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This article presents a theory of groups. The theory takes a more molar perspective on groups than has often been the case in group research. It gives special emphasis to temporal processes in group interaction and task performance. The three main sections of the article present the theory as a series of propositions about the nature of groups, temporal processes in group behavior, and temporal aspects of interaction, respectively. The final section presents brief comments on some implications and potential applications of the theory.

TIME, INTERACTION, AND PERFORMANCE (TIP) A Theory of Groups

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This article contains a theory about groups and how they do what they do. It gives special attention to temporal processes in group interaction and performance (hence the acronym, TIP). It is an attempt to conceptualize groups and group activity at a level of molarity and complexity that reflects, to some degree, the nature of groups in everyday life.

For over half a century, social psychologists have studied groups. Although research interest in groups has waxed and waned, that research effort has accumulated an impressive volume of empir-

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ical work (not all of which is yet thoroughly integrated). That work has also included a number of efforts to formulate both limited and general theories. Useful integrations of portions of past empirical research on groups are given in Bales and Cohen (1979); Davis, Bray, and Holt (1977); Hackman and Morris (1972); Hare (1973, 1976); Kelley and Thibaut (1954, 1978); Levine and Moreland (1990); McGrath (1978, 1984); McGrath and Altman (1966); Moreland and Levine (1982, 1984, 1988); Steiner (1972); Thibaut and Kelley (1959); and Zander (1979a, 1979b), among others. Both the empirical evidence resulting from that work and the theoretical formulations based on it have added much to our appreciation of how groups form, develop, and carry out their activities.

Yet there are some serious limitations to much of that earlier work, especially regarding the degree to which it reflects the structures and processes of naturally occurring groups as we meet them in our everyday lives. In part, those limits reflect features of the methodological and conceptual paradigms that have dominated the group research field, along with most of social psychology, within that same period of time: an analytic paradigm that presumes directional causal relations among isolated factors with little regard for physical, temporal, or social context. Much of the empirical foundation of group theory derives from study of a limited range of types of ad hoc groups under controlled experimental conditions. Most of that work involves very small groups (two to four members) with constant membership arbitrarily assigned by an experimenter that exist only for a limited time without past or future as a group, isolated rather than embedded in any larger social units (organizations, communities). These groups are studied while performing single and relatively simple tasks arbitrarily assigned to them by the experimenter (i.e., not tasks indigenous to those groups) under "context-stripped" conditions.

Such limiting features of the groups on which empirical evidence has been gathered systematically constrain the scope of the theories built on that evidence. The theories do not purport to be about ad hoc, laboratory groups of limited mission and under limited conditions. To the contrary, most group theories purport to be about

groups in general and, by implication, about naturally occurring groups. But the groups we meet in those theories, like the groups used in most studies, differ markedly from the kinds of groups we meet in everyday affairs. The groups that inhabit our theories and experiments are of relatively constant membership. Their activity entails going about some experimenter- or supervisor-assigned, singular, simple, well-practiced task—and nothing else. Those groups never have to decide which tasks to do or to do next. They never have to make do without essential materials, personnel, or other resources. They never have to reckon with disputes, with “freeloaders,” and so on—unless, of course, those are the specific issues of concern for the theorist-experimenter.

Many of the groups we meet in everyday living are not like that at all. They have pasts together, and they expect to have futures. Yet they have variable membership from one occasion to another. They seldom exist in isolation; they are embedded within larger social aggregates—communities, organizations, neighborhoods, kin networks, and departments. Sometimes they do specific tasks, but along with that they usually are engaged in goal-directed activities having to do with interests of specific members and of the group itself, as well as pursuing “production” goals. Even their pursuit of production goals is often not composed of repetitive, unrelated tasks, as in successive “trials” of an experiment but, rather, of complex sequences of interdependent tasks that compose a larger “project.” And they often have more than one such project going at the same time. These and other activities, indigenous to many everyday groups, are largely neglected in past group theories based on studies of limited, context-stripped groups.

In recent years, a somewhat different paradigm for small group research has begun to take shape. Work in this tradition treats groups dynamically and attempts to take full account of the physical, temporal, and social context within which those groups are embedded. Unlike most earlier work on small groups, it gives particular attention to temporal issues. Notable contributions to that new tradition include the work of Altman and colleagues from a transactional perspective (e.g., Altman, Vinsel, & Brown, 1981;

Werner, Haggard, Altman, & Oxley, 1988); Gersick's work on time-linked transitions in work groups (Gersick, 1988, 1989); extensive work by Moreland and Levine on group development and socialization of members into the group (e.g., Levine & Moreland, 1985, 1990; Moreland & Levine, 1982, 1984, 1988); and the work of Poole and colleagues on adaptive structuration theory (e.g., Poole & DeSanctis, 1989; Poole & Roth, 1988a, 1988b). The theory presented here has been influenced considerably by work within that new, temporally oriented tradition and is an attempt to make a contribution to it.

The theory of time, interaction, and performance (TIP theory) presented here is based on a substantial body of work we have done in recent years within a continuing program of research on temporal factors in individual, group, and organizational contexts. The material in this article draws heavily on a number of earlier publications from our research program dealing with groups, time, and related topics (Futoran, Kelly, & McGrath, 1989; Kelly, 1988; Kelly & McGrath, 1988; Kelly, Futoran, & McGrath, 1990; McGrath, 1987; McGrath & Beehr, 1990; McGrath & Kelly, 1986, 1990; McGrath, Kelly, & Machatka, 1984; McGrath & Rotchford, 1983). This article attempts to integrate ideas from those separate presentations into a single systematic theoretical statement, taking into account other research and theory, especially work in that new, temporally oriented tradition.

The conceptual formulation presented here is about the nature of groups and of their interaction and performance. It emphasizes temporal patterning of interaction and performance in such groups. It is expressed as a series of propositions that present assumptions underlying the model; empirical generalizations adduced from several substantial research literatures (on groups, on time, and on communication) and from earlier work in our research program; and hypotheses that are, in principle, testable. The three main sections of the article present propositions about the nature of groups, about temporal patterning in groups, and about the interaction process in groups, respectively. The brief final section comments on some implications and potential applications of the theory.

PROPOSITIONS ABOUT THE NATURE OF GROUPS

Proposition 1: Groups are assumed to be complex, intact social systems that engage in multiple, interdependent functions, on multiple, concurrent projects, while partially nested within, and loosely coupled to, surrounding systems.

Multiple functions. Groups are multifunctioned. They make contributions to systems at each of three levels:

1. to the systems in which they are embedded (e.g., an organization),
2. to their component parts, that is, their members, and
3. to the group itself, as an intact and continuing social structure.

Those are, respectively, the group's *production function*, its *member-support function*, and its *group well-being function*. (These parallel the criteria for group effectiveness specified in Hackman, 1985.) These three functions, though analytically distinguishable, are inseparably intertwined in concrete systems.

Purposeful activity. Groups engage in purposeful activity at three partially nested levels: *projects*, *tasks*, and *steps*. A project is a mission, a set of activities in the service of a goal or goals (Little, 1983). A task is a sequence of activities instrumental to completion of a particular project. A step is an activity that is a proper part of a task. These levels of activity are also levels of purpose: Steps and tasks have instrumental value insofar as they contribute to projects. Completed projects have intrinsic value for the group's three contribution functions.

Ordinarily, at any one time, a group will be engaged in activities associated with multiple concurrent projects and having to do with all three contribution functions. A group thus requires some means for coordination of multiple functions on multiple concurrent projects that overlap in time, place, and members.

Partial nesting. Groups, their members, and the organizations within which they are embedded usually are partially nested sys-

tems. Individuals are partially nested within the groups of which they are members. Partial nesting means that a given individual is ordinarily not a member of one and only one group but, rather, is a member of multiple groups at any one time. Thus group members are not "proper parts" but rather "participating parts" of any given group to which they belong. Groups also often are partially nested within the embedding system of which they are a part (an organization, a community, etc.)

Loose coupling. Most work groups can be regarded as loosely coupled systems at two levels. Individual group members are loosely coupled to one another, and the behavior of the group as a unit is loosely coupled to the larger social units within which that group is embedded. *Coupling*, here, refers to the strength, directness, and complexity of causal relations among parts of a system (see, e.g., Weick, 1976, 1982).

A caveat. Much of the work of natural groups gets done by individuals or subgroups, acting when the "main" group is not in session: One member of a research team has an insight that solves a key problem for the whole team, two group members go into town in early morning to pick up supplies needed for the group's work that day, and so on. Thus even the observation of "all" group meetings and the recording of "all" group actions and communications still cannot capture the totality of the flow of work in that group, much less the totality of group life beyond direct task performance. Direct empirical evidence about work in naturally occurring groups (or in groups created for purposes of research) is ultimately limited to data derived from events and actions that take place while group members are acting in concert. That limit is implicit throughout this article.

Proposition 2: All group action involves one or another of four modes of group activity:

Mode I: inception and acceptance of a project (goal choice),

Mode II: solution of technical issues (means choice),

Mode III: resolution of conflict, that is, of political issues (policy choice), and

Mode IV: execution of the performance requirements of the project (goal attainment).

These modes of activity apply to all projects, and they transcend the various group functions. There is a distinctive but parallel set of modes for activities related to the production function, the member-support function, and the well-being function (see Figure 1).

Modes are potential, not required, forms of activity. Modes I and IV (inception and execution) are involved in all group tasks and projects; Modes II (technical problem solving) and III (conflict resolution) may or may not be involved in any given group activity. Furthermore, groups are always acting, in one or another of these four modes, with respect to each of the three functions, but they are not necessarily engaged in the same mode for all functions, nor are they necessarily engaged in the same mode for a given function on different projects that may be concurrent.

There is much similarity between several of these modes and the quadrants of the task performance space or task circumplex postulated in McGrath (1984). Noting the similarities may make this article easier to follow for readers who are familiar with that other work, but it is important to note the differences as well. Quadrants II, III, and IV of that task circumplex, whose key functions are choose, negotiate, and execute, respectively, are closely aligned with Modes II, III, and IV here. Quadrant I of the circumplex, for which the key function is to generate (ideas and plans), however, is not at all isomorphic with Mode I (project inception). Moreover, the task circumplex dealt only with the group's production function. Furthermore, the quadrants of the task circumplex were conceptualized as more or less mutually exclusive alternatives to one another at the task level, whereas the modes of activity presented here are regarded as potential components of activity at the project level—some or all of which may be involved in carrying out the tasks of any given project.

FUNCTIONS

	Production	Well-being	Member Support
Mode I Inception	Production Demand/ Opportunity	Interaction Demand/ Opportunity	Inclusion Demand/ Opportunity
Mode II Problem Solving	Technical Problem Solving	Role Network Definition	Position/ Status Attainments
Mode III Conflict Resolution	Policy Conflict Resolution	Power/ Payoff Distribution	Contribution/ Payoff Relationships
Mode IV Execution	Performance	Interaction	Participation

Figure 1: Modes and Functions

Modes of the production function. The four modes of the production function reflect the relation between the group as a functional unit and the environmental circumstances within which that group is operating. They are akin to what are often referred to as problem-solving or task-performance phases (see McGrath, 1984; Poole & Roth, 1988a, 1988b).

Mode I of the production function has to do with project inception—choosing among sets of production or achievement opportunities (and demands). Groups acquire a project in one or another of three ways: A member may propose it; an outside agent (e.g., boss or experimenter) may assign it; or the group may undertake a given project simply by engaging in the ordinary activity of that group. Mode I involves a choice of goals and a consequent selection (often implicitly) of an initial performance strategy.

A number of studies have shown that groups tend to select an initial work strategy early, often with seemingly little deliberation, and typically continue following that initial strategy until forced to change by inadequate task performance (Hackman, Brousseau, & Wiess, 1977; Gersick, 1988, 1989). Thus inputs to the group early in a project, regarding strategy and process, are likely to have especially high impact.

Mode II of the production function is a technical problem-solving mode—attempts to determine the most appropriate means (techniques, procedures, or algorithms) by which to carry out the project. Mode II involves a choice of means.

This is the mode to which group research has given the most attention. It is the focus of attention in studies of problem solving, decision making, and the like (for reviews, see Hackman & Morris, 1972; Kelley & Thibaut, 1954; McGrath, 1984; Steiner, 1972). In those studies, the other three modes of the production function are generally rendered moot: Project inception is not problematic because groups are assigned the task. The execution mode for these kinds of problems is trivial once the means has been determined. Conflicts of priorities are treated as error, as are time and attention

devoted by the group to the nonproduction functions—often labeled pejoratively as “process losses” (Steiner, 1972).

Mode III of the production function is a political preference-resolving mode—attempts to resolve potentially conflicting preferences, values, or interests within the group. Mode III involves a choice of policies. This mode has been given some study in group research, notably in work on negotiations and on such matters as jury deliberations (e.g., Davis et al., 1977; Vidmar & McGrath, 1970).

Mode IV of the production function is the execution mode—carrying out, in real time and space, the behaviors necessary and sufficient to attain the goals of a project in which the group is engaged. Mode IV involves goal attainment. It can be assessed in terms of some combination of quantity, quality, and speed of production of some end product(s).

Modes of the well-being function. The four modes of the group well-being function describe activities that have to do with development and maintenance of the group as a system; hence they reflect relations among group members.

Mode I (inception) for the group well-being function involves choices among sets of interaction opportunities (and demands). Mode II (technical problem solving) for the well-being function involves role-net definition. The group decides technical staffing questions: who will do what, when, and with whom. This mode involves choices of interpersonal means. Mode III (conflict resolution) for the well-being function involves power and payoff allocation. The group resolves political issues regarding who controls the distribution of work and rewards. This mode involves the resolution of political issues of interpersonal status, power, and payoff. Mode IV (execution) for the well-being function involves interaction. The group carries out concrete interpersonal activities involved in the performance process of a given project.

Modes of the member-support function. The four modes of the member-support function describe activities that have to do with

the ways in which the individual is embedded within the group; hence they reflect relations between individual members and the group.

Mode I (inception) for the member-support function involves choices about inclusion and participation opportunities (and demands). The individual may choose inclusion in the group, with whatever rewards that entails, in return for his or her participation, loyalty, and commitment to the group. Sometimes, of course, member inclusion in a given group for a given project is not entirely voluntary. In those cases, that member's participation, loyalty, and commitment is also potentially problematic.

Mode II (technical problem solving) for the member-support function involves position and status attainment. This mode includes both the self-selection side and the group-assignment side of the practices and policies by which individual members attain positions or roles in the group. These range enormously among groups. They tend to be entirely informal and even implicit in friendship and other informal groups. In many formal groups, they are highly routinized and explicit procedures or highly ritualized rites of passage.

Mode III (conflict resolution) for the member-support function involves negotiation (and renegotiation) of the individual's expected contributions to and payoff from the group's purposeful activities. Mode IV (execution) for the member-support function involves members' concrete participation in the group's activities.

Proposition 3: The four modes of activity are not a fixed sequence of phases but, rather, are a set of alternative kinds of activity in which the group and its members may engage.

Although all projects begin with Mode I and end with Mode IV, any given project may or may not entail Modes II or III for any of the three functions. There are alternative time-activity paths, from Mode I to Mode IV, for completion of the production, well-being, and support functions (see Figure 2).

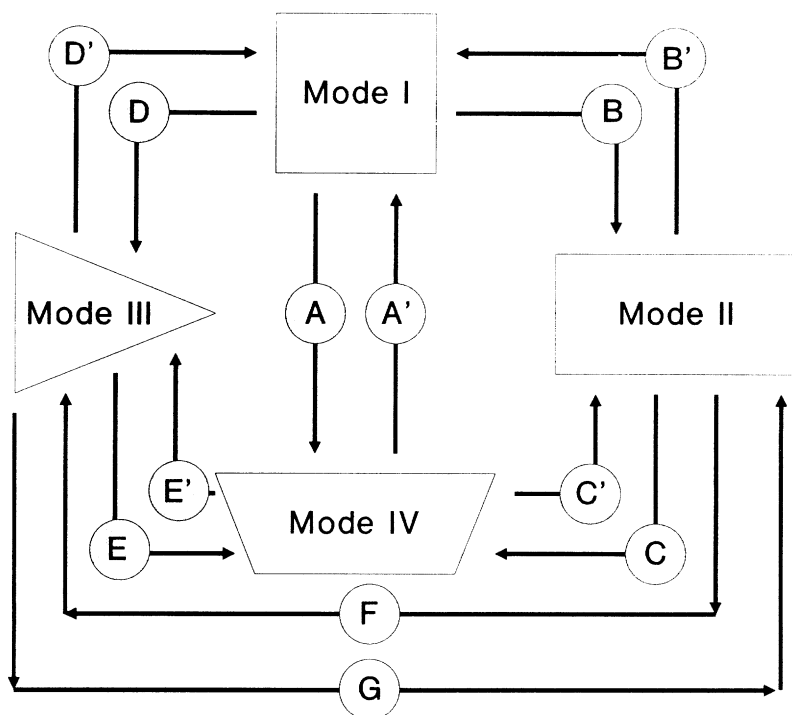


Figure 2: Four Modes and Alternative Paths

The direct path—from Mode I inception (opportunity for production, interaction, or participation) to Mode IV execution (actual production, interaction, or participation)—is the default path for all functions on most group projects (link A in Figure 2). TIP theory assumes that a group will use the default path if it can, and in any case will use the least complex path that its purposes, resources, and circumstances will allow.

This view contrasts with most theories that invoke “problem-solving phase sequences.” Most phase-sequence theories invoke what Poole and Roth (1988a, 1988b) call a “unitary phase sequence,” namely, that there is one “most rational” or “most efficient” sequence. The theory presented here does not posit such a

most rational or most efficient phase sequence but, rather, posits a default sequence that is a "satisficing" or "least effort" path. TIP theory asserts that the default path will prevail unless conditions warrant some more complex path (see below).

For example, a group will use a three-mode path (Modes I, II, and IV, links B-C in Figure 2) for its production, well-being, or member-support functions, respectively, when it needs to identify or construct a logically correct or preferred means for solution of the technical issues involved in its project or projects or needs to deal with role-net definition or redefinition or needs to deal with issues related to members' position and status attainment. These needs might arise, for example, if the group had a project involving new tasks or if it had new members or if conditions in the embedding system had changed substantially.

A group will use a different three-mode path (Modes I, III, and IV, links D-E in Figure 2) for its production, well-being, or member-support functions when it needs to resolve a set of conflicting interests or values related to performance on the project or needs to deal with issues of power allocation or payoff distribution in the group. These needs also might arise with the coming of new tasks, new members, or new operating conditions.

Sometimes even more complex paths are required for completion of the production, well-being, or member-support functions. For example, sometimes groups attempt direct execution (i.e., Modes I-IV) but encounter technical or political problems and are forced to engage in Mode II or III before execution. Sometimes they find that technical problems are really political problems (or embed them) and, therefore, have to go from Mode II to Mode III. Sometimes they find that political problems, when resolved, create new technical problems; hence they may have to go from Mode II to Mode III and back again to Mode II. Such complex cases might follow paths such as links A-C'-C, or links A-E'-E, or links A-A'-D-G-C, in Figure 2).

Interaction of functions, modes, and projects. Group activity always entails an interplay of functions, modes, and projects. A

given group may use different paths for different functions on each of multiple concurrent projects. A given project may require a complex path involving three or all four modes, or an even more complicated path, for at least one function but only require the direct two-mode default path (link A) for one or both of the other functions.

In the past, group researchers have been too quick to label such complex patterns as "process losses" (Steiner, 1972). That concept, or its cousins, has been used, pejoratively, to imply that any group activity that did not seem to fit the researcher's preconceived picture of what a direct, "efficient" performance of the task ought to look like was somehow evidence of a deficiency in that group. Such labeling implies the assumption that the group had (or should have had) only the experimenter- or manager-assigned task on its agenda. It also carries the implication that there must be some flaw in the group's structure, behavior, or character that needs "fixing" — typically by importing the researcher's favorite techniques (such as NGT, Delphi, and the like) that purportedly will "improve" group performance.

TIP theory holds that such complexity of paths, modes, and functions is by no means evidence of process losses. Rather, it more likely is evidence of one or more of three other circumstances: (a) that the group is giving attention to the well-being and member-support functions, as well as to the production function; (b) that the group is attempting to resolve technical or political problems within the production function, of which the researcher may be unaware; or (c) that the group might be engaged in some project other than (or in addition to) the one the experimenter is tracking. TIP theory assumes that when a group engages in any path more complex than the default path, it does so for good and sufficient reasons — reasons to which the researcher may or may not be privy. TIP theory thus takes the perspective of the group rather than the viewpoint of the researcher (or of the supervisor). In these circumstances, the proper question to ask is not how do we get the group not to do these "extraneous" things, but rather what conditions led the group to need or want to use a more complex time-activity path. In TIP

theory, such complex paths suggest long-run effectiveness on the part of the group, even if at a small cost in short-run performance rate on the task to which the researcher is attending (see Poole & Roth, 1988a, 1988b, for an alternative perspective on these phase-sequence issues).

KEY POINTS THUS FAR

The first three propositions of the theory are largely definitional and scene setting. They represent groups and their activities in a molar and complex way. Groups are simultaneously performing a number of functions with respect to a number of projects. There are multiple alternative time-activity paths by which groups can do what they are doing. Use of more complex paths indicates presence of conditions calling for those complex activities rather than indicating some culpability or inadequacy of the group.

PROPOSITIONS ABOUT TEMPORAL ASPECTS OF BEHAVIOR IN GROUPS

Proposition 4: Behavior in work groups shows many forms of complex temporal patterning, including

1. temporal aspects of the flow of work in groups, which raise issues of scheduling, synchronization, and time allocation (see Proposition 5),
2. problems of efficiently matching periods of time with bundles of activities (see Proposition 6), and
3. entrainment processes leading to patterns of synchronization, both of group members' behavior with one another, and of group behavior with "external" events (see Proposition 7; for more detail, see McGrath & Kelly, 1986, 1990).

Proposition 5: All collective action entails (at least) three generic temporal problems that both organizations and individuals must reckon with.

The three generic temporal problems (see McGrath & Kelly, 1986; McGrath et al., 1984; McGrath & Rotchford, 1983) are

1. temporal ambiguity (when particular events will occur and recur and how long they will last),
2. conflicting temporal interests and requirements, and
3. scarcity of temporal resources.

Characteristic organizational responses to these temporal problems are, respectively,

1. scheduling of activities,
2. synchronization of activities by different segments of the organization, and
3. allocation of temporal (and other) resources to projects.

Parallel individual responses are

1. making temporal commitments,
2. negotiating norms for behavior sequencing, and
3. regulating flow of task and interpersonal interaction.

There is always some degree of lack of fit between organization and individual responses to these temporal issues. Such lack of fit gives rise to residual temporal problems that have to do with

1. establishing and enforcing deadlines,
2. establishing norms to get smooth dynamic teamwork, and
3. regulating flow of task and interpersonal interaction to resolve inefficient or inequitable demand-capability matches.

These residual problems—deadlines, dynamic coordination, and regulating flow of interaction—often get played out in group contexts. They become ubiquitous issues for all three functions of groups doing multiple concurrent projects in real time.

Proposition 6: A temporally efficient flow of work in groups requires complex matching of bundles of activities to particular periods of time.

Time as experienced violates two Newtonian assumptions: (a) that time is infinitely divisible and (b) that units of time are homogeneous and interchangeable (McGrath & Kelly, 1986, 1990). Units of time, as experienced, are epochal or "lumpy," not smooth and homogeneous. Periods of time that are equal in Newtonian terms are not necessarily interchangeable as to what activities can be done in them. Therefore, the fit between a particular bundle of activities and a particular period of time is particular, not arbitrary. Neither bundles of activity nor periods of time can be divided (or combined) without limit and without cost (see below).

Some periods of time are more versatile than others regarding what range of activities can be done in them. For example, the range of activities that can be done efficiently in nighttime hours is far less than the range for daytime; and, in our culture, the range of activities that can be done efficiently on Sunday is different from the range of activities of a weekday.

Conversely, some bundles of activities are more flexible than others regarding at what times they can be done efficiently. For example, the range of times at which banking or grocery shopping can be done is greatly restricted in some communities, less so in others. Activity bundles also vary in terms of how "modular" they are; that is, how efficiently they can be aggregated or subdivided to fit within a time period of a particular size and temporal location. There are both upper and lower bounds on such "modularity." For example, it is not efficient to do laundry one sock at a time, but it is also not efficient to aggregate it over an entire month. Similarly, some material can be read effectively in short periods of a few minutes each, whereas other material requires substantial blocks of time for effective reading.

Proposition 7: One major form of temporal patterning is social entrainment.

Entrainment refers to synchronization (temporal coordination) of phase and periodicity of two or more processes. *Social entrainment* refers to entrainment of processes that are behavioral not physiological (see Kelly, 1988; Kelly, Futoran, & McGrath, 1990; Kelly & McGrath, 1985; McGrath & Kelly, 1986, 1990; McGrath et al., 1984).

Entrainment operates at various system levels: within individuals, between individuals, and between groups and their embedding systems. Entrainment can be internal or external to a given social unit. That is, it refers both to mutual synchronization of two or more endogenous rhythms and to entrainment of an internal rhythm (or bundle of rhythms) to an external signal or cycle that serves as a pacer. Entrainment is a form of loose coupling (see Proposition 1). Synchronization is induced, not compelled, by the entraining process.

Features of social entrainment. Social entrainment (or synchronization) operates for a wide range of individual, group, and organizational processes. Patterns of entrainment vary with group, task, and situational conditions. They also vary for group performance under different time-pressure conditions. Such variations in patterns of entrainment arise partly through differences in perceptions and expectations that accompany different task conditions (e.g., experiences of different forms of difficulty; see Kelly et al., 1990). Entrainment processes operate for patterns of communication and interaction, as well as for rate and quality of task performance (Kelly & McGrath, 1985).

Interdependence of modes, functions, and entrainment processes. Modes, functions, and entrainment processes operate interdependently. Groups often need different paths for different functions on a given project and often are engaged in multiple concurrent projects. Time pressure often leads groups to focus only on the

direct path (link A) of the production function. This may reduce the quality of production, and interpersonal issues may suffer from lack of attention. Groups with ample time tend to use all of the available time. This enables them (but does not compel them) to engage in activities that can enhance the quality of production and to give appropriate amounts of attention to well-being and member-support functions (Kelly, 1988; Kelly et al., 1990; Kelly & McGrath, 1985; McGrath & Kelly, 1986, 1990; McGrath et al., 1984). Such social entrainment processes apparently hold for “natural” groups created to carry out specific single projects within a predetermined “life span” (Gersick, 1988, 1989), as well as for laboratory groups doing experimenter-assigned tasks.

PROPOSITIONS ABOUT GROUP INTERACTION PROCESS

Proposition 8: In TIP theory, *group interaction process* refers to the flow of work in groups at a micro level.

The unit of interaction is a single act or input of a group member. Each act can be referenced to three axes: type of act, source of act, and time of act. The first axis has to do with identifying how each act relates to the group's ongoing activity. The second axis has to do with identifying the source (and target) of each act. The third axis has to do with specifying when the act took place—the time when each act began and ended, hence its serial position, its duration, and its temporal location. These axes, together, identify interruptions and overlaps in speakers and periods of silence (a conjoint nonaction by all members), as well as various types of one-speaker-at-a-time acts (see Futoran et al., 1989).

Proposition 9: In TIP theory, it is assumed that at any point in interaction, a group has a current purpose or objective that can be regarded as its focal task.

The *focal task of a group* refers to what the group is explicitly trying to accomplish at that time. In TIP theory, functions are characterized at the project level with tasks and steps subsumed under them; but interaction acts are characterized at the level of a focal task. A focal task may relate to the well-being, support, or production functions. Such a focal task, therefore, can have "socio-emotional" rather than "instrumental" content.

Proposition 10: Each act can be regarded as either germane to the group's current "focal task" or not germane to it.

Acts that are germane to the focal task. An act can be germane to the focal task in one of four ways: a task proposal, such as a proposed answer to a task problem or the execution of a task step; a process proposal, a contribution to the group's management, such as suggesting a shift in activities, strategies, or goals; a task evaluation, of one's own or another's prior task contribution or contributions; or a process evaluation, of one's own or another's prior process contribution or contributions. Each of these four types of acts can be divided into subtypes (e.g., evaluations can be positive or negative, and they can involve suggestions for modification or outright rejection).

Acts that are not germane to the focal task. Acts that are not germane to a group's focal task can occur in any of several forms: acts that have personal or interpersonal content that is pertinent to the group or to some of its members but not to the focal task; acts that have content related to the group's ongoing project or projects but that digress from the group's focal task (e.g., irrelevant anecdotes about content related to the group's project); acts that have content related to situational or environmental conditions (e.g., complaints about an overheated workplace).

Proposition 11: Acts have situated, rather than generic, meanings in relation to the modes, functions, and paths of group activity.

Acts are related to the modes, functions, and paths of group process, but those relations are complex, and there is not a single isomorphic mapping between a given type of act and a given mode-function-path.

Germane acts. The four types of act that are germane to the focal task are related to the modes of activity and to paths through those modes for all three functions. Task proposals are often Mode IV activities, and sometimes Mode II activities, of the production function. Process proposals may involve Mode I (project acquisition, goal acceptance) activities or may involve an effort to shift the group to an alternative path with regard to its production function. Evaluations of task contributions may reflect a concern for quality in Mode IV, execution. But evaluations, especially negative evaluations, also may reflect Mode III activities of any of the three functions or Mode II activities of the well-being and support functions. Evaluations of process proposals may reflect Mode I, II, or III activity of the production function or any mode of the well-being and support functions.

Nongermane acts. Nongermane acts also reflect various modes of activity and functions. Interpersonal acts may indicate effort to attend to some modes of the well-being function. Personal acts may mark a concern with the member-support function, especially Modes II and III. Task digressions may be attempts to elaborate on task contributions—hence may reflect efforts toward Mode II or Mode IV of the production function. Such task digressions may also reflect an effort to redirect the group from its attempt at direct task execution (link A). Situational reactions may be surrogates for negative process evaluations or otherwise reflect efforts to redirect the group.

Acts have situated meanings. In TIP theory, the meaning of an act depends in part on its context. Therefore, it is not appropriate to attempt a one-to-one mapping between act type and mode-function combinations. For example, an act coded as an evaluation of

process (e.g., "I don't think this approach is getting anyplace. We are just going around in circles on this") could serve Modes II or III of the production function or any of the modes of the well-being or support functions. Acts have situated meanings, not generic ones, and although we may isolate individual acts for analytic purposes, their meanings for the group derive from the context within which they are embedded. To gain understanding of the meaning of a specific act, hence its relation to the modes and functions, one needs to consider what has gone before and what follows it. Therefore, how acts are aggregated is crucial to any analysis of group interaction process.

Proposition 12: Various aspects of the flow of work in groups are reflected in different forms of aggregation of acts.

Although such an approach is not essential to TIP theory, the discussion in Propositions 8-11 presupposes that the flow of work in groups can best be examined by first "parsing" the flow of interaction into specific events and acts and then aggregating acts over types, over members, or over periods of time. Such aggregations can be done in a number of forms, each of which deals with different aspects of the temporal relations between acts:

1. Work-flow analyses can be done in terms of comparisons of distributions of (absolute or relative) frequencies of different types of acts, by different (types of) members, during different periods of time (or by two or all three of these facets simultaneously).
2. Work-flow analyses also can be done in terms of comparisons of durations (or proportions of time) for different types of act, for different members, and for different periods of time (or for two or all three of these facets).
3. Work-flow analyses can examine sequences of two, three, or more acts in terms of sequences of act types (e.g., what kinds of acts follow a negative evaluation?); sequences of related content (e.g., do some tasks produce longer chains of content-related acts than others?); sequences of speakers (e.g., how often does member C follow member A?); and combinations of these.

The preceding discussion of the situated meaning of individual acts points to alternative possibilities for analysis of interaction process. Instead of using an act-by-act categorization of ongoing process, group interaction can be studied by constructing what might be regarded as “qualitative aggregations” of acts.

An example of such an approach is the technique developed by Gersick (1988, 1989). She condensed transcripts of group work into contiguous, content-related segments and characterized the activity within each of those relatively short segments. She then coded the segments with respect to occurrence of acts of particular interest (e.g., timing acts, contributions to the product), which she aggregated quantitatively. But at the same time, she also used the descriptions of segments to develop a “story” of group process over extended periods of time for multiple meetings of the group. This permitted her to display “meeting maps” indicating who made what kinds of inputs at what points in the group’s meetings, hence to more nearly grasp the situated meanings of those acts. A qualitative-aggregation approach such as Gersick’s has the advantage of taking fully into account the context-dependent or situated meanings of acts, but it has the disadvantage of losing much detailed information at the more micro level of specific acts.

Each of these four different ways of combining information over specific actions—frequencies or proportions, durations or relative durations, sequences, and more molar or more qualitative aggregations—offers different but useful information about the temporal patterning of work in groups. There is no reason for TIP theory (or any given empirical study) to prefer one of these to the exclusion of the others. Judicious use of all of them would seem best suited to help us gain further understanding of the operation and impact of temporal processes on groups.

SOME IMPLICATIONS OF TIP THEORY

This condensed presentation of TIP theory contains a number of implications for the nature of groups and of their operation and at

the same time raises a number of issues about work in groups that have received only limited attention in past research. Three sets of such implications are noted below as examples.

Impact of changes in group, task, and circumstances. Several propositions of the theory imply that major shifts in the pattern of group activity (i.e., in the mode-function sequences by which groups carry out their work) will follow from (a) changes in group membership, (b) changes in the type and difficulty level of the projects and tasks the group is undertaking, and (c) changes in operating conditions (such as time limits, connections to other units, and the like) under which the group is working. There is really very little empirical evidence to draw on to support or refute those implications, because remarkably little research has been done on the effects of even such major changes as loss, addition, or substitution of new members or the impact of changing a group's basic mission or tasks, even though such changes are ubiquitous in natural groups. (The marked preference for studying groups as static entities, with constant membership, tasks, and operating conditions, is another consequence of our discipline's strong reliance on the static-analytic methodological and conceptual paradigm that was noted at the beginning of this article.) TIP theory highlights the need for systematic empirical study of the impact of such changes on work groups and their actions.

Situated versus generic meaning of acts. One of the most interesting sets of implications of TIP theory arises from its recognition that a given act or act sequence takes its meaning partly from the context in which it occurs. Most systems for observing and coding interaction process (including the TEMPO system developed earlier in our research program) are built on the implicit assumption that a given act has the same meaning (in terms of the coding system being used) no matter who performs it and no matter when it occurs in the group's activity. A proposed solution is a proposed solution, and a negative evaluation is a negative evaluation, regardless of its

source, target, timing, or context. But when TIP theory attempts to map types of acts to mode-function sequences, it becomes clear that a given type of act may involve different meanings (i.e., different modes and functions), depending on the circumstances under which it occurs. For example, a proposed solution after the group has already reached a final decision is hardly to be considered equivalent to a proposed solution made early in the group's work. Similarly, a negative evaluation early in the group's work is more likely to function as an attempt to improve quality of a given task performance than is a negative evaluation at the end of the group's session.

Such issues have been little studied in group research, in part because they have been assumed away by the underlying paradigm. Here, again, there is a clear need for empirical research not to determine whether meanings in interaction are situated or generic (doubtless both are true in part) but, rather, to determine the sets of conditions under which acts take their meaning from the circumstances within which they are performed.

Consequences of modifications in group communication systems. TIP theory also has implications for the likely effects of the introduction of technological enhancements (e.g., computers) within the group's communication system — a more and more frequent fact of life in natural work groups. An earlier version of TIP theory was applied for a preliminary analysis of effects of such enhancements (McGrath, 1990), suggesting that such enhancements are likely to have both desirable and undesirable effects. Poole and colleagues have carried out a similar analysis working from adaptive structuration theory (Poole & DeSanctis, 1989). But those treatments leave many questions still unanswered and many issues unaddressed. In the light of the increasingly varied uses of computer-mediated communications to aid group work, further research along these lines is another critical need. Such research can both make use of TIP theory to guide its inquiries and provide feedback to the theory regarding empirical support of its propositions.

REFERENCES

- Altman, I., Vinsel, A. M., & Brown, B. B. (1981). Dialectic conceptions in social psychology: An application to social penetration and privacy regulation. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 14). New York: Academic Press.
- Bales, R. F., & Cohen, S. P. (1979). *SYMLOG: A system for the multi-level observation of groups*. New York: Free Press.
- Davis, J. H., Bray, R. M., & Holt, R. W. (1977). The empirical study of social decision processes in juries: A critical review. In J. Tapp & F. Levine (Eds.), *Law, justice and the individual in society: Psychological and legal issues*. New York: Holt, Rinehart & Winston.
- Futoran, G. C., Kelly, J. R., & McGrath, J. E. (1989). TEMPO: A time-based system for analysis of group interaction process. *Basic and Applied Social Psychology*, 10, 211-232.
- Gersick, C.J.G. (1988). Time and transition in work teams: Toward a new model of group development. *Academy of Management Journal*, 31, 9-41.
- Gersick, C.J.G. (1989). Marking time: Predictable transitions in task groups. *Academy of Management Journal*, 32, 274-309.
- Hackman, J. R. (1985). Doing research that makes a difference. In E. E. Lawler, A. M. Mohrman, S. A. Mohrman, G. E. Ledford, T. G. Cummings, & Associates (Eds.), *Doing research that is useful for theory and practice*. San Francisco: Jossey-Bass.
- Hackman, J. R., Brousseau, K. R., & Wiess, J. A. (1977). The interaction of task design and group performance strategies in determining group effectiveness. *Organizational Behavior and Human Performance*, 16, 350-365.
- Hackman, J. R., & Morris, C. G. (1972). Group tasks, group interaction process, and group performance effectiveness: A review and proposed integration. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 8). New York: Academic Press.
- Hare, A. P. (1973). Theories of group development and categories for interaction analysis. *Small Group Behavior*, 4, 259-304.
- Hare, A. P. (1976). *Handbook of small group research* (2nd ed.). New York: Free Press.
- Kelley, H. H., & Thibaut, J. W. (1954). Experimental studies of group problem solving. In L. Lindzey (Ed.), *Handbook of social psychology*. Reading, MA: Addison-Wesley.
- Kelley, H. H., & Thibaut, J. W. (1978). *Interpersonal relations: A theory of interdependence*. New York: Wiley.
- Kelly, J. R. (1988). Entrainment in individual and group behavior. In J. E. McGrath (Ed.), *The social psychology of time: New perspectives* (pp. 89-110). Newbury Park, CA: Sage.
- Kelly, J. R., Futoran, G. C., & McGrath, J. E. (1990). Capacity and capability: Seven studies of entrainment of task performance rates. *Small Group Research*, 21, 283-314.
- Kelly, J. R., & McGrath, J. E. (1985). Effects of time limits and task types on task performance and interaction of four-person groups. *Journal of Personality and Social Psychology*, 49, 395-407.
- Kelly, J. R., & McGrath, J. E. (1988). *On time and method*. Newbury Park, CA: Sage.
- Levine, J. M., & Moreland, R. L. (1985). Innovation and socialization in small groups. In S. Moscovici, G. Mugny, & E. Van Abermaet (Eds.), *Perspectives on minority influence* (pp. 143-169). Cambridge: Cambridge University Press.
- Levine, J. M., & Moreland, R. L. (1990). Progress in small group research. *Annual Review of Psychology*, 41, 585-634.

- Little, B. R. (1983). Personal projects: A rationale and method for investigation. *Environment & Behavior*, 15, 273-309.
- McGrath, J. E. (1978). Small group research. *American Behavioral Scientist*, 21, 651-674.
- McGrath, J. E. (1984). *Groups: Interaction and performance*. Englewood Cliffs, NJ: Prentice-Hall.
- McGrath, J. E. (1987). *Toward a time-based theory of functional groups*. Technical Report 87-1. Champaign: Psychology Department, University of Illinois.
- McGrath, J. E. (1990). Time matters in groups. In J. Galegher, R. E. Kraut, & C. Egido (Eds.), *Intellectual teamwork: Social and technical bases of collaborative work* (pp. 23-61). Hillsdale, NJ: Erlbaum.
- McGrath, J. E., & Altman, I. (1966). *Small group research: A synthesis and critique of the field*. New York: Holt, Rinehart & Winston.
- McGrath, J. E., & Beehr, T. A. (1990). Time and the stress process: Some temporal issues in the conceptualization and measurement of stress. *Stress Medicine*, 6, 93-104.
- McGrath, J. E., & Kelly, J. R. (1986). *Time and human interaction: Toward a social psychology of time*. New York: Guilford.
- McGrath, J. E., & Kelly, J. R. (1990). *Temporal context and temporal patterning in social psychology: A preliminary statement of a social psychological theory of time*. Manuscript submitted for publication.
- McGrath, J. E., Kelly, J. R., & Machatka, D. E. (1984). The social psychology of time: Entrainment of behavior in social and organizational settings. In S. Oskamp (Ed.), *Applied social psychology annual* (Vol. 5, pp. 21-44). Beverly Hills, CA: Sage.
- McGrath, J. E., & Rotchford, N. L. (1983). Time and behavior in organizations. In L. Cummings & B. Staw (Eds.), *Research in Organizational Behavior* (Vol. 5, pp. 57-101). Greenwich, CT: JAI.
- Moreland, R. L., & Levine, J. M. (1982). Socialization in small groups: Temporal changes in individual-group relations. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 15, pp. 137-192). New York: Academic Press.
- Moreland, R. L., & Levine, J. M. (1984). Role transitions in small groups. In V. Allen & E. Van de Vliert (Eds.), *Role transitions: Explorations and explanations* (pp. 181-195). New York: Plenum.
- Moreland, R. L., & Levine, J. M. (1988). Group dynamics over time: Development and socialization in small groups. In J. E. McGrath (Ed.), *The social psychology of time: New perspectives* (pp. 151-181). Newbury Park, CA: Sage.
- Poole, M. S., & DeSanctis, G. (1989). Understanding the use of group decision support systems: The theory of adaptive structuration. In C. Steinfield & J. Fulk (Eds.), *Theoretical approaches to information technologies in organizations*. Beverly Hills, CA: Sage.
- Poole, M. S., & Roth, J. (1988a). Decision development in small groups: IV. A typology of group decision paths. *Human Communication Research*, 15, 323-356.
- Poole, M. S., & Roth, J. (1988b). Decision development in small groups: V. Test of a contingency model. *Human Communication Research*, 15, 549-589.
- Steiner, I. D. (1972). *Group process and productivity*. New York: Academic Press.
- Thibaut, J. W., & Kelley, H. H. (1959). *The social psychology of groups*. New York: Wiley.
- Vidmar, N., & McGrath, J. E. (1970). Forces affecting success in negotiation groups. *Behavioral Science*, 15, 154-163.
- Weick, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative Sciences Quarterly*, 21, 1-19.

- Weick, K. E. (1982). Managing organizational change among loosely coupled elements. In P. S. Goodman & Associates (Eds.), *Change in organizations: New perspectives on theory, research and practice* (pp. 375-408). San Francisco: Jossey-Bass.
- Werner, C. M., Haggard, L. M., Altman, I., & Oxley, D. (1988). Temporal qualities of rituals and celebrations: A comparison of Christmas Street and Zuni Shalako. In J. E. McGrath (Ed.), *The social psychology of time: New perspectives* (pp. 203-232). Newbury Park, CA: Sage.
- Zander, A. F. (1979a). The psychology of small group processes. *Annual Review of Psychology*, 30, 417-471.
- Zander, A. F. (1979b). The study of group behavior during four decades. *Journal of Applied Behavioral Science*, 15, 272-282.

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