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The measurement of human interactions

Commentary

There have been criticisms by some that Moreno's writing was not scientific enough, by others, that his writing was too technical. However, both these areas of concern continued to influence Moreno throughout his life. He himself saw the publication of *Das Stegreiftheater* in 1923 as marking the point at which he adopts a more scientific approach in his writing:

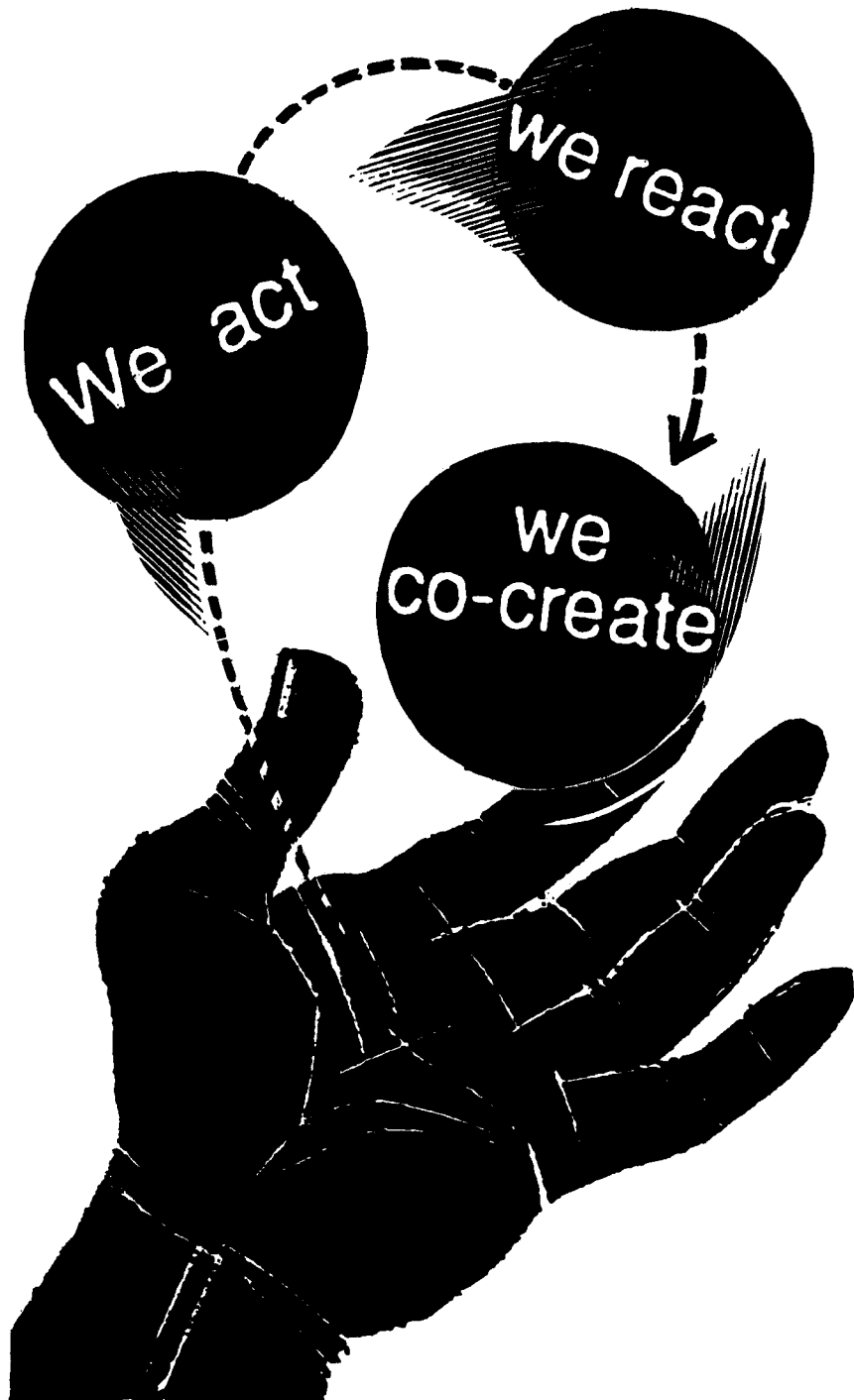
Das Stegreiftheater marked in my work the beginning of a new period; the transition from religious to scientific writing. It initiated many characteristics found in my later work, such as the emphasis on measurement and charting of inter-personal communication, movement diagram, on operational procedure and situational analysis. As such it was a forerunner to the sociogram, the social atom diagram, the role diagram, the action sociogram etc.

(J.L. Moreno 1947: 1)

Moreno argued for understanding preceding treatment, and with the tools of sociometry we have many useful diagnostic instruments. This chapter may remind us that the science of the measurement of the relationship was a creation of Moreno's, albeit one that he put down and let others adapt, whilst he devoted himself to developing the clinical method of psychodrama. The authors show just how useful a tool it can be to clinician and group-worker alike.

REFERENCE

Moreno, J.L. (1947) *The Theatre of Spontaneity*, New York: Beacon House.



Sociometry and sociodynamics

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FOUNDATIONS

Goals: choosing partners, co-creating groups

Choosing a partner for marriage or work, gaining acceptance into a group, forming groups which can effectively accomplish their purpose, choosing a course of action, and electing political leaders, are some of the most important tasks we confront. Sociometry (Moreno 1978; Moreno 1942) and its offspring sociodynamics (Carlson-Sabelli *et al.* 1991; Carlson-Sabelli and Sabelli 1992b, c; Carlson-Sabelli *et al.* 1992a; Sabelli 1989) provide us with some useful tools to deal with such choices, and to understand the 'role we play' in our relations. They also illuminate and guide personal development, because our life is a co-creation with others. Who we become depends on the environment in which we live.

Sociometry studies interpersonal bonds by examining choices. Thus, Moreno generated a set of methods for empirical measurement of personal interactions in small groups, a series of principles relating to the development of the individual in groups, a number of experiments involving therapeutic regrouping of occupants of prisons, hospitals and schools into communities (Hare 1992), and a series of clinical methods that are, at the same time, assessments and therapies. The simplicity, versatility and richness of sociometric methods both as research tools and as practical techniques for understanding and organising groups, has found extensive application in business, education, community planning and health care systems.

Chance, cause, choice, co-creation

Sociometry is a therapeutic intervention (not only an objective measurement), to promote personal choice, and to foster insight into the physical, biological, social and psychological processes that predetermine them, and which may be largely outside the realm of free choice. Gaining insight into

socioeconomic or psychological issues frequently reveals that what we believed to be a free choice was actually determined. The idea that illness can be a choice has been an ill-fated and cruel tenet of earlier psychoanalysis. Mental illness is the product of biological, social and psychological processes of causation, which includes chance, such as the genetic lottery. Manic-depressive illness, for example, is no more a matter of choice than diabetes. To seek treatment is a choice that all patients deserve. Since currently psychopharmacology offers fundamental, albeit not comprehensive, treatment for mental illness, it behoves every well-educated psychotherapist and educator to recognise when the protagonists, or their significant others, suffer from physical or mental illness that requires treatment. Chance events and causal processes pre-exist, coexist and outlast our personal choices. Choosing and creating may acquire supremacy only after recognising what physical, biological and economic causes have priority.

Stressing choice, sociometric tests neglect the biological, economic, social and psychological causes that determine and limit the range of (relatively free) choices. There is a priority/supremacy relationship in the process of choice, which, as in other cases, depends on the relations of power and of complexity: the more powerful processes (i.e. those with great energy) determine the universe of choice, whereas the most complex processes determine, within the range of the universe of choice, which choice is made. The formation of natural groups precedes choices, and their maintenance largely results from acceptance, which does not mean neutrality. In an enlightening pencil-and-paper exercise, persons draw their social atom, colouring each relation as being the result of choice (for example, one's spouse, business partner, teacher, doctor), of acceptance (brother-in-law, a student in my class), or of submission to necessity (a disliked co-worker). It is interesting to note where participants place their parents and children. Passive persons are often stimulated by this exercise to participate more actively in making choices.

It is important to study choice, because choice is a unique process of causation that distinguishes human behaviour from physical or socioeconomic determinations. Choice can be changed more readily, hence the importance of understanding the 'role we play' in our relations. However, choice is always embedded within other processes of physical and socioeconomic determinations, as well as in a web of reciprocities. Family ties and economic relations are not a matter of choice, but form the context within which personal choices are made. Biological (e.g. parent-child) and economic (e.g. employer-employee) bonds pre-exist, coexist and outlast personal choices, predetermining the range of choices and bias the outcome. The study of interpersonal bonds must then exceed and precede the analysis of choices.

The priority of biological and social roles, and the supremacy of personal choices

The interpersonal behaviour of individuals, and their collective behaviour in groups, is embodied in each individual first, as inborn patterns (such as infant care, harmonic and conflictual emotions, etc.) transmitted genetically, and second, as memories and rules introjected through experience. Moreno founded sociometry on role theory, postulating that social roles pre-exist the individual manner in which they are performed. Sociodynamics specifies that roles are created first by biological processes (e.g. woman and man, child and adult), and later created and conserved by social processes (nationality, class). Third, individuation differentiates a variety of styles within each of these roles, and may also create new roles which may be socially conserved. Before we develop as individual persons we are already assigned biological and social roles: a newborn baby already is a girl or a boy, and a member of a particular nation, class and religious faith. We exist as members of a population and of a family with which we share biological, economic, affective and ideological links. We play a role, the protagonist role, in our lives, but the 'role we play in' is in part determined by situations beyond choice, and by the choice of others. Social systems are not created by a mythological social contract between individuals, as individualistic economics and psychology pretend. Humans evolved from social animals, and only later became unique individuals. We begin life, and each interaction, as one of many members of a class of interchangeable *modules* (Carlson-Sabelli and Sabelli 1992a,c; Sabelli 1989) defined by age, sex, class, race and nationality. Our social self is attributed to us before we have the chance to develop our personal self. Before knowing each other as individuals, women and men, parent and child, teacher and student face one another as a function of their respective roles. In each *encounter*, you are the 'doctor' or the 'patient', the 'waiter' or the 'customer', the 'adult' or the 'child', the 'black man', the 'foreigner', the 'dumb blonde', before you have the chance to be known, and to know, the other. These social roles occur in pairs, in which the meaning of each member depends on its complementary opposite (an example of the *union of opposites*), and always imply a third role (child *vis-à-vis* mother and father; enabler *vis-à-vis* abused and abuser). Social roles serve as the ground for personal relations. The social role precedes the individual manner in which it is performed. There are many more individual personalities and life histories than the relatively small number of social roles. In this sense, we may say that the *social* has *priority* over the personal (individual and interpersonal psychological), and yet *personal* psychology and relations have *supremacy* over social but impersonal relations (Sabelli 1989, 1991a; Sabelli and Carlson-Sabelli 1989), for it is in the development of personal uniqueness that spontaneity and creativity

come into being. Yet, the most fundamental encounter, usually our mother is, by its very nature, deeply personal, and in the normal course of development all relations become more personal: personalisation may be in fact the process through which large, impersonal groups move from exploitative to humane relations (Sabelli and Synnestvedt 1990). In the process theory view, interpersonal bonds predetermine the range of choices; bonds coexist and outlast personal choices, while personal choices have supremacy in that one may choose to create, modify or break bonds.

From sociometry to sociodynamics

Sociodynamics expands sociometry to consider both the priority of biological and social bonds, and the supremacy of personal choice. We define *sociodynamics* as *the comprehensive study of interpersonal relations as exchanges of energy* (physical and psychological). The analysis of energy flows connects sociodynamics to thermodynamics, economics and psychodynamics. Freud explained psychological processes as flows of psychological energy or 'libido'. Personal and interpersonal energy is also a central concept in Taoism.

Here we shall introduce sociodynamics through a series of new sociometric methods and practical exercises, which we developed clinically, and now also apply in education and organisational development. In earlier publications we have developed sociodynamics in the contexts of social psychology (Carlson-Sabelli and Sabelli 1984, 1992b,c) and of sociology (Sabelli 1991a; Sabelli and Javaid 1991), and presented its theoretical foundations in process theory (Sabelli 1989, 1991a,b,c; Sabelli and Carlson-Sabelli 1989, 1992) and in mathematical dynamics (Abraham *et al.* 1990; Thom 1975).

Moreno's sociometry owes its power to the combination of a clinical and therapeutic approach to social behaviour with simple mathematical techniques which can be readily applied by practitioners. Sociodynamics expands sociometry by using equally simple geometric methods recently developed to study processes which are too complex to be studied with metric methods, such as chaos (Baker and Gollub 1990) and catastrophes (Guastello 1988; Cobb and Zacks 1985). These methods expand sociometry by (i) investigating biological and social bonds, such as family ties and economic relations, which are not a matter of choice; (ii) studying conflictual motivations and emotions, and measuring the complex, contradictory nature of the dynamics underlying choice; and (iii) focusing on changes in individual pattern over time and in different groups, including natural open groups (this is in contrast to traditional methods that focus on snapshots of specific interactions in closed groups).

A simple example will illustrate the practical implications of the

A

Rank	Selection	p	n	Rank	Selection	p	n
1	Choose +	9	2	6	Choose +	7	3
2	Reject -	8	8	7	Neutral 0	5	4
3	Choose +	7	2	8	Neutral 0	3	2
4	Choose +	8	9	9	Reject -	3	7
5	Neutral 0	4	2	10	Reject -	2	9

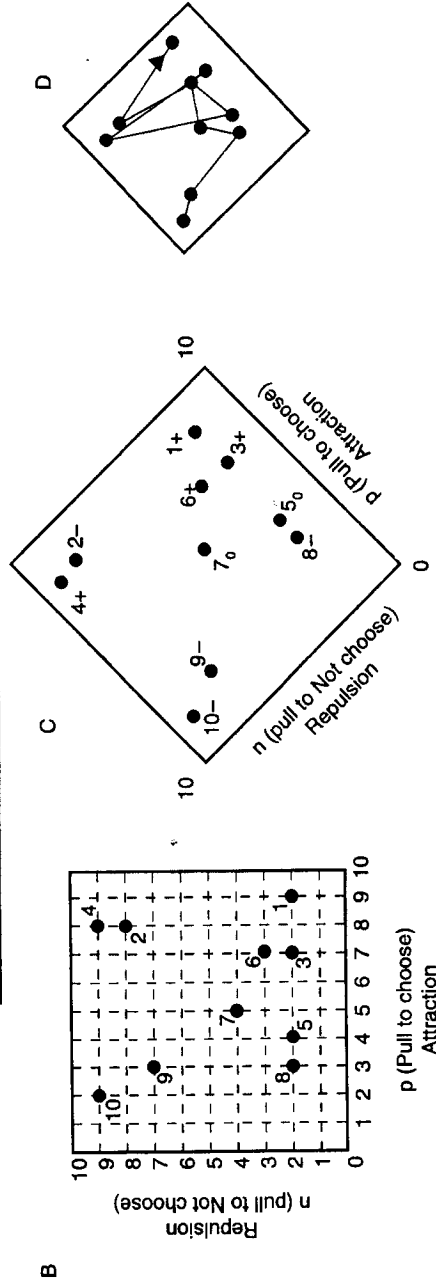


Figure 1 Diamond of opposites. Sociodynamics adds measures of attraction and repulsion to the traditional sociometric test. In addition to reporting categorical choices (+) and rejections (-), participants also report the rank order of their selections, and the degree to which they experience both a pull to choose (p) and a pull not to choose (n) each person (1A). It allows one to report the intensity of both opposites with a single point within a co-ordinate plane. (1B) The axes are a pair of orthogonal opposites. When this co-ordinate plot is rotated 90° counterclockwise (1C), the shared origin of the opposites is at the bottom, and the figure has a diamond shape, suggesting its name. This provides information about the range of intensity of contradictory feelings underlying interpersonal choice. The rank order, and actual choices (+) or rejections (-) or remaining neutral (0) made on the bases of the feelings of attraction and repulsion may be represented as a third dimension (1D). The trajectory (1D) indicates the sequence of rank.

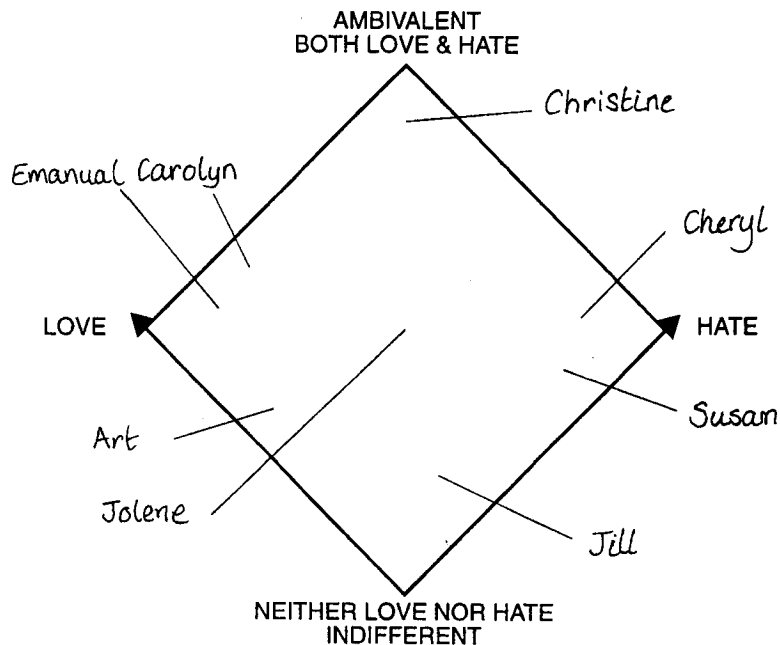


Figure 2 Name warm-up. In the example, Emanuel and Carolyn both love their names, while Cheryl and Susan both hate theirs. Jill, Jolene and Christine all are alike in that they each like their name with the same intensity that they dislike it; however they differ from each other in the amount of intensity involved. Jill neither likes nor dislikes her name. She is indifferent. In contrast, Jolene is neither indifferent, nor highly ambivalent. She both likes and dislikes her name, to a moderate degree. Christine loves and hates her name with great intensity. Her name arouses conflictual responses inside her. Although she likes it a lot, Christine was a name given to her by her family when they emigrated, to replace her original name which was hard to pronounce. Finally, Art indicates that he likes his name very much, but he also dislikes some aspects of it. Following this example, each individual is asked to report his or her feelings regarding loving and hating their name, on a large diamond drawn on a chalk board. Those that think they understand the concept are asked to go first, providing further examples for those who don't quite grasp it yet. We have found that individuals, when taught, are equally able to report opposite feelings or motivations using either method.

sociodynamic perspective. Traditional sociometry conceives opposites as mutually exclusive categories (choice versus rejection), or as extreme poles of a continuum. This linear manner of thinking is embodied in the rank-order line from first choice to last rejection. Sociodynamics recognises that opposite feelings, for example, attraction and repulsion, harmony and conflict, almost invariably coexist, albeit in different degrees. Thus, it adds measures of attraction and repulsion to the traditional sociometric test. To

report the intensity of opposites, participants in a sociodynamic exercise place themselves in a co-ordinate plane defined by such a pair of opposites (the *diamond of opposites* (Figure 1B)). The actual choice or rejections made on the bases of the feelings of attraction (p) and repulsion (n) represent a third dimension (Figure 1C and D, and there are other important dimensions to record and correlate with them, such as social status and age. This method requires participants to 'think in opposites', to consider the possibility that opposites may grow together. To facilitate this we have developed the 'name warm-up' (Figure 2).

Moreno identified spontaneity, role pairing and creativity as the three fundamental aspects of healthy functioning: We act we react, and we co-create each other's lives. Spontaneously, we act rather than remaining inactive; we are pulled by opposing motivations that lead us to alternative courses of action; we choose a behaviour that embodies our complex motivation, as well as our interaction with others. *Action, opposition and co-creation* are the three basic steps of the process of choosing. They correspond to the three fundamental patterns of all processes – the three laws of process theory.

ACTION, PSYCHOLOGICAL ENERGY AND SPONTANEITY

Action sociometry

A distinctive feature of sociometry, psychodrama, and related methods of evaluation, education and therapy, is that they occur in action, and in the present. Clinical experience indicates that action methods are often more powerful than paper-and-pencil tests to understand interpersonal choices and group dynamics. In our experience, action sociometry is more fun than paper-and-pencil counterparts, and also more revealing. Expressing choices in action offers a dynamic give and take, where the participants influence each other. However, public revelation also inhibits free expression. An inner choice and the choice expressed are not necessarily identical, as we have shown in a recent experiment (Carlson-Sabelli *et al.* 1992a; Carlson-Sabelli 1992). Our practice has led us to believe that interpersonal choices are revealed most fully in action when the process of choosing is incorporated as part of a larger activity, rather than the specified aim of the exercise. We have developed a series of fantasy play activities for children and adults to reveal connections and choices.

Co-created stories

We have learned from our experience with children that their fantasy play is always a story about how the players interact with each other, and, at the same time, reveals personal patterns of behaviour related to each

child's unique life story. And the same principle is true for adults who engage in sociodramatic play (Blatner and Blatner 1988b). The metaphors, characters, interactions and story line, connect the life stories of each participant to the collective story generated in play. To facilitate the enactment of a story in which everyone contributes, we ask for a volunteer to become a character, set a scene and begin doing something. Through soliloquy and action a story line begins to develop. The other participants are told they may enter the action, one at a time, by taking any role they would like. Fantasy characters are not restricted to people, but can be inner thoughts – a fly on the wall, an antique mirror, anything that comes to mind. Persons are told not to enter just because they think they are supposed to, but to wait until they feel personally compelled to intervene. Anyone may exit the scene at any time, as long as they explain their leaving to the audience and other players in dialogue; for example, 'I am leaving to get pizza.' One can change to a new character in a new entrance, or remain the same. The fantasy might be allowed to take its own course, or be directed. The director uses all the techniques that might be used in a psychodrama, including role reversals among the fantasy characters. If the group has not done a story before, the members are warmed up to the co-created story by sitting in a circle and telling a story. One person starts, and brings into the story only one character. The story is narrated in the third person, and lasts until it has reached to its natural end. The group is then told to do the same thing in action, but to start with an entirely new story. A popular alternative is to start a verbal story, and move it into action when it comes back to the person who started it.

Revealing choices in action through fantasy play

'Howling wolves' is a story enacted in the children's theatre by four boys who had been hospitalised together on a child psychiatric unit. Previous sessions involved a central theme, with small variations, of wild animals, such as lions, tigers, wolves and cheetahs, helping each other survive the onslaught of hunters who wanted to sell their skins for fur coats, belts and shoes. The animals though wounded, always escaped. Dragged back to their cave, they were lovingly tended and healed. The four boys were the core of these sessions, which spanned several weeks and included numerous other children who came and went. It was the last theatre session for Mark, who was being discharged later in the week. He had been hospitalised the longest, and had initiated the 'jungle series' arising from his conviction that animals should not be killed for the profit of men. Once again, the jungle story unfolded. All four boys chose to be wolves, casting the staff as hunters. The wolf played by Mark ventured out too far, and was shot. Missing him, his wolf family began searching the jungle. He was eventually located by one of his 'brothers'. Soon all three wolves were

hovering, nudging, and licking his wounds, but the injured wolf did not respond. 'I hope he's not dead', one wolf exclaimed. Activity increased to a frenzy, but nothing worked. Soon, a low-pitched noise, faint at first, but quickly rising in pitch and volume began to fill the room. The wolves were howling together, experiencing the agony of their loss. The boys were saying goodbye to a very special friend. The observer's eyes filled with tears, listening to their collective pain. During discussion following the play, we learned the full impact of its meaning. Extraordinary as it might be, the hospitalisation for each of the three 'howling wolves', had been related to the death of someone in their family. Mark's leaving aroused their personal pain and facilitated its uninhibited expression. The collective action is influenced and impacts the lives of the individual players in the group. The connections between the therapy group and the personal groups of each participant can be viewed in the mind's eye of the observer, as a sociogram, which can then be captured on paper, as illustrated in Figure 3.

Fairy tales, and other well-known stories provide structure to focus action. Permission to deviate from the story line facilitates the emergence of personal interpretations that have sociometric significance. Imagine a group of children playing a new ending to *Goldilocks and the Three Bears*. Unable to agree on who baby bear will be, we have twins. One of the twins invites Goldilocks, played by the newest child on the unit, to come and live with them forever, but the other loudly refuses. Occurring during therapeutic theatre on our child psychiatric unit, this scenario prompted a room change as the refusing bear was, at the time, Goldilocks's room mate.

'Connections': warming up energy through the exploration of the history of interpersonal bonds

Action requires a warming-up process. To highlight the subgroups formed by previous relationships and to illuminate the history of connections in long-standing groups for its newer members, we often begin by having each member of the group put a hand on the shoulder of the person in the room, they have known the longest. Starting from the oldest relationship, progressing to the newest, brief recollections from each participant about the time they first met, provide a history of a group in a very short time. Different directions follow, based on the configuration that emerges, the number of persons in the group and the purpose for doing the exercise. For instance, one might follow with the direction to touch the shoulder of the person they know the best, the least or with whom they would like to deepen the relationship. Using this technique with a group of trainees, for instance, highlighted a pair of men whose longest relationship was with each other. When asked to indicate the second longest relationship, one

of the pair remained unattached to the group; his issue, isolation/inclusion was chosen for psychodramatic exploration. The exercise facilitated the most isolated person in the group to be chosen as protagonist, serving a therapeutic purpose for the group as a whole. Illuminating the bonds that already exist in a group, it provides every group member common knowledge about the existing structure of the group, before sociometric testing takes place.

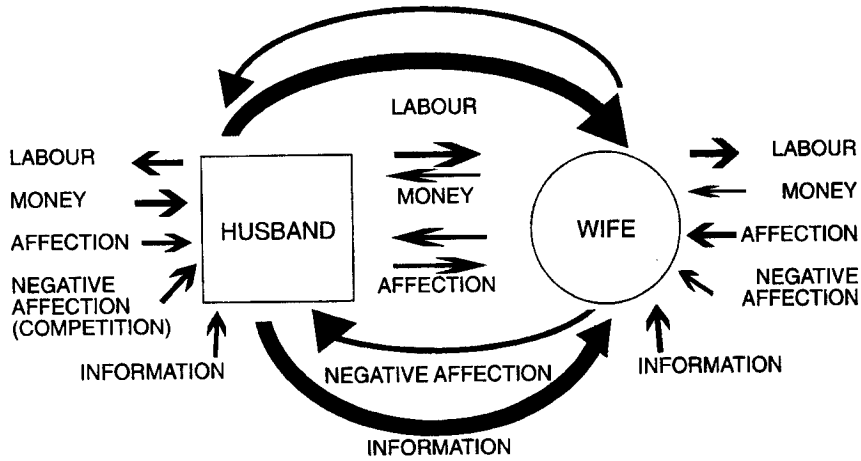
In addition to exploring concrete bonds, rather than choices, this exercise also illustrates a process-orientated view which links events and choices in time, revealing the unity and continuity of spontaneous processes. In contrast, the structure illuminated by sociometric tests based on specific choices for selective, and often artificial criteria, is just a snapshot of the overall dynamics, a view of a very complex process, at one moment in time, which may or may not be representative of the rich complexity of the process as it develops in time. Having illustrated the concepts of process (in contrast to isolated events or permanent structures), of bonds (in contrast to choices) and of action through practical exercises, we shall now link them theoretically.

Action and libido

Action is not the result of a force or motivation; action and interaction, change and exchange, are spontaneous, while immobility and isolation are the result of inhibition. Although the term 'action' has an intuitive meaning in all realms of human discourse, it is worthwhile to define it as in physics, as the product of energy \times time. The first law of process theory postulates the oneness of nature: everything is action. There is a unity to all processes that affect our existence. Both matter and ideas represent forms of action, i.e. of physical energy. Emotional, economic, cultural and other forms of motivation interact with each other as components of the same process, rather than remain separate in isolated realms of experience.

Freud described psychological processes as flows of psychological energy (libido), that includes affection, curiosity and anger as well as sexual energy, and is nothing more than a complex organisation of physical energy. His view has been validated by the fact that the density of energy flow in the human brain is 75,000 times greater than the flow of energy in the sun (Sabelli 1989: 87–9). We conceptualise interpersonal relations as exchanges of energy: *sociodynamics is the integrative study of interpersonal libido*. The circulation of psychological energy is both intrapersonal and interpersonal. Emotions are patterns of variation of energy, imprinted in physiological rhythms (heart rate, respiration, patterns of neurotransmitter release in brain) and expressed by interpersonal behaviours. In other publications we have discussed how intrapsychic and interpersonal patterns of energy flow are integrated in manic-depressive illness (Sabelli *et al.*

HUSBAND'S VIEW



WIFE'S VIEW

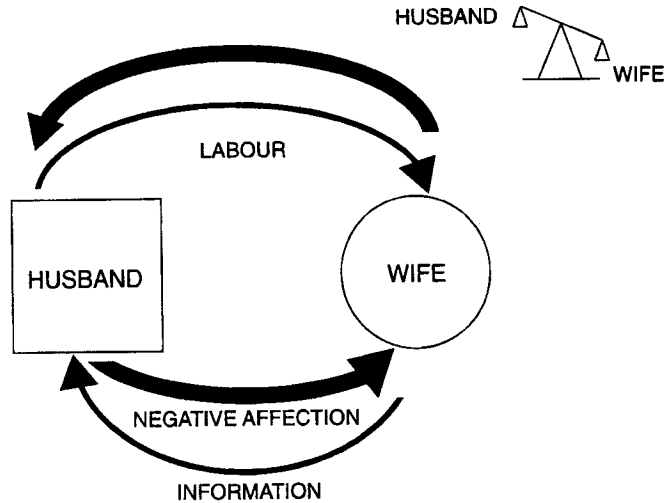


Figure 4 Action graphs. Exchange of energy (labour), matter (money) and information (affection and knowledge) for a married couple. After each participant draws her or his view of the exchanges, we ask each of them to draw how the 'scales of justice' are tilted for each of the relations depicted. Inequalities in the exchanges of labour, money and affection may produce conflict and separation. We use these diagrams to promote insight and congruence between the perceptions of each partner.

1990), unipolar depression (Sabelli and Carlson-Sabelli 1991), psychoses (Sabelli and Carlson-Sabelli 1989: 1548) and multiple personality disorder (Sabelli 1989; Raaz *et al.* 1992). These patterns may be revealed by mathematical analysis of longitudinal recordings of cardiac rhythms (Carlson-Sabelli *et al.* 1992b; Sabelli *et al.* in press) and of longitudinal monitoring of mood (Carlson-Sabelli and Sabelli 1990), and can also be studied sociometrically through the sociodynamic test (see p. 165) and action graphs.

Action graphs and personal justice

To examine interpersonal bonds in a comprehensive manner, we have developed the *action graph*, a paper-and-pencil diagram of interpersonal exchanges of energy (labour), information (about self and others, affection, entertainment, practical, social and intellectual skills) and matter (money and property). For instance, in a traditional family (Figure 4), the spouses exchange female labour (reproductive, raising the children and caring for the home) for male husbandry, energy for matter (money). In the majority of families today, both parents work within and outside the home, and so the exchanges are more variable and complex. Each person is connected to each other by a multiplicity of economic, affective and intellectual bonds. The thickness of the arrow serves to indicate the relative magnitude of intensity of flows each way. Bonds always go both ways, but the exchange is asymmetric. Diagramming these exchanges provides us with a dynamic 'action' model of personal systems and social nets. Affective bonds are thereby studied within the context of exchanges of energy, the intensity of the interactions in the relationship which carry material and information.

After the action graph of a family is completed, we ask the participants to examine it, and evaluate how justly they are being treated and how they treat others. We ask them to draw 'the scales of justice', tilted in one direction or another, regarding their relation with spouse, working partner, parents, society at large and 'life' (which many construe as God). In this manner we introduce a personal conception of justice, which often proves instrumental in modifying marital relations, as one learns to perceive how one contributes to our personal happiness and unhappiness, as well as one may learn to appreciate who treats us better than life in general.

OPPOSITION AND ROLE PAIRING

Choice and rejection, the sociometric test

To study interpersonal and social behaviour, Moreno examined two opposed actions – choice and rejection – between individual members of

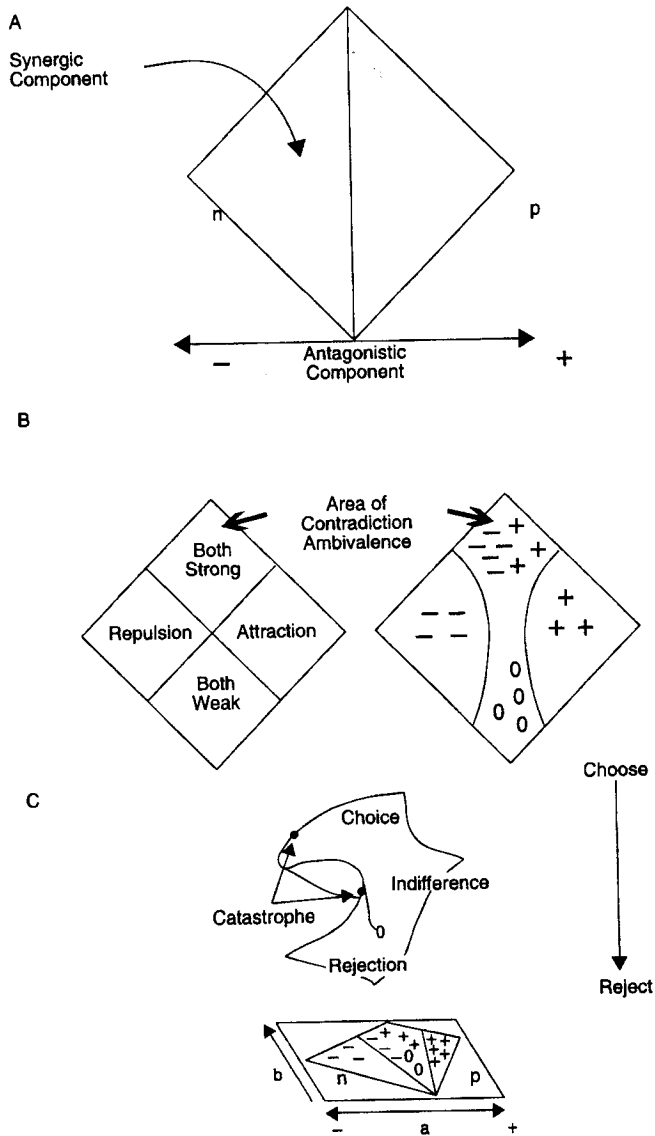
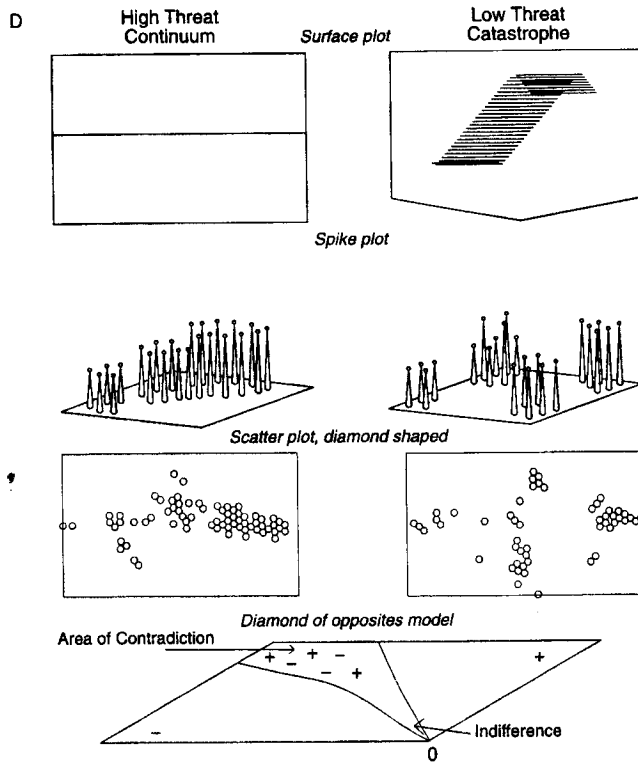


Figure 5 Phase plane of opposites.

A Opposite forces of attraction (p) and repulsion (n) are represented as mutually orthogonal vectors to illustrate they always coexist, and are in part synergic (vertical axis) and in part antagonistic (horizontal axis).

B Choice (+) is associated with higher attraction (right quadrant), rejection/separation(-) with higher repulsion (left quadrant), neutrality (0) with weak attraction and repulsion (bottom quadrant); strong attraction and strong repulsion (\pm) (ambivalence, upper quadrant) creates unpredictable switches between choice and rejection.



C The distribution of outcomes (choice/union or separation/rejection) represents a third dimension (z) outside the plane of attraction (p) and repulsion (n). As ambivalence can lead to either choice or rejection, there is a fold in the outcome surface representing the distribution of outcomes. This is a catastrophe model, in which (b) the bifurcating control parameter is the energy provided by the union opposites ($b = f(p + n)$, where $f =$ function, and the asymmetry (a) between outcomes is given by the difference between attraction and repulsion ($a = f(p - n)$).

D Catastrophe models comparing the distribution of sociometric outcome with attraction and repulsion, in conditions of high (left) and low (right) threat, illustrating the relationship of the distribution of the intensity of attraction (right vector) and repulsion (left vector) on the *diamond of opposites* (bottom plots) with the sociometric outcome expressed in spikes of different height (middle plots: tall = choice; medium = neutral; short = rejection), and corresponding three-dimensional surface (top). The high-threat criterion (left) yields a two-dimensional line (top left), indicating a polarisation of opposites along a continuum. Conversely, the low-threat criterion yields a surface with a fold (top right) associated with a catastrophe distribution. Note the coexistence of attraction and repulsion corresponding to neutrality at low intensities and with both choices and rejections at high intensity.

a group as partners for specific activities (sociometric criteria). The sociometric test (Hale 1981; Moreno 1978) is a self-report instrument where subjects delineate who, among the others present, they will choose to engage with in a specific activity. It involves real persons in actual interpersonal situations. Each group member is asked to assign other individuals in the group to one of three categories that they: (i) choose to participate with; (ii) choose not to participate with; or (iii) choose to remain neutral towards, and to rank their choices and rejections in order of preference.

In the sociometric test, the selection categories are assumed to correspond to the two underlying motivational forces, attraction and repulsion, or their presumed absence, neutrality. Moreno interviewed all of the subjects about their choices, adamant that a test should include the reasons for choosing. Such explanations uncover a multiplicity of reasons and feelings, which may be in part contradictory, creating various degrees of ambivalence. Yet, there has been no way to include this information in the traditional sociometric format, in which both the data-collection method and analysis are based on the either-or separation of opposites, choice and rejection and on linear numerical order such as rank ordering of choices. The sociometric methods that assume a linear continuum of attraction–neutrality–repulsion fail to disclose contradiction and ambivalence. This omission compromises their informational value (Hale 1989; Sabelli 1989: 405–6), a limitation that is not unique to sociometry. Empirical studies using regression analysis (Carlson-Sabelli 1992; Carlson-Sabelli *et al.* 1992a) indicated that attraction and repulsion are not inversely related. Hence, the linear continuum model of traditional sociometry distorts the data, and should not be used clinically.

The existence of ambivalence, contradiction and complexity in motivation and emotion is widely recognised, and the coexistence of opposites is taken as a basic feature of psychological processes at least since Freud, Adler and Jung. Likewise the principle of the union of opposites occupies a central place in process philosophies, and in quantum physics (Bohr's complementarity principle), but there has been no practical manner to apply it to empirical data.

The phase plane of opposites

Process theory approaches this problem by measuring opposites such as attraction and repulsion separately, using the phase plane of opposites (Figure 5A). The phase plane of opposites is a co-ordinate plane in which each axis represents the intensity of a pair of opposites. We originated the phase plane of opposites (which we call by the less technical name, the *diamond of opposites*) as a method to study the development of family relations of psychiatric patients (Sabelli 1989: 405), and later on as an

action method with groups of patients and students (Carlson-Sabelli and Sabelli 1992b,c). Group members are asked to place themselves within a large diamond drawn in the centre of the room. The bottom vertex represents zero feelings (indifference or neutrality), and serves as the origin for the two axes along which the protagonists report their subjective estimate of the intensity of their opposing preferences, emotions, attitudes and feelings. Each group member is asked to stand within the diamond at the point determined by the intensity of both positive and negative feelings. The top vertex represents an area of contradiction, where opposing feelings are both intense and equal. Here there is a moving scenario, as those individuals with strongly contradictory feelings tend to pace near the top vertex, while the indifferent individuals stand quietly near the origin.

We use the diamond of opposites to measure separately the intensity of attraction and repulsion (the underlying opposing motivations involved in choice making). This is the first step in the *sociodynamic test*. By measuring attraction and repulsion in a bi-dimensional construct, the sociodynamic method provides an estimation of ambivalence behind each choice, making available for quantitative and dynamic analysis information found only in the reasons for choice on the sociometric test.

Introduced by the French mathematician Poincaré at the turn of the century, the phase plane has become a main tool of modern mathematical dynamics. The patterns of a complex process can be found by plotting its trajectory on a space defined by two (phase plane) or three (phase space) dimensions. The choice of the variables taken as co-ordinates is a difficult and critical step for which dynamics itself offers no suggestions. Process theory suggests that the most revealing plots will be obtained by choosing pairs or triads of complementary and opposite forces as the axes of the phase space. This is the phase plane of opposites, and it provides a practical method to study empirically, and numerically, contradictory processes. The phase plane of opposites is a generic method applicable not only in sociometry but also in psychological testing (Carlson-Sabelli *et al.* 1992a; Sabelli 1989) and in the natural sciences (Sabelli 1989, 1992). The diamond of opposites depends on the ability of individuals to report opposites, either by assigning a numerical number to the intensity of each opposite separately, or reporting each as a single point on a co-ordinate plane. We prefer to have individuals use the second method, to mark the place within the diamond intuitively, either in action (by standing in a particular spot), or in writing, without pre-assigning numbers. Why? It is the data plot, the configuration formed indicating the relationship of the opposites that we are interested in. The plot provides a way to envision the relationship of various combinations of opposites to outcomes. When opposites are plotted on a co-ordinate plane, the surface can be roughly divided into areas reflecting the mix of opposites. When the choice-making

process is mapped, attraction and repulsion are the opposites, and sociometric selection (choice rejection, neutrality) and rank order are the outcomes which can be plotted together on the surface as symbols (Figure 5B) or as a third dimension as spikes (Figure 5C).

It can immediately be read and interpreted, whereas numbers have to be plotted before they are useful. Indicating opposites on the phase plane simplifies the process and eliminates errors in scoring. If additional statistical analysis is to be done, the corresponding co-ordinates can easily be determined.

To create a phase plane of opposites: (i) decide which opposites are involved in the process; (ii) measure them separately (thereby allowing for an empirical evaluation as to whether they neutralise each other or grow together); (iii) graph them together as a point on the co-ordinate plane, noting the time; (iv) connect in order the points obtained at different times, drawing the trajectory of the process. Trajectories delineate patterns towards which processes converge when transient influences fade away (*attractors*), such as a consistent choice, *repellers* from which processes diverge (such as rejectees), as well as transitions from one attractor to another (*bifurcations*), such as switches from choice to rejection. Many complex processes converge to simple attractors, and can therefore be studied by examining plots in two or three dimensions (phase plane and phase space). Low energy is associated with decay towards equilibrium attractors (neutrality); moderately intense opposites produce bifurcations and cycles (periodic attractors) between them. High-energy opposites produce repeated bifurcations that lead to turbulence (chaotic attractors) and the emergence of novelty: creativity results from the union of high-energy opposites.

The union of opposites

Processes include both harmonious and antagonistic interactions between coexisting and similar opposites. Life itself is energised and procreated by the intercourse of opposite sexes; social processes are organised by the cooperative and conflictual interactions between administrators and workers; matter is constituted by positive protons and negative electrons. The union of opposites contrasts with the separation of opposites posited by logic (opposites as mutually exclusive categories, such as choice versus rejection), by linear thinking (opposites as polar extremes of a continuum, such as in the rank order of choices) and by dialectics (opposites as antagonists). The union of opposites has a number of important applications in sociometry.

First, roles are complementary. The ability to take on a desired role, depends on pairing with another person who plays the reciprocal role. One cannot mother without a child, teach without a student, or become a

husband without a wife. When one is unable to play a role he or she desires to engage in, act hunger occurs. Second, opposites are more synergetic than antagonistic. For instance, it often appears that because resources are limited, one can gain only at the expense of the other; in fact, such economics do not apply to a marriage (where either both spouses gain or both lose) or to any other type of partnership, and, in last instance, we are partners of all those with whom we coexist. So, to benefit myself, I must benefit the other. Third, opposites are more similar than different. Hence, love to be loved, choose to be chosen, be tolerant to be tolerated, act non-violently to decrease violence. And yet, violence may also be increased by failure to defend oneself, tolerance may promote the development of intolerant groups and choosing may be one-sided. Harmony requires conflict, and conflict can create harmony. Fourth, opposites coexist: feelings of attraction and repulsion almost invariably underlie every important choice, and even opposite behaviours such as choice and rejection alternate and/or coexist in many interpersonal processes.

The principle of the 'union of opposites' has been known since antiquity; process theory adopts it as its second law, and operationalises it through the phase plane of opposites. The clinical usefulness of this method has been supported by experimental studies (Carlson-Sabelli *et al.* 1991; Carlson-Sabelli *et al.* 1992a; Carlson-Sabelli 1992) as well as by clinical experience. Opposites we often explore are inclusion and exclusion, feeling good and feeling bad, healthy and unhealthy, organised and creative, externally motivated and internally motivated, thinking and feeling, introverted and extroverted, feminine and masculine, grandiosity and low self-esteem (as characteristic of depression and of self-disorders) (Sabelli 1989).

The sociodynamic test

The sociodynamic test consists of the report of feelings of attraction and repulsion towards a given choice (person, activity, opinion), followed by the report of the categorical selection and the rank order of choices as customarily performed in sociometry. The sociodynamic test thus includes, and expands, the sociometric method, and can be performed in action as well as a pencil-and-paper exercise. Co-ordinates for attraction and repulsion are plotted as the opposites in the diamond (Figure 1B). As mentioned above, sociometric selection (choice rejection, neutrality) and rank order can be plotted as symbols (see Figures 1C and 5B) in the plane, or as a third dimension in space (see Figure 5C); when the test is performed in action, one may sit or stand to indicate choice or rejection. Choices are expected on the right quadrant where attraction is high and repulsion is low. Conversely, rejections are expected on the left, where repulsion is high, and attraction low. Along the vertical axis of the

plane, attractive and repulsive forces are fairly equal; when neither opposite is dominant, but they are fairly symmetric in intensity, the person may express neutrality, but also may choose or reject, hence the selection is unpredictable. In such cases, the combined intensity of both opposites together is useful to understand the psychological process. The bottom low-intensity area, where there is very little attraction or repulsion, is associated with neutrality in sociometric selections. In contrast, when the pulls to choose and to reject the same person are both intense at a given moment, the protagonist may choose or reject, but does not remain neutral. Two different outcomes, sociometric choices and rejections, are associated with the same underlying condition, highly intense opposites, coexisting in ambivalence and contradiction. Because both opposites are strong, but neither dominates, a little nudge can cause a qualitative shift from a choice to a rejection, or vice versa. This is called a *catastrophe* (see p. 171), which is the simplest form of a bifurcation.

When motivations are highly contradictory, subjects often give a higher-rank order to rejections than to some choices (Carlson-Sabelli 1992). This discrepancy between choice and preference is particularly significant in view of similar phenomena in experimental animals: resection of the brain amygdala eliminates valuation regarding food consumption – the animal eats not only food but also other kinds of objects, including harmful ones; however, the rat still eats everything in the same order of preference before the resection (Pribram 1990). This exemplifies that motivations, rank order and categorical values of choice are different measurements of the same phenomenon. Contradictory motivation dissociates preference from value in interpersonal choices. The discrepancy between sociometric choice and rank order of preferences exists only when underlying motivations are contradictory and indicates the value of measuring and mapping all three.

Clinically significant events occur in conditions of contradiction. Because of the instability, persons indicating activity in this area, are most susceptible to therapeutic action.

Using the diamond of opposites in psychodrama

We often use the diamond of opposites as a method to choose a protagonist for psychodrama, using the right axis to represent the intensity of positive feelings towards choosing oneself to be the protagonist, and the left axis to represent the intensity of feelings against becoming the protagonist. Those individuals with strongly contradictory feelings pacing near the top vertex are ready to change, and hence to become the protagonist, while the indifferent individuals standing quietly near the origin, are less motivated to change, and less ready to be the group's protagonist.

After reporting their underlying tugs towards and against being a

protagonist the group can be polled concerning their pulls towards and tugs against each choice, once again, on the diamond. A chosen protagonist can poll potential directors concerning their desires for and against directing the drama. Once understood, the diamond of opposites can be used in any number of ways. For example, the exercise can also be used to ascertain those persons whose attention is not with the group. We do this by asking each participant to take an inward look and identify how much of their attention is focused in the present, and how much is focused in the past or future. Each person is asked to assign each of these opposites an intensity score from 1 to 10 and to report their scores by physically placing themselves on a co-ordinate plane drawn on the floor, stating the numbers assigned to each opposite and the reasons for their placement. The report identifies distracted individuals and allows group participants to articulate problems that are weighing on their mind. This exercise identifies persons who might need assistance, perhaps even a psychodrama, before being able to contribute to the work of the group. When selecting a protagonist based on this 'diamond of opposites check-in', we often ask the group to choose among the individuals in the 'focused elsewhere' (left quadrant) and high-intensity 'split focus' (upper quadrant) areas (see Figures 1C and 5B). The drama with a protagonist chosen in this manner addresses concerns that are blocking focus. The purpose is to facilitate inclusion, and contribute to the wellbeing of the group.

As other action methods, the diamond of opposites may be used as a warm-up to psychodrama. It provides a meaningful development of the central concern model (Buchanan 1980), widely used to discover and highlight issues of immediate concern in a particular group by polarising opposites from material expressed early in a session. In the central concern model, individuals representing the extremes of each opposite are placed at the ends of continuum. Other group members are asked to find their place in between, forming a spectrogram (Kole 1967: 53-61). Using the diamond of opposites serves to highlight the contradictions that are essential to the understanding of the process, and that are obscured by the linear continuum. Using the continuum to report emotions, attitudes or behaviours, forces participants, and the group leader, to think in black-and-white dichotomies. In contrast, the diamond of opposites gives insight into the coexistence of opposites. It provides a way for participants in the centre of the continuum to recognise that there may be differences among them, regarding the total intensity of the opposites. Some individuals place themselves in the centre of the continuum because they do not relate to either opposite very much. Others might be feeling a great deal of both. These situations are concealed by the continuum, and revealed with the diamond. Further, with the diamond, persons at either end, may be prompted to assess if they usually are in a polarised position with regard to the opposite being explored, or if they are also capable of modulating

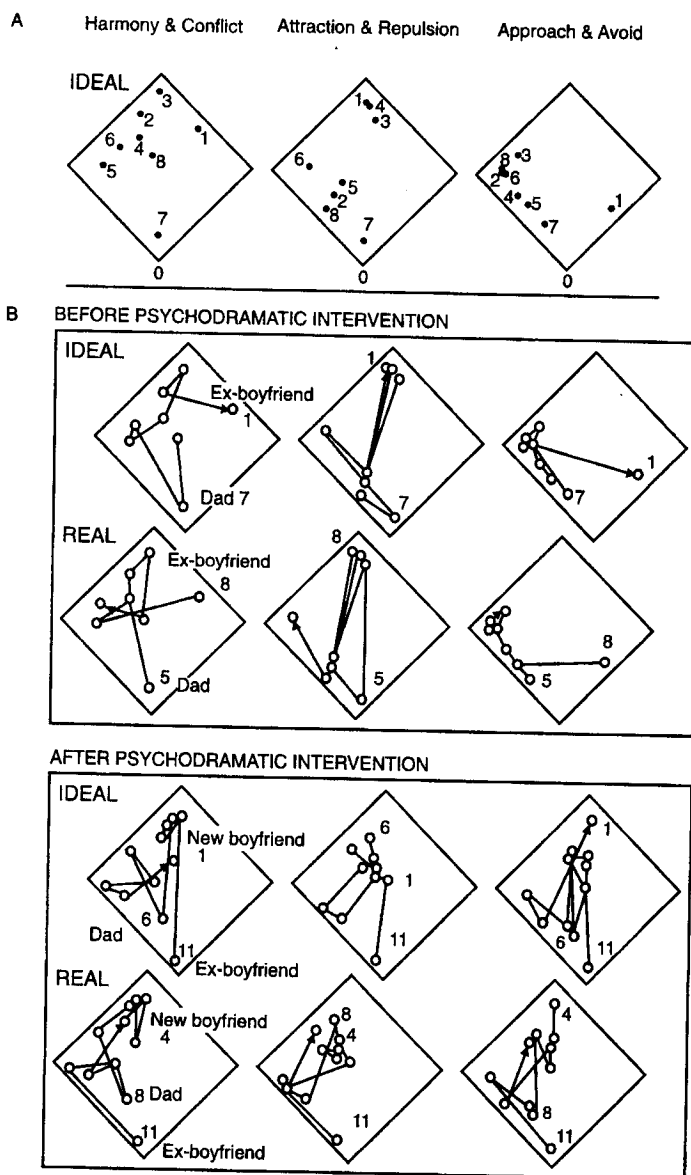


Figure 6 Interpersonal profile. A Diamonds of opposites depicting the intensity of harmony/conflict (left), attraction/repulsion (middle) and approach/avoid (right) in the interpersonal relations of one subject with the most important persons in her network numbered to indicate the order in which she would like to have contact (ideal rank order).

B Trajectory plots comparing the desired situation (top) with the real situation (bottom) concerning the amount of time one subject spends with significant others, before and after psychodramatic intervention.

their responses. Often they find that they belong in the contradictory quadrant, rather than in a polar extreme. The diamond includes the continuum, and provides a vehicle to acknowledge and report complex interactions of competing attitudes, thoughts and feelings underlying behaviour.

Interpersonal profiles

Attraction and repulsion is only one of the possible pairs of opposites relevant to sociometric choices; we also include harmony and conflict, and approach and avoidance, as opposite axes of the phase plane. We ask participants to generate a list of persons with whom they are emotionally connected, and to indicate (i) the order in which they would like to spend time with each person (ideal rank order); and (ii) the order in which they actually spend time (real rank order). Next, they are asked to indicate the intensity of their feelings regarding their interactions with each individual on their list by placing a point within each of three phase planes of opposites (harmony/conflict, attraction/repulsion and approach/avoid) (Figure 6A). Two sets of trajectory plots are made by connecting the dots according to ideal and real rank order from last to first; the arrow points to the person ranked first. In this way, the pattern indicating the real situation (Figure 6B), can be visually compared with the wished-for (ideal) situation (Figure 6B). We noticed in studies with twenty-two persons (Carlson-Sabelli and Sabelli 1992b) that the neutral quadrant was much more empty than the contradictory quadrant in all the plots in all subjects, indicating that coexisting opposites are more likely to create ambivalent bonds than neutrality. Thirty-six per cent reported at least three relationships in the contradictory corner of their plots denoting a process that is predictive of catastrophic switches between opposites, where one's choice might easily become a rejection, and vice versa. Finally, we were surprised when comparing information concerning real relationships with wished-for (ideal) relationships. We expected that the trajectories of ideal rank order would point to the extreme left vertex indicating a desire for pure harmony, attraction and approach, but such a pattern was observed only in 33 per cent of the subjects; apparently many people want some degree of conflict in their relations.

Because each reveals personally unique patterns, we use interpersonal profiles in our groups for targeting issues and measuring change in psychotherapy (Carlson-Sabelli and Sabelli 1992b, c). When used in conjunction with the social networks inventory (Treadwell *et al.* 1993), one can determine whether individuals dissatisfied with social distance in their important relationships wish to move towards or away from intimacy.

Identifying issues and evaluating the effectiveness of psychodrama with the interpersonal profile

Illustrated here are interpersonal trajectory plots before and after psychodramatic intervention for a young woman (Figure 6B). The 'before' plots (top) indicate a big discrepancy between this woman's wished-for (ideal) and real situation. Her first-ranked choice for contact (an ex-boyfriend), is the person with whom she reports having the least contact, suggesting potential unfinished business in this relationship. Further, she has more variance in the harmony/conflict and attraction/repulsion plots, than in the approach/avoid realm, suggesting a need to broaden her range of response.

After psychodramatic intervention, this subject's problematic relationship (ideal rank 1, real rank 8) shifted from the high-intensity contradictory area to the neutral corner and was replaced by a new one which is less conflictual (bottom), indicating that the unfinished business with her boyfriend had been completed. However there is still a lot of discrepancy in the ideal (1) and real (11) rank of the new boyfriend, indicating more work needs to be done to break the pattern regarding her relationships with significant others. This will likely involve psychodramatic work with early familial relationships from which this pattern emerged.

We are now in the process of creating an interactive computer program to provide immediate analysis and to track trajectories of change in every relationship reported on, over time, and to provide the capability to measure a variety of opposites.

Mutuality and accuracy of interpersonal perception

Interpersonal choices and bonds are two-way processes. Marriages, for instance, require a sustained mutual choice, and the ever growing creation of behaviours that accommodate both spouses. Mutual choices strengthen the bond between individuals and provide stability to groups; likewise rejections tend to become mutual. In the process of mutual interactions, how we feel for others becomes similar to how others feel about us, and vice versa. Attraction begets attraction, and repulsion begets repulsion (similarity of opposites). Attraction and repulsion involve a perception of how others feel towards us just as choice and rejection involve the anticipation of how others would regard the decision. As social conflicts are introjected as fear and distrust for members of social groups different from ours (*para-consciousness*) (Sabelli 1989), we can create the conflicts we fear. Paranoids become isolated, while, in contrast, 'Pollyannas' become popular. Choices are also impacted by one's perception of the opinions of third parties. The Rockwell occupational approval grid (Rockwell 1987) has been developed as a tool to clarify this aspect for individuals considering various careers.

Fearing rejection, individuals may avoid choosing someone whom they

regard highly, and so it is not unusual that a highly desirable partner be left without one. Choosing to go out with a girl my brother dislikes might be motivated by the response expected from him, or might take place in spite of his opinion. Attraction to one person may become rejection of another to whom we also feel attracted. These scenarios exemplify the complexities in the process of choice. Compounding it all is the fact that misperceptions can and do occur. Accuracy of interpersonal perception is important because choice is a two-way process, in which the choice of A by B favours the choice of B by A.

To measure the *accuracy of interpersonal perception*, subjects add to their reports of choices and intensity of opposing motivations, their guesses concerning the choices (Bonny 1943; Hale 1981; Moreno 1942) and motivations of the others for them (Carlson-Sabelli *et al.* 1991; Carlson-Sabelli *et al.* 1992a; Carlson-Sabelli 1992). In experimental studies, the ability of individuals to perceive correctly how much others are attracted to and repulsed by them (sociodynamic test) was greater than their ability to predict whether they were chosen or rejected (sociometric test), because choices and rejections are unpredictable when motivation is contradictory (Carlson-Sabelli 1992; Carlson-Sabelli *et al.* 1992). This suggests that intensity scores of attraction and repulsion should be used, instead of the actual decision, in computing and indices of accuracy (the degree to which one reads others accurately) and openness (the degree to which one is read accurately by others) regarding interpersonal perception. Perceptual sociometry can thus be developed as a measure of personal ability to understand and be understood by others, and may serve to evaluate the effectiveness of the role reversal technique used in psychodrama, and in family therapy, to improve empathy.

In attempting to understand two-way empathy, Moreno (1978) developed the sociometric test, and developed the concept of 'tele' as 'the reality-based feelings individuals have for one another in shared, here-and-now interactions related to roles and situations'. He thus contrasted 'tele' with psychoanalytic transference, which 'is not reality-based'. In our view, irrational transference feelings and objective economic bonds are as important as any form of empathy in the constitution of groups. We use interpersonal libido as a comprehensive construct that includes these various forms of bonding energy; action graphs are one method to study this process, while the measure of energy in the sociodynamic test (see below) is another.

CO-CREATION OF CHOICE

Catastrophes: how the interaction of opposites promotes creativity

Moreno's concept of co-creation is the core of the third law of process theory: Natural evolution and individual development result from the

co-creation of opposites. The goal of sociometry (and of sociodynamics) is to measure and enhance our ability to choose, to create and to co-create harmoniously with others.

Metric models imply that selections are a linear outcome of attractions and repulsions; they are unable to deal with novelty and creativity, which are, by definition, non-linear. As discussed earlier, attraction and repulsion do not neutralise each other; their algebraic sum does not predict the sociometric outcome. On the contrary, the very nature of choice forces one motivation to overcome the other, and when both motivations are intense, selections are unstable, and likely to switch rapidly between choosing and rejecting, and thereby creating a more complex form of behaviour than either one or the other. Phase-space portraits allow us to analyse complex phenomena where gradually changing forces or motivations lead to abrupt changes in behaviour that do not fit unidimensional linear models. Discontinuous, sudden, qualitative shifts from one equilibrium state to another, such as from choice to rejection, or vice versa, are modelled in mathematics by a *catastrophe* (Thom 1975).

In experimental studies including thirteen different groups, we have observed a linear distribution of selections as a function of choices only in a few cases (Carlson-Sabelli *et al.* 1991; Carlson-Sabelli and Sabelli 1992b,c; Carlson-Sabelli *et al.* 1992a; Carlson-Sabelli 1992). In contrast, we have shown empirically that the distribution of interpersonal choices as a function of the underlying feelings of attraction and repulsion can be adequately modelled by a fold (see Figure 5C), one of the seven possible types of catastrophe (Thom 1975). Further studies may reveal that different criteria, different social circumstances, or different personalities generate other forms. Figure 5D illustrates the distribution of actual data obtained with criteria of differing threat: a linear distribution is the best fit when the sociometric criterion has a high-threat case, while in the low-threat case, data have a better fit with a catastrophe fold. Figure 5D indicates the expected correspondence of the co-ordinate plane of opposites with the catastrophe surface.

In mathematics, the term catastrophe does not have the connotation of a traumatic event: it describes a process where there is a potential for divergence because there are two competing point attractors. Consider, for instance, an animal confronting a threat. If frightened, the animal will retreat, whereas anger without fright predicts attack. When the animal feels the threat to be weak, and hence is neither frightened nor angered, the outcome is neutral, and the behaviour is more complex, either indifference or curiosity. When the animal is both intensely frightened and intensely angered, the outcome is even less predictable, and the animal may retreat or attack, or switch from one behaviour to the other. The direction of the switch is easily influenced by small external triggers. This switch between retreat or attack is an example of a catastrophe.

A catastrophe is the simplest form of non-linear change (bifurcation). When many bifurcations occur, there is chaos, which is not randomness but a turbulence that creates novelty and complexity. Chaos represents heightened spontaneity and creativity. As bifurcations serve as the basis for chaos, choices serve as the basis for creativity. Introducing catastrophe modelling into sociodynamics allows one to develop a strategy to promote creativity. The shape of a catastrophe is determined by two control variables: (i) a bifurcating function that at low values leads to a continuous outcome, while at high values the outcome is discontinuous; and (ii) an asymmetric variable that at mid-values is associated with large changes between the modes, while at extreme values is associated with small changes around the modes. We discovered that in our data the bifurcating function could be calculated as the sum of the underlying opposing forces of attraction and repulsion, while the asymmetric function was their difference. Intuitively, both opposing forces contribute energy (bifurcating factor) to the process: at low energy, there is neutrality, and at high energy, choice, rejection or ambivalence. The difference between opposite motivations provides information regarding the direction of the outcome (asymmetric control parameter). These results root sociometry in the powerful mathematics of catastrophe theory. They also suggest that catastrophes, the simplest form of non-linear, i.e. creative interaction, result from the union and difference of opposites (Sabelli 1989; Carlson-Sabelli and Sabelli 1992b; Seiden and Sabelli 1992).

We propose (Sabelli 1992; Seiden and Sabelli 1992) a *formula for creativity*: unite opposites (opposite opinions, perspectives, classes) such that both are of approximately similar and relatively high intensity. Testing the multiple motivations and conceptions that a person has at a given time, and as they evolve in time, in the phase plane of opposites, can reveal contradictions, and thereby promote creative solutions that include both opposites. In physical processes, novelty and complexity arise when a process is shaken by strong fluctuations leading to chaos, which in turn, create new and complex structures. Likewise, emotional contradiction does not arrest in balanced equilibrium or ambivalence, but the interaction of opposites co-creates novelty and complexity.

The co-organisation of groups

The complex process of organisation and reorganisation of real groups must be composed of a myriad of bonds and choices. Spontaneously formed groups may appear to exemplify 'self-organisation', but, in fact, groups are co-organised by the interaction of many, mutually contradictory, processes. As each person attracts and repels others in different respects and at different times, we may conceive of persons as being attractor-repellers in the interpersonal field. Each action and each choice

represents the conjoint result of a multiplicity of personal and group processes. *Sociograms* are visual representations of the process of interpersonal choices among persons in a group (Moreno 1978; Hale 1981; Blatner and Blatner 1988a). Their value is limited because they are snapshots of a process, and only represent the conscious and public aspect of this process, and nevertheless are useful to the individual (who learns about her/his patterns of interaction, and gains access to roles and relationships) and to the creation and nurturing of groups. Sociograms can be expanded after the fashion of action graphs, to include not only choices but also other types of bonds between the individual members. In the standard sociogram, each person is connected to each other by a coded arrow denoting either choice or rejection, the thickness of which indicates its strength. The sociodynamic test allows one to draw in each case two arrows, attraction and repulsion, thereby revealing more cogently the dynamics of the group.

Data from the sociometric test provides information about the group including the existence of subgroups, and the identification of pivotal persons linking them with each other. The visual configurations of the bonds among group members reflect the way the group members organise themselves around a particular criterion in a straightforward manner, so persons unfamiliar with sociometric methods can understand a great deal about the group from it. With several tests, patterns of relating can be identified, and interventions to promote connectedness planned. The degree of connectedness with and isolation of an individual from other persons in a group conveys information about one's access to roles. Sociograms serve to identify stars (chosen by many), isolates (one who neither chooses, nor is chosen), rejectees, stars of incongruity (rejected by those he or she chooses or vice versa), and connectors. The study of sociograms sometimes reveals the existence of individuals who are both chosen and rejected more often than others. Plotting feelings of attraction and repulsion readily reveals in sociograms, or in the phase plane of opposites, the identification of four classes: indifferent isolates, attractive stars, repulsive rejectees and bifurcators. *Bifurcators* give and receive strong feelings of attraction and repulsion, and may be the target of many choices in some groups and of many rejections in others. They are, in general, high-energy persons, ranging from innovators and creators to bipolar personalities and manic-depressive patients, and other persons with strong personalities and/or strong convictions.

Sociometric asymmetry and social hierarchy

In all groups, interpersonal affection and choice is distributed unevenly. Some individuals are rich in choices, receiving far more love than they can reciprocate, while there is a number of unchosen, unwanted persons, who

receive far less love needed for emotional growth and integration. Moreno discovered this asymmetry in the distribution of choices, and considered it the most basic sociodynamic law (Moreno 1978). Moreno's *sociodynamic asymmetry* is not a particular characteristic of processes of choice. The sociogram of an organisation does not make sense unless we distinguish levels of hierarchy, which are not determined by mutual choices, but by the choice of those in power. Likewise, social hierarchies are determined by reasons of birth and wealth, not by choice. Whereas greater equality is often desirable, one must also recognise that human asymmetries are just one particular case of Pasteur's *cosmic asymmetry*, that exists in every structure, and that is acknowledged as a fundamental feature of biological processes (Clynes 1969). According to process theory, asymmetry is the imprint that energy flow leaves on all structures, serving to store information (e.g. cultural conserves) and as a catalytic agent to direct change (Sabelli 1989; Sabelli and Carlson-Sabelli 1989). Just as in nature, high-energy systems tend to gain energy at the expense of lower-energy systems, so in society persons rich in energy, wealth or choice, draw from the weaker others. Here sociodynamic asymmetry reappears in its most fundamental form, as social hierarchy, economic inequalities, personal domination and, at times, oppression and abuse. Social status predetermines choices (priority). People who are rich or powerful are often chosen. This point is clinically important, as persons with low status often suffer a further decrease in their self-esteem because they receive few choices. Illuminating the biological and socioeconomic bases of sociometric asymmetries serves to heal many psychological and interpersonal wounds. On the other hand, people become rich and powerful because they are chosen by others (supremacy); it is thus of practical importance to learn strategies to improve our 'sociometric wealth', such as 'choose to be chosen'.

To explore these issues in action, group members may line up according to their perception of how often they are chosen, and interchanges between highly-chosen and seldom-chosen persons may elicit significant material. We add to this linear exercise a number of two-dimensional planes, including the frequency of being chosen and being rejected (revealing bifurcators), as well as (in groups of persons who know each other) subjective and collective estimates of these two parameters (widely differing for many types of personality). It is also therapeutic to understand that hierarchies are bi-directional. For instance, *male supremacy* is a reality, but so is *female priority* (Sabelli 1989; Sabelli and Carlson-Sabelli 1989; Sabelli and Synnestvedt 1990), as mothers are the first environment, the first love, the first authority and the first identification figure in the lives of most individuals. Moreover, women usually outlive men; hence older men have more choices than women (supremacy), but more women than men are alive to choose (priority). Recognising that women have power, sometimes even greater power than men in the family, does not deny the

oppression of women in society at large, nor is intended as a compensation, but rather serves to recognise a reality, and to provide a basis for empowering the oppressed in each circumstance. To highlight the coexistence of opposing patterns of power in each relation, it is useful to request persons in a family or group to plot their intensity and extension in a plane of opposites. One may thus identify areas in which each spouse dominates the other, as well as areas in which there is equality or alternation of power. We discussed home economics in terms of interchanges of labour (energy) such as each person's contribution to home tasks, of information (practical, affective, intellectual) and money (matter) leading to relations of status. But labour and wealth not only have a use value; they also have a price or market value. It seems hard to look at the exchange value of people, but the reality is that groups are not closed, and that as many as 50 per cent of marriages end in divorce in the USA today.

Sociographs of family and group relations

Sociograms are also applied to study open natural groups, such as families and the 'social atom', the network of persons directly interacting with a given person. Social atoms are open systems, that extend indefinitely, without boundaries, but with decreasing exchange of energy and information at the periphery. The person is the one centre of a double cone that expands towards many in the past and towards many in the future. The advantages of the here and now indicate the usefulness of sociometric snapshots of groups under study, but when group members report about their outside relations such advantage is lost, while much can be gained by looking at relations historically. Sociographs plot the trajectory of the process of change in interpersonal bonds over time. These are constructed by plotting the intensity of opposites in a relationship, for example, attraction and repulsion, as a single point on a co-ordinate plane. Connecting the points from past to present, produces a trajectory depicting the pattern of the change for each relationship plotted. Figure 7 illustrates the evolution in time of the relation of a marital couple with the main significant other, over their life span. Sociographs can be obtained for natural groups such as families, or for the therapy or educational group in which the exercise is performed. We can thus compare the relationships of one person with others in different situations. Subjects are asked what they notice about similarities between the temporal patterns of their relations inside each of these groups (family, work, therapy group), as well as regarding the differences in pattern between their wished-for (ideal) and real situations. What can you do to move from the real towards the ideal? What are the barriers? What relationships need working on? What other issues does this exercise highlight for you? When we do this exercise in action, we ask the protagonist to reverse roles by standing in the site where she or he has

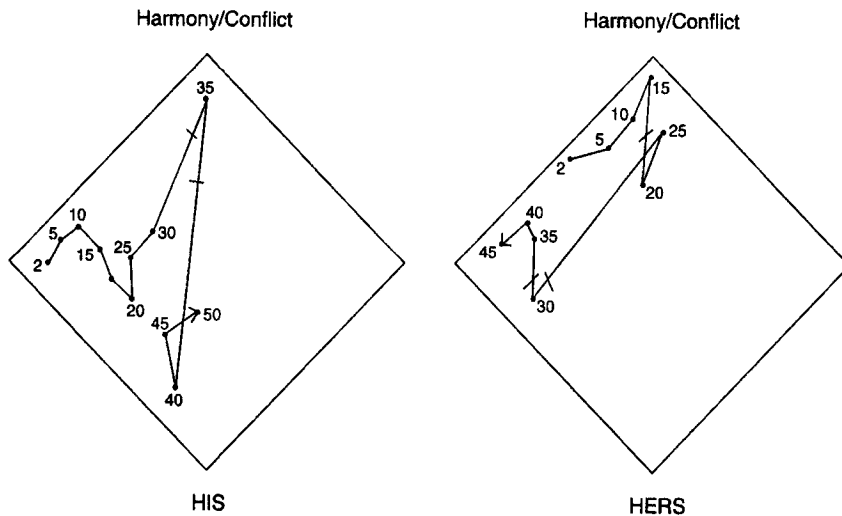


Figure 7 Sociographs. A sociograph is a trajectory constructed from connecting sequential measures (T_1 , T_2 , etc.) indicating a pattern over time. This trajectory indicates the amount of harmony and conflict reported by husband and wife regarding their most significant relationships over the course of their life.

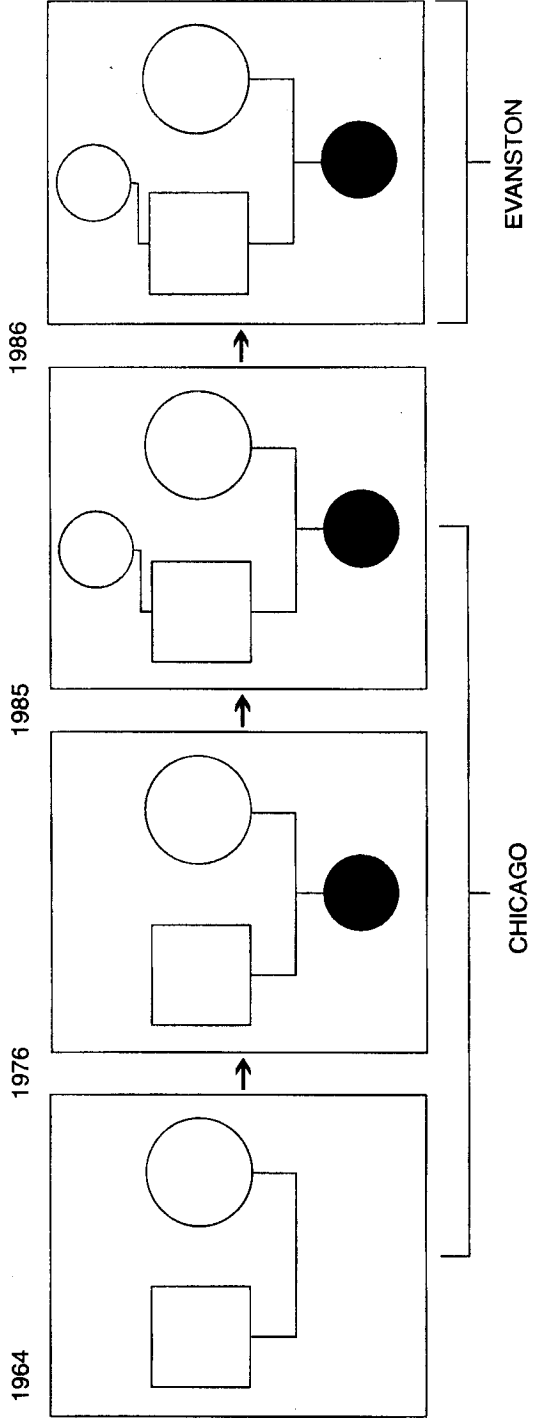
placed mother, father, spouse, child, co-worker, at various points in time, and from that position spell out how they feel *vis-à-vis* the protagonist. This exercise illustrates sociodynamics as a sociometric method that focuses on long-term processes of interaction between coexisting contradictory feelings in the co-creation of situations and relations.

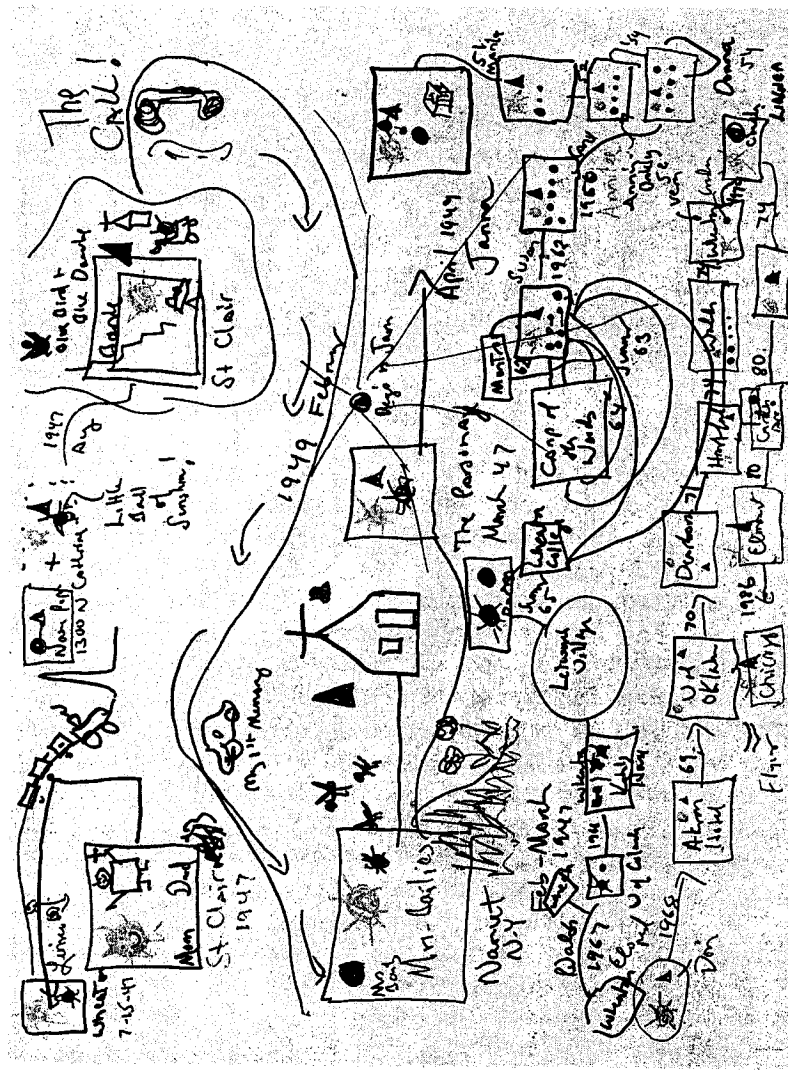
Colour sociograms

Seeking the *trifurcation* of opposites serves to understand patterns that are otherwise obscured by the tendency to think in pairs of opposites. The three primary colours serve as a model to understand the trifurcation of opposites. We use them therapeutically, to encourage people to go beyond the dichotomies of black and white thinking, shown by Adler (1954) and by Beck and co-workers (1979) to predispose to neurosis and to depression (Sabelli and Javaid 1991). We invite people to think of one possible pattern of behaviour that corresponds to each of the primary colours, and to their combinations.

In a typical group exercise, the participants are asked to assign a colour to (i) each other group member; and (ii) all persons in their family and social atom, by listing their names on labels of eight different colours (three primaries, three secondaries, black and white). We first examine

A THE HOUSEHOLD METHOD





B

Figure 8 Households. Portrayed here (A) is the household of a 20-year-old woman (filled circle) still living with her parents. She was an only child, born when her parents had been married 12 years. At age 9, her half-sister, a daughter of her father from a previous marriage, joined the family and soon after, the family moved from the city to a suburb. A household changes whenever a person enters or leaves the household, or the person doing the exercise, moves, and can be embellished in a variety of ways (B).

the results in terms of correlations; for instance, many times participants unconsciously assign the same colour to the therapist and to one of their parents. Next we ask the participants to pair each colour with the names of coloured objects (fire, sun, water, earth, plant), emotions (anger, sexual arousal, tranquillity, etc.) and behaviours (aggression, escape, harmony, etc.). Then we ask the participants to interpret the colours chosen, under the assumption that colours do have some objective social meaning that have priority (as leading examples, we refer to red anger, depressive blues and cowardly yellow; to red left, royal and police blue, and the yellow of the Vatican theocracy) but individuals add personal meanings that have supremacy. Even at the social level, each colour has opposite meanings; for instance, passion is red, whether sexual or aggressive.

Colour sociograms serve to bridge the dynamics observed in the group with the dynamics of each person's social atom. This renders the study of relations within a therapy group more readily applicable to real life.

Household method

The household method (Figure 8) captures personal history as a series of sociograms which tap into a fundamental natural group. We ask participants to draw sequentially each household of which he was a member, starting with his parents' place before he was born, and defining a transition from one household to another by the entry or exit of one person, or changes in domicile (because these often imply a change in the circle of friends, school, work, as well as may reflect socioeconomic changes) (Figure 8A). Households most often are families, but in all cases represent economic units, and thus reveal significant sociodynamic factors. The history obtained using the household method is very rich. Individuals often embellish these with personalised illustrations (Figure 8B). It is a good exercise early in the life of a group to facilitate members to get to know each other quickly and highlight potential issues that are likely to emerge.

Co-creation games

We start co-creation games with an activity to increase energy and interaction. For example, we might play music and ask everyone to dance. When the music stops, the facilitator yells a number, and everyone has to form a group of that size. When the group is warmed up, we initiate an improvisation with 3 rules: (i) initiate, don't ask questions. Make statements and suggestions; (ii) say yes to whatever is offered, and introduce variations and embellishments; (iii) use partial contradiction; agree with what you can, and offer alternatives. In this improvisation, one person starts an activity in which he or she is doing something. It must be non-verbal. The group guesses what the person is doing. Once the activity

is correctly guessed, another person in the group enters the scene, and it moves from non-verbal to verbal. The two players establish together, by their interaction their relationship to one another, and the reason they are together. For example, a person who starts a scene shovelling, might be joined by someone who says, 'I see you are digging a hole'. Person 1 might have had in mind that he was shovelling snow, but now shifts to accommodate the contribution of the other, through the conversation and action. Meanwhile the audience is responsible for stopping the players any time one of them breaks a rule, providing the opportunity for the rule breaker to try again. This activity goes on long enough for everyone to understand the rules. Next we break into groups of three, getting into groups by counting off by threes, so people are more likely to be with others they know less well than those they are sitting next to. The first person assigns a scene and a character for the other two. The two persons must start a dialogue that is within the scene. Again the rules must be kept, and person 1 is the judge. After 5 minutes, person 2 becomes the judge as persons 1 and 3 continue the dialogue, but with person 3 in the role he or she did not take in the previous dialogue. Finally the dialogue continues with persons 2 and 1, again, with a switch in character so that everyone plays each character and is the judge. A third activity can be added, which involves creating something together, a group co-creation. An activity that works well for large groups is to have a short guided fantasy in which each participant has a personal experience. The facilitator might ask people to relax, breath more slowly and imagine themselves walking in a serene place, a place where they might go when they needed renewal or were celebrating. As they are walking, their wise self comes and takes them by the hand. They come upon a huge cave that has a stone at its doorway. The stone rolls away, revealing a person or character, perhaps an archetypal character, whose presence has special personal meaning for the beholder at this particular time. The attention of the participants is brought back to the group, and each person is requested to draw a picture of the character that emerged doing something, to put a one-sentence title on the drawing, to tape it on the wall and to examine the drawings of others. Finally, each person is asked to draw their figure in someone else's picture, and add a sentence that says something about who it is and why the character has been added. There is no limit to how many characters can be in any picture. After this has been done, we find the pictures with the most characters in them, and have the persons regroup around these, breaking into one to five smaller groups, depending on the number of participants. These groups then are asked to create a metaphor or fluid sculpture depicting the picture they have joined. I have the person who initiated the picture be first in the enactment, and then come out and watch it from outside. The result is the immediate co-creation, a poetic dance with personal and collective meaning.

CONCLUDING REMARKS

Overcoming the individualistic focus of earlier psychotherapy, Moreno developed the *role-reversal technique* to provide insight into the other, and founded sociometry, psychodrama and family therapy on the unifying concept of the encounter. Sociometry and psychodrama are thus related as parallel developments within a *clinical philosophy* which regards *insight into the other* a necessary ingredient for interpersonal health. Understanding the 'role we play' in situations we dislike, we develop empathy for others.

Sociometry highlights the complementarity of roles. Psychodrama reveals them through the role reversal. Sociometry measures relations; psychodrama seeks to understand the causes and choices that lead to them, and provides skills to improve them. A psychodrama can be processed sociometrically, that is examine the reasons for role selections, and consider how one might increase access or gain role relief. Finally, sociometric portraits can be used to identify interpersonal issues, highlight a pattern within a psychodrama (Goldman *et al.* 1989) or evaluate psychodramatic work (Leutz 1992).

As the mathematical and clinical analysis of social behaviour, sociometry represents the product of a comprehensive, scientific and socially conscious clinical philosophy. Conceptualising social processes in terms of energy serves to unify sociometry with biology and economics (priority) as well as with psychodynamics (supremacy). Bridging mathematical dynamics with psychodynamics, sociodynamics embodies the process method of examining each problem from the complementary perspectives of the simpler, more fundamental levels of organisation, that have priority, and of the more complex levels, that have supremacy. The highest perspective is ethical, and hence we include in action graphs a consideration of 'the scales of justice'. Ethical concerns apply not only to individuals but also to society. In Moreno's vision (1978: 3), 'a truly therapeutic procedure cannot have less an objective than the whole of mankind'. In his quest 'to move within a rational therapeutic framework from small group psychotherapy to mass psychotherapy and mass Psychiatry', Moreno was interested in reaching the masses; in his spirit, we are developing sociodynamic exercises that challenge the participants to co-create a society at the service of persons rather than profit or power (Sabelli 1991b; Sabelli and Synnestvedt 1990). Moreno created sociometry as the ground basis for 'sociatry', the psychiatry of society. At this time when social visions are handicapped by a void of ideas, our generation must keep alive this historical mission. Mathematical method, clinical art, and social ethics, are three aspects of the Morenian tradition that should not be separated.

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