaptive, expressive) rather than circular, and cases where even part (1) of the hypothesis does not fully hold, and neighboring mode-regions do intermingle.

Interestingly, in studies of Quality of Life where two groups are compared, of advantaged and of disadvantaged people, the advantaged group (in addition to scoring higher than the disadvantaged on the functioning *levels*) exhibits the standard systemic structure conforming to the hypothesis, while the disadvantaged group diverges from it (e.g., Davidson-Arad, 2005; Benish-Weisman & Shye, 2011). Such findings seem to indicate that the standard pattern represents a preferred, perhaps 'healthier', state of affairs for the system.

Figure 2. Two-way Systemic Event Classification

Locus of Actualization	OUT	Expressive	Adaptive
	IN	Integrative	Conservative
		IN	OUT
		Locus of Emergence	

Since the set of functionings in a particular mode constitutes a system in its own right, it, too, functions in each of the four modes. For example, the expressive mode of the subsystem of conservative functioning of a given system stands for developments in the defining structure of the system. For example, amendments to the constitution of the U.S. express its essential spirit by introducing evolutionary changes in it. Such conceptual refinements suggest additional, more refined and intricate hypotheses that can be formulated and tested. Studies that use finer 16-mode schemes have been conducted in quality of life research (see Systemic Quality of Life Model) as well as in the study of human services organizations (Wolins et al., 1980; Wozner, 1991) and of child rights (Veerman, 1992).

While the four systemic functioning modes are helpful in reasonably classifying observable variables, real-life observable variables can be "impure" in that any one of them may contain meanings that pertain, in varying extents, to more than one functioning mode. *Definitional-reliability* tests in which a panel of judges, schooled in FAST, assess the extents to which each variable pertains to each of the modes, can and have been successfully conducted. Thus, the set of all conceivable functioning variables does in fact constitute a continuous semantic space as suggested by the Continuity Principle. But this continuous space is partitioned, for analytic purposes, into four regions (typically sectors) that correspond to the four functioning modes. (As an analogy, consider the continuum of spectral colors, represented by their wavelengths, which may be divided into intervals that correspond to our understanding of red, orange, yellow, green, blue, etc. Indeed, colors, judges for their similarities, have also been so analyzed (Shepard, 1978))

The measurement of system quality

The quality of a system may well be equated with its functioning effectiveness, as defined by FAST. Scores obtained for a balanced selection of observed functioning variables – evenly representing the four modes – may be compiled to obtain an overall assessment of the system functioning effectiveness, for example by some summation procedure. However, a more careful measurement procedure, one that takes into account the likely multidimensionality of the systemic data, would employ Multiple Scaling by Partial Order Scalogram Analysis (POSAC) (Shye 1985b). In such a case, a summation is performed on subsets of observed variables pertaining to a single functioning mode, to create compound modal variable. Such a summation is the more justified the better the set of variables approximates a *Guttman Scale* (Guttman, 1944; Shye, 2008b). The compound modal variables thus created are then processed by Multiple Scaling (Shye, 1985b) to obtain the minimal number of scales commensurate with the systemic structure.

POSAC action system configuration (Shye, 1985b) is the simplest systemic model, or hypothesis, for the outcome of four dichotomous modal variables, v_1,v_2,v_3,v_4, indicating whether the system functions well (v_i=1) in a given mode or not (v_i=0) in the four modes: conservation, integration, adaptation and expression, respectively. The *state* of a system is described by its 4-score profile. For example, the profile 1010 indicates good functioning in the conservative (v_1) and the integrative (v_3) modes; and weak functioning in the expressive (v_2) and the adaptive (v_4) modes.

Logically, 2^4=16 state-profiles are possible in this case, requiring a 4-dimestional space for their representation (with each variable defining a different dimension or axis). But the model postulates the following substantive conditions:

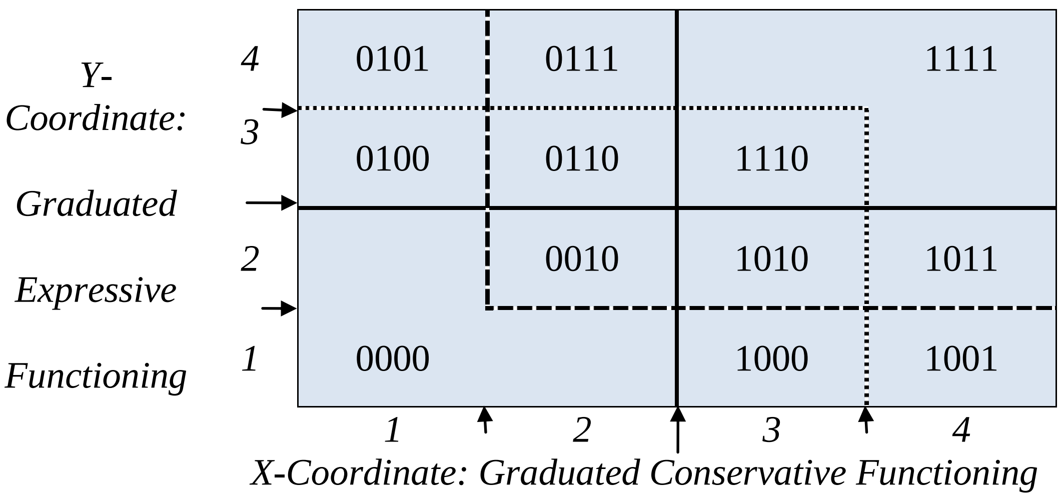
(a) Conservation (v_1) and expression (v_2) are the two poles of a system, and their functioning scores may occur in all their combinations: 00, 01, 10, 11.
(b) If v_1=1 and v_2=1, then v_3=1. (I.e., good functioning in both, the conservative and the expressive modes entails good functioning in the integrative mode.) Hence profiles 1100 and 1101 will not occur.
(c) If v_4=1, then either v_1=1 or v_2= 1 (or both). (I.e., if a system functions well in the adaptive mode, it functions well either in the conservative mode or in the expressive mode or in both.) Hence profiles 0001 and 0011 will not occur.

Thus, of the 16 logically possible profiles, four are excluded and only 12 may be actually observed according to this model. These 12 require just a 2-dimensional coordinate space for their order-preserving mapping, as Figure 3 shows. The two coordinates (X,Y) in Figure 3 are the basic scales that are necessary and sufficient for measuring action systems that conform to this model. From the partition lines in the measurement space that correspond to the four modes, it may be concluded:

X-coordinate: conservative functioning, graduated by integrative functioning (in the lower part of the scale) and by adaptive functioning (in the upper part of the scale).

Y-coordinate: expressive functioning, graduated by integrative functioning (in the lower part of the scale) and by adaptive functioning (in the upper part of the scale).

Figure 3. Theory-Based Measurement-Space for the Functioning of a Simple Action System*



*The order of the scores within each profile is: Conservation, Expression, Integration, Adaptation. A partition line separates between 0's and 1's in the respective variable, thus:

The two (straight) solid lines partition the measurement space by the (*polar*) Conservative Mode and by the (*polar*) Expressive Mode variables;

The (L-shaped) broken line partitions the space by the (*attenuator*) Integrative Mode variable;

The (inverted L-shaped) dotted line partitions the space by the (*accentuator*) Adaptive Mode variable).

Discussion

In the study of Quality of life and of QOL-related activities, institutions, and human services, one often deals with a cohesive yet complex set of interrelated phenomena. Hence a systemic approach to their study seems appropriate.

Faceted Action System Theory (FAST) is conceived in terms of modes of system functioning that derive from more elementary, undefined (but intuitive) concepts: event, emergence and actualization. Systemic functioning modes are then understood to encompass 'being' (re-formulated here in terms of behavior as *conserving* constitutive characteristics), engaging in interactive processes (*integration* and *adaptation*) and growing--impacting on the environment (through *expression*). This conception of systemic functioning resonates with Rapoport's (1968) fundamental aspects of organized systems ("structure, function, evolution"), with Sen's (1992) human functioning as "being and doing" as well as with Parsons' (e.g., 1953) action system functional imperatives. But FAST (1) rests on explicit axiomatic basis, thereby sharpening the definitions of systemic modes; (2) provides a rationale for the functioning modes and their interrelationships; (3) specifies the data analytic procedure (i.e., the particular aspect of empirical reality embodied in Faceted SSA) for testing its hypotheses; (4) specifies a procedure for theory-based measurements of systemic functioning effectiveness (i.e., by applying Multiple Scaling by Partial Order Scalogram Analysis (POSAC) to recorded data or to hypothesized set of possible system-state profiles). Thus, drawing from different branched of mathematics – logic, geometry and algebra – FAST suggests mathematical language and tools suitable for investigating systems as complex network of interactions (rather than as a heap of causal mechanisms). These mathematical procedures have been developed largely within the field of facet design and analysis proposed as a methodological paradigm for behavioral research (Guttman, 1959a; 1959b; 1968; Shye, 1978a; 1978b; 1985b; 1998; 1999; Shye & Elizur, 1994; Borg and Shye, 1995).

Cross References

Systems of indicators

References

Abu-Gosh, S. and Shye, S. (1971). *The impact of the Elective Local Council System on Arab Traditional Society in Israel, Vol. III*. Jerusalem: Israel Institute of Applied Social Research.

Benish-Weisman, M. and Shye, S. (2011). Life quality of Russian immigrants to Israel: patterns of success and of unsuccess. *Social Indicators Research* Volume 101, Number 3, 461-479.

Bertalanffy, L. von (1968). *General System Theory*. New York: Braziller.

Borg, I. and Shye, S. (1995). Facet Theory: Form and Content. Thousand Oaks CA: Sage.

Davidson-Arad, B. (2005). Structural Analyses of the Quality of Life of Children at Risk. *Social Indicators Research*, Vol. 73, No. 3 (Sep., 2005), pp. 409-429.

Ezrachi, A. (2008). *Patient-psychotherapist adaptation patterns: A faceted systemic analysis of patients' and therapists' evaluations of the therapy and its impact on patient's quality of life*. (Ph.D. thesis). Jerusalem: The Hebrew University of Jerusalem.

Fritzon K., Canter D., and Wilton Z. (2001). The application of an action system model to destructive behaviour: the examples of arson and terrorism. *Behavioral Sciences and the Law,19* (5-6):657-90.

Guttman, L. (1944). A basis for scaling qualitative data. *American Sociological Review, 9*, 139-150.

Guttman, L. (1959a). Introduction to Facet Design and Analysis. *Proceeding of the Fifteenth International Congress of Psychology. Brussels, 1957*. Amsterdam: north-Holland, pp. 130-132.

Guttman, (1959b). A structural theory for intergroup beliefs and actions. *American. Sociological Review, XXIV*, 318-28

Guttman, L. (1968). A General nonmetric technique for finding the smallest coordinate space for a configuration of points. *Psychometrica*, 33, 469-506.

Gratch, H. (Ed.) (1973). Twenty Five Years of Social Research in Israel. Jerusalem: Academic Press.

Miller, J. G. (1978). *Living Systems.* New York: McGraw-Hill.

Laumann, E. O. and Pappi, F. U. (1976). *Networks for Collective Action: A Perspective on Community Influence Systems*. New York: Academic Press.

Parsons, T. (1953). A revised analytic approach to the theory of social stratification. In R. Bendix and S. M. Lipset (Eds.) *Class, Status and Power: A Reader in Social Stratification*. Glencoe, IL: Free Press.

Rapoport, A. (1968). Foreword to W. Buckley (Ed.) *Modern Systems Research for the Behavioral Scientist*. Chicago: Aldine.

Ritzer, G. and Smart, B. (2001). *Handbook of Social Theory*. London: SAGE Publications Ltd. ISBN 0-7619-5840-1.

Sen, A. (1992). *Inequality Reexamined.* Boston: Harvard University Press.

Shepard, R. N. (1978). The circumplex and related topological manifolds in the study of perception. In S. Shye (Ed.) *Theory Construction and Data Analysis in the Behavioral Sciences*. San Francisco: Jossey-Bass.

Shye, S. (Ed.). (1978a). *Theory Construction and Data Analysis in the Behavioral Sciences*. San Francisco: Jossey-Bass.

Shye, S. (1978b). Achievement motive: a faceted definition and structural analysis. *Multivariate Behavioral Research, Vol. 13*, No.3.

Shye, S. (1985a). Nonmetric Models for Behavioral Action Systems. In D. Canter (ed.) Facet *theory: Approaches to Social Research.* New York: Springer.

Shye, S. (1985b). *Multiple Scaling: The Theory and Application of Partial Order Scalogram Analysis.* Amsterdam: North-Holland.

Shye, S. (1995). *Facets of Distributive Justice*. Jerusalem: The Louis Guttman Israel Institute of Applied Social Research.

Shye, S. (1989). The Systemic Life Quality Model: A Basis for Urban Renewal Evaluation. *Social Indicators Research, 21*, pp. 343-378. Stable URL: http://www.jstor.org/stable/27520775

Shye, S. (1998). Modern Facet Theory: Content design and measurement in behavioral research. European *Journal of Psychological Assessment*, *14*, (2), 160-171.

Shye, S. (1999). Facet Theory. *Encyclopedia of Statistical Sciences, Update, Vol. 3*. New York: Wiley, 231-239.

Shye, S. (2008a). Faceted Models for Behavioral Systems: Examples from Quality of Life and Intelligence/creativity Research. The 5th European Conference on Complex Systems. Jerusalem, September 2008. http://www.jeruccs2008.org/node/284

Shye, S. (2008b). Guttman Scale. In P.J. Lavrakas (ed.). *Encyclopedia of Survey Research Methods.* Thousand Oaks CA: Sage.

Shye, S. (2009). From the Circumplex of Political Attitudes to the Radex of Universal Values. *The 12th International Facet Theory Conference,* Jerusalem, Israel, June, 2009.

Shye, S. and Elizur. D. (1994). *Introduction to Facet Theory: Content Design and Intrinsic Data Analysis in Behavioral Research*. Thousand Oaks, CA: Sage.

Veerman, P.E. (1992). *The Rights of the Child and the Changing Image of Childhood*. Dordrecht: Martinus Nijhoff. (International Studies in Human Rights Series).

Wiener, S., Shye, S. Shefler G., and Wiseman, H. (1997). Psychotherapeutic difficulties: faceted action system analysis. *Proceedings of the Sixth International Facet Theory Conference, Liverpool, September, 1997*.

Wolins, M., Wozner, Y. and Shye, S. (1980). Rejuvenating the Asylum: A Field Study. *Social Work Research and Abstracts, 16*:17-25.

Wozner, Y. (1991). *People Care in Institutions*. New York: Haworth.