Participation in Heterogenous and Homogenous Groups: A Theoretical Integration[1]

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the outset of group interaction when there is no structure, a larger number of cycles may be necessary to establish a pattern, than when the group has developed at least a partial structure. For example, in a group where one actor has already established superior behavior patterns with a number of the other actors, that actor may come to establish similar patterns with the remaining others quite easily. In such cases a minimal cycle consisting of a questioning look directed toward another, responded to by a brief nod, may be enough to establish the new behavior pattern. It is even possible that an actor who witnesses a behavior pattern develop between two other actors comes to "share" in the pattern by identifying himself with one of the two actors.

The context of the group is also likely to affect the process; for example in laboratory groups where actors may have no serious investment in the group as such, and no expectations of extended interaction with each other, they may be able to establish behavior patterns on the basis of a few consistent interaction cycles. However, in a permanent committee within an organizational context, where individual and group interests are at stake, and where individuals expect to be working together for long periods, the emergence of behavior patterns will be slower. Finally, there are individual dispositional differences to consider – there will be actors who are disposed to accept behavior interchange patterns on the basis of a few consistent cycles and there will be those who require large numbers of cycles before a behavior interchange pattern is accepted.

Another basic question posed by the concept of a behavior pattern is how consistent the power and prestige significance of the cycles making up the pattern has to be. For reasons of theoretical simplicity we prefer to conceptualize the process of emergence of behavior patterns as calling for total consistency. Given that a pattern has emerged, however, we certainly do not expect all interaction cycles to be consistent with the pattern. In fact we believe that after a behavior interchange pattern has emerged, a second pattern involving the same actors, and inconsistent with the first can emerge at a later time. This is one of the means by which the power and prestige orders of groups of long duration change. However, the emergence of a pattern inconsistent with an existing pattern is likely to be a difficult process, and we certainly do not expect to see it in laboratory groups which interact for limited time periods.

Since the number of cycles of interaction making up a behavior pattern is highly variable we prefer to define the concept from the points of view of the actors involved. That is, for a set of consistent interaction cycles to be a behavior interchange pattern, the actors involved must accept, through their actions, that one actor has a positive behavior pattern and the other a negative behavior pattern. Actors may not articulate the notion and they need not even give it conscious thought, but they will recognize the pattern at some level of perception. Given these considerations we define the term as below.

Definition 1 (A Behavior Interchange Pattern) *is a set of task behavior cycles involving two or more actors, where the acts are mutually accepted, and which are consistent in their power and prestige significance.*

A behavior pattern is made up of two complementary parts, a positive part and a negative part. Thus when a behavior pattern is established between two actors, one will be seen as possessing the superior, or positive part, and the other the inferior, or negative part. Therfore a behavior pattern is a basis of discrimination between actors and functions like a status element in providing expectation information about actors. By the same token, behavior patterns also enter into status organizing processes like other status elements, and combine with other status elements in the formation of aggregated expectation states. We use the symbol b(+) to represent the positive, and the symbol b(-) to represent the negative parts of the behavior pattern, respectively, in the graphic representation of status situations. These two parts are connected by a dimensionality relation which represents both their linkage and opposition to each other.

Our representation of behavior elements in the in the graphic representation of status situations, uses a second basic concept, that of an abstract power and prestige behavior type. This concept captures the fact that there are idealized notions of what superior or high status power and prestige behaviors are like, as well as complementary notions of what low status or inferior power and prestige behaviors are like. These power and prestige behavior types may differ in detail from culture to culture, but all cultures have well defined notions of how high and low status people are supposed to behave in task situations. We represent the two types as B(+) and B(-), standing for high and low status behavior types respectively. Abstract

power and prestige behavior types are relevant to states of abstract task ability, which are induced elements in the theory of status characteristics and expectation states. That is, an actor who possesses a high status power and prestige behavior type would be expected to possess high abstract task ability, and an actor who possesses a low status type would be expected to possess low abstract task ability. Behavior patterns and abstract power and prestige behavior types are obviously related, and a basic theoretical notion is that when a behavior pattern becomes salient in a group, its different parts will come to be seen as relevant to the like signed types of abstract power and prestige behavior. These ideas are spelled out in the formulation we present in the second part of this paper.

A discussion of the concept of behavior patterns naturally leads to the question of which actors will come to possess positive, and which negative pattern parts. Natural as the question is, for the purposes of this formulation it is not relevant since we are not concerned with the process by which behavior patterns emerge, but with how they affect the power and prestige order once they emerge. We take behavior patterns as givens, very much like the theory takes status characteristics as givens, and explore their implications for power and prestige orders. All the same, a brief discussion of the major determinants of the distribution of behavior patterns is called for. First, it should be pointed out that the theory of status characteristics and expectation states, does make an assertion about how behavior patterns are distributed. The theory asserts that, if actors are discriminated by a status characteristic, then the actors who possess the positive state of the status characteristic are more likely to come to possess the positive parts of behavior patterns. However, the theory makes a probabilistic assertion – it is not the case that the higher status actor will always come to possess the positive pattern part. In fact one of the aims of the current extension is to account for how behavior can modify status based expectations, and therefore, power and prestige orders. As noted in our previous discussion, a major consideration is the content of the interaction. To the extent that actors can evaluate each others' contributions, those providing superior inputs are more likely to possess the positive parts of behavior patterns. These evaluations of individual performances will also be affected by social pressures to conform to majority opinions, and the need to further the task process. A further consideration is the styles of behavior, or the

task cue levels of the actors involved (Dovidio and Ellyson, 1982; Nemeth 1983; Ridgeway, Berger and Smith 1985; Berger, Webster, Ridgeway and Rosenholtz, 1986) Recent research has shown clearly that the levels at which actors exhibit task cue behaviors affect their power and prestige standings, as well as showing that actors' levels of task cue behavior is a function of their power and prestige standings. Therefore we would expect actors who exhibit higher levels of the look speak/look listen ratio, who speak fluently and fast, and generally exhibit confident styles of behavior to possess the superior behavior interchange patterns more frequently than actors who do not. Finally, we also expect individual dispositional factors to affect who possesses the positive, and who the negative pattern parts. People do clearly differ in their dispositions to be "ascendant" (Schutz, 1958).

Legitimation

The theory of status characteristic and expectation states focuses on the fact that states of status characteristics have task performance expectations associated with them. These expectations can be diffuse or specific depending on the type of characteristic, and they form the basis on which aggregated task performance expectations are formed for actors in status situations. At the same time, diffuse status characteristics also have moral and normative expectations associated with them (Berger *et al.*, 1966; Berger *et al.*, 1980). Thus, if gender is a status characteristic, the male is not only supposed to be better than the female at performing tasks, but he is also supposed to be "better" in a generalized moral sense. Therefore in male dominated societies it is "right, meet, and proper" that the male has a more valued status position, and more valued goal objects in general, than the female.

Theories within the expectation states framework have focused on this aspect of status characteristics as well. In particular reward expectations theory (Berger *et al.*, 1985) describes and explains how status characteristics lead to the formation of reward expectations in status situations. Reward expectations are, usually, correlated with task performance expectations, but they are not identical to them. In an interaction between two actors, it is possible that one has higher task performance expectations, but lower reward expectations, than the other. While task performance

expectations are the primary determinants of power and prestige orders in task performing groups, reward expectations also affect the patterns of power and prestige behaviors in such groups. This point has been most clearly established in the literature on gender differences in task performing groups (see Meeker and Weitzell-O'Neal, 1977, Lockheed, 1985 and Wagner 1988 for reviews of this literature). An important finding is that females have trouble assuming leadership roles, and exhibiting leadership behaviors. This is true not only for mixed gender groups but for all female groups as well, which poses a problem for the theory of status characteristics and expectation states. As a solution to this problem Ridgeway (1988) has suggested that in all female groups which function in male dominated social contexts (as most social contexts are) the diffuse status characteristic gender becomes salient and prevents the females from assuming leadership roles. Why the salience of the gender characteristic should have such an effect is explained by the Ridgeway and Berger theory of legitimation (1986).

According to Ridgeway and Berger the process of legitimation is one of turning power and prestige positions into positions that are accorded normative rights and privileges, elements which are not necessarily associated with power and prestige positions. While legitimation is a concern for any power and prestige position, it is particularly important for the top power and prestige position, because its legitimation creates what we take to be the leadership position. The theory asserts that legitimate status positions, especially the leadership position, are valued goal objects which groups allocate to their members, and therefore, that legitimation is a matter of reward expectations. The key concept of reward expectation theory (Berger *et al.*, 1972, 1985) is that of a referential structure. Referential structures are "socially validated beliefs that describe how the states of valued characteristics that individuals posses are associated with differences in reward levels" (Berger *et al.*, 1985). Referential structures relate generalized actors with generalized classes of rewards and serve as social standards on the basis of which actors form reward expectations in status situations. Since there are salient referential structures associating being female with low reward classes in male dominated social contexts, females have trouble exhibiting high status power and prestige behaviors.

Given these considerations our theoretical integration would be incomplete if it did not incorporate these ideas. A further reason for incorporat-

ing legitimation dynamics into the current integration is that the concept of behavior pattern is naturally relevant to legitimation processes. Our discussion of the behavior pattern has focussed on its property of conveying information relevant to task performance expectations, and has portrayed these patterns as status elements. Behavior interchange patterns are indeed status elements, but they also convey a different kind of information: That the actors involved are acknowledging, affirming and validating each others' relative positions. That is, an actor who watches a behavior pattern emerge between two other actors not only has a new basis for forming or modifying expectations for the two actors, but also observes that they accept each others differential power and prestige positions. This aspect of behavior patterns, that they are expressions of interpersonal validation of status positions, is of crucial importance to legitimation processes. This point has been made best by Zelditch and his associates (Zelditch and Walker, 1984; Walker, Thomas and Zelditch 1986). Their analysis of the nature of legitimation of authority within organizations leads to two conditions for legitimation. One is resources granted to the authority by the larger organization in which his unit is imbedded and the other is the personal approval given the authority by the subordinates within the unit. Zelditch and Walker consider the first condition to be more important, however they also point out that it does not apply to informal groups without formal hierarchies. In fact, for the kinds of groups we are dealing with, personal approval of group members is, probably, the primary source of legitimation[2].

A hypothetical example may clarify the role of behavior patterns in legitimation processes: Consider a situation where a number of previously unacquainted individuals start interacting on a task. Suppose two actors establish a behavior pattern with the first possesing the positive, and the second the negative parts of the pattern. That is, the second actor is agreeing with, deferring to, and accepting influence from the first actor. Now suppose that a new behavior pattern is established between the first actor and a third actor, with the first actor again possesing the positive part of the pattern. That is, the third actor is also agreeing with, deferring

[2]Other sources of legitimation as formulated by Ridgeway and Berger are the magnitude of reward expectations and the consistency of reward and task expectations.

to, and accepting influence from the first. Extend this image by adding further actors who establish similar behavior patterns with respect to the same first actor. It is not difficult to see the actors coming to act as though the first actor was their legitimate leader as their numbers increase. Each validates the first actor's position with respect to himself, and each sees a number of others similarly validating the first actor's position with respect to themselves. Thus each actor validates all others' behaviors, and the first actor's power and prestige position is thoroughly confirmed as superior to all others.

What is likely to occur when an informal task group of previously unacquainted individuals start interacting is obviously more complicated than the hypothetical situation we have constructed. However, some features of the general situation are likely to be quite similar to this hypothetical case. As actors interact behavior patterns will begin to appear, and form a configuration which will be far from random. This configuration of behavior patterns which emerges is likely to have two important features: It will be "clustered" and it will be "transitive". By clustered we mean that the initial behavior patterns to appear will involve a small subset of actors, rather than being distributed among many. To see this point, remember that behavior interchange patterns are visible not only to the actors involved but to all actors in the situation, and consider the simplest case: The first behavior pattern has been established between two actors A and B, with A possesing the superior part. At this point, actor A has a positive status element, actor B has a negative status element, and no other actors posses any other status elements. Therefore, actor A will have higher, and actor B will have lower, task performance expectations than all the other actors in the group. This means that actor A is more likely than any other actor to produce performance outputs, and also that he is the actor most likely to be addressed, and given an action opportunity by, another actor. Therefore actor A is the actor who is most likely to be involved in the next behavior pattern to emerge in the situation.

On the other hand actor B is less likely to produce performance outputs than the other actors, but he is likely to be the target of actors who are behaving strategically. B's possession of the negative part of the behavior pattern might well lead other actors to think that if they were to interact with B, they would end up possessing positive behavior pattern parts.

While we cannot make a definite statement about B's probability of being involved in the next behavior pattern to emerge, it seems reasonable to assume that it will be greater than the probabilities for the other actors. Thus, it is the case that the next interchange pattern to emerge is more likely to involve either A or B, than two of the other actors, and A would be more likely to possess the positive part and B the negative part of the pattern. This argument can be generalized to say that, at any time, a new behavior pattern to emerge is more likely to involve at least one actor who was involved in a previous interchange pattern, than not. Therefore, behavior patterns will tend to be clustered among a subset of actors rather scattered among the entire set.

By saying that the configuration of behaviors will be transitive, we mean that if actor A and actor B posses the positive and negative parts of a behavior pattern respectively, and if actor B and actor C similarly share the positive and negative parts of a behavior pattern, then if actor A and actor C share a pattern, actor A will posses the positive part, and actor B will posses the negative part. That is, the actors can be linearly ordered in terms of their possesion of behavior patterns.

It is reasonable to assume that if A observes B deferring to himself and C deferring to B, he is unlikely to defer to C. This point also follows from the theory. By our previous argument the second behavior interchange pattern to emerge in a group situation is likely to involve one of the two actors, A and B, who were involved in the first interchange pattern, and another actor C. If the pattern involves A and C, then since A has higher task performance expectations by virtue of the positive pattern he already posseses than C who posseses no status elements, he is more likely to come to posses the positive part of the new pattern as well. If that is the case, than no matter how a behavior interchange pattern is later established between B and C, the resulting overall configuration will be transitive. Similarly, if the pattern involves B and C, B has lower task performance expectations than C, and is more likely to come to posses the negative part of the pattern. Then, regardles of how a pattern is established between C and A, the resulting configuration will be transitive[3].

[3]The argument presented here is parallel to, and motivated by results presented by Chase (1982). Farraro and Skvoretz (1988) have presented a formal analysis of Chase's results and formulated a general theory of dominance orders.

The properties of clustering and transitivity present a picture of power and prestige order formation which is quite distinctive: The first thing to happen is that a nucleus involving a few actors is formed. We think of this nucleus as the core of the group, and believe that its existence involves important substantive issues. As the nucleus increases to a reasonable size, and can properly be thought of as a core, it will start to function as a decision making body, as an executive for the group. This suggests that the core will not increase indefinitely as more and more actors become related to each other in terms of behavior patterns, but will come to stabilize at a certain size. The properties of clustering and transitivity also make it highly probable that the core will have an internal structure such that one actor will posses a number of positive and no negative parts of behavior patterns. This actor may become the legitimate leader of the group. Whether he will actually come to be the legitimate leader will depend on two factors: One is the amount of support, that is the number of positive pattern parts, he posseses. How many will be enough will depend on a number of situational factors. For example in groups of short duration and relatively little personal investment on the part of the group members, fewer patterns should be necessary to generate a legitimate order, compared to groups of longer life span and greater member investment. The attributes of the group task should have similar effects. We would expect that more important tasks would necessitate greater support than less important tasks, and more urgent tasks would necessitate less support than less urgent tasks.

The other factor determining whether legitimation will occur or not is the match between the status characteristics possesed by the actor who may become the legitimate leader and the salient referential structures in the situation. The referential structures determine who is acceptable for legitimate leadership and who is not. Thus if there are salient referential structures which relate being male to highly valued status positions and being female to relatively low valued status positions, legitimation will not occur if the actor who is candidate to legitimate leadership is female.

When the power and prestige order is legitimated the actors come to behave as though they had socially defined status positions, positions which have normative rights, privileges and duties associated with them. Obviously the top, or leadership, position is of special importance in a legitimate order, as the leader is assigned special executive rights.

With the emergence of the leader, a new dimension of group interaction comes into existence, the leader interacts with the group as a whole, rather than as a collection of individuals. That is the leader has the right to address the group as a single entity. Obviously, other members can, and do address the group as a whole, but when they do they are basically relating to each actor seperately at the same time. This point, of course, makes a considerable amount of difference to the patterns of participation in the group.

An Expectation Measure for Multi-Actor Situations

A fundamental idea in expectation states theory is that power and prestige positions are situational and relative. An actor's power and prestige position can only be meaningfully spoken of with respect to a specific other actor in a given setting. The determinant of the power and prestige position of an actor with respect to another is the actor's self-other task performance expectations. These ideas have lead quite naturally to the use of the concept of expectation advantage, defined as the difference between the actor's expectations for self and those for the other with whom he is interacting, as the basic expectation measure in the theory. However, for multi-actor situations[4] such as the ones we are concerned with, this measure is not apropriate since an actor can be simultaneously interacting with more than one other actor. In fact, participation in a group discussion often involves simultaneous interaction between a performing actor and all other actors. Therefore we need a measure that can place an actor on the expectation dimension with respect to a number of other actors simultaneously, rather than merely a single other actor. This measure should capture the expectations for an actor relative to all the other actors in the situation, and should do this in as simple a way as possible. We proceed as follows.

The model generates expectation values for actors which are measured on a scale running from minus one to plus one. That is, expectations can be positive or negative, reflecting expectations for success or failure, respectively. While such scaling reflects the qualitative significance of expec-

[4]The mathematical formulation does include multi-actor situations, however it is limited to the kind where only two of the actors interact at one time, but who the actors are changes over the course of time.

tations, it makes multiple comparisons difficult to formulate algebraically. A simple way to obtain a useful measure of relative expectations begins by adding one to each expectation value, thus making them all nonnegative. In this way all transformed expectation values will lie between zero and two. We can now formulate a measure which places the actors relative to each other on the expectation dimension by dividing each of these new values by the sum of these values over all the interactants in the situation. These operations can be symbolically expressed as below.

$$s_i = \frac{1 + e_i}{\sum_{j=1}^{n}(1 + e_j)}$$

The measure "s" we call "expectation standing", with the subscript identifying the actor in question. The "e"s in the above formula stand for expectation values for the actors, and n is the number of actors in the situation. The expectation standing represents an actor's proportion of the total expectations in the situation, and thus places an actor on the expectation dimension relative to all others in the group.

Theory and Model

Given the theoretical considerations of the previous sections we can formulate an extension of the theory of status characteristics and expectation states which applies to multi-actor, status heterogenous and status homogenous situations. We first formulate a general theory, and then construct a specific model based on the theory for Bales type discussion groups. Our presentation of the formulation does not restate the original formulation, which we refer to as the core theory, in detail, as it has appeared in print a number of times, but it indicates its general ideas, and explicitly states the new additions and modifications.

The Theory

The scope of the formulation covers collectively oriented task groups. The task must be valued and the actors must take each others behaviors into

account in performing the task. The actors may, or may not, be discriminated by status characteristics. We refer to a situation which fullfils these conditions as an S situation.

A status characteristic is defined as a socially valued characteristic with at least two distinct states which are differentially valued, and which have task performance expectations associated with them. Task performance expectations can be diffuse – that is they can refer to a generalized expectation irrespective of any particular task, or they can be specific, that is they can be defined with respect to a specific task. Status characteristics are called diffuse or specific depending on the type of expectations they carry. Sex and age are examples of diffuse status characteristics, and musical ability and mathematical ability are examples of specific characteristics.

We construct a graph diagram to represent the structure of an S situation. This diagram is constructed from the point of view of one particular actor. However, at this point we assume that there is consensus, so that the structure is the same from the points of view of all the actors in the situation.[5] Actors and status elements such as states of status characteristics which are salient in the situation are represented as points in the graph structure, and three relations, represented by signed lines in the graph, can hold between these elements. Actors may *possess* states of status characteristics, and a state of one status characteristic may be *relevant* to a state of a different status characteristic. Two status elements are relevant if an actor possesing the first expects, or is expected to possess the second. Possesion and relevance are "positive" relations. The third relation which is "negative", and is called *dimensionality*, holds between the two differentially evaluated states of the same characteristic possessed by actors in the situation, such as male and female, indicating their linkage and opposition.

The graph of the situation always contains two elements T(+) and T(-) which represent outcome states, success and failure at the task, respectively. Two other points representing the high and low states of the instrumental ability (i.e. the ability that is necessary for succesful task performance) are also always in the graph of the situation, and these elements are relevant to the similarly signed task outcome states. Thus the initial graph of any

[5]Situations where actors have different points of view of a given situation are, obviously, of special substantive interest. However the modelling of such situations is something to be attempted in the future after we model the simpler situations where there is consensus.

S situation consists of a set of unconnected points representing the actors in S, two task outcome states, and two states of the instrumental ability, C*(+) and C*(-), which are relevant to the outcome states.

The initial structure is completed through the *salience* and *burden of proof* processes. The salience assumption describes how status characteristics become salient. There are two conditions under which status characteristics become salient – when they are initially relevant to the task, and when they discriminate between the actors in the situation. It should be noted that salience is a theoretical state and not a question of what the actors do, or do not, perceive in the situation. A state of a status characteristic which does not satisfy these conditions will not become salient even though it is clearly perceived by the actors in the situation. Similar conditions need to be stated for the salience of behavior patterns.

The assumption places theoretical conditions on when behavior interchange patterns become salient, parallel to the conditions for the salience of status characteristics. Once again, salience does not depend on how visible or highlighted the pattern is, but on the condition that the pattern provides new status information in the situation. Thus if two actors are discriminated by a status characteristic, and a behavior pattern emerges such that the actor with the high state of the status characteristic also has the positive pattern part, the pattern will not be salient.[6] In such cases the behavior pattern does not provide new status information but only confirms existing status differences. However, if the reverse had been the case, that is, if the actor with the high state of the status characteristic came to posses the negative behavior pattern part, the pattern would be providing a new basis of status, and would be salient. If the actors are discriminated inconsistently by status characteristics, we believe that behavior patterns will become salient, because given inconsistency, any information is new information. Similarly when actors are not discriminated by status char-

[6]There are good theoretical reasons to assume that when actors are discriminated by diffuse status characteristics, consistent behavior patterns will not become salient: The social evaluations of honor, esteem, and respect associated with diffuse status characteristics make consistent behavior patterns only to be expected. The case for specific status characteristics is less clear: It may be the case that behavior interchange patterns do become salient when they are consistent with specific status characteristic discrimination. However, given the absence of relevant empirical evidence we prefer the simpler formulation which does not distinguish the two types of status characteristics.

acteristics, that is in homogenous groups, behavior patterns provide new bases of status differentiation, and therefore they will become salient. These ideas are summarized in the assumption given below. This assumption is meant to be taken in conjunction with the original salience assumption.[7]

Assumption* 1 (The Salience of Behavior Patterns) *Given a behavior interchange pattern which occurs between an actor and one or more other actors, the states of the behavior interchange pattern will become salient*

1. *if the actors are not discriminated by status elements, or*
2. *if the parts of a behavior interchange pattern are inconsistent with status elements which discriminate the actors.*

The burden of proof assumption of the core theory describes how salient status elements which are not connected to the task at the outset become connected. The name reflects the basic principle that unless a status element is explicitly dissociated from the task, it will come to be relevant to the similarly signed task outcome state, that is positive elements will become relevant to success, and negative elements will become relevant to failure. For diffuse status characteristics the process works through the activation of generalized expectation states which become relevant to the instrumental characteristic. For specific status characteristics, it works through the activation of the task outcome states of specific characteristics which become relevant to the induced states of abstract task ability.

Behavior type is the element which provides the connection of behavior patterns to the task outcomes. That is, when behavior patterns become salient, high and low status behavior types are induced, conceptions of what high and low status behaviors are like, elements provide the bridge over which behavior patterns become relevant to states of abstract task ability, and ultimately relevant to the task outcome states. These ideas are formally stated in the assumptions below.

Assumption* 2 (The Burden of Proof of Behavior Patterns) *Given a salient behavior interchange pattern, its relevant behavior type will be induced and this behavior type will become relevant to the similarly evaluated*

[7] We use asterisks to indicate that these assumptions are additions to the original assumptions with the same numbers.

state of abstaract task ability, and the latter will become relevant to the similarly evaluated outcome state of the group task.

The sequencing of structure completion assumption of the core theory describes how the salience and burden of proof assumptions operate to further complete the situational structure as new actors become interactants, and new status characteristics become salient in the situation. We now need to add to this assumption that the structure will be further completed as new behavior interchange patterns emerge in the situation. Each new behavior pattern, if it becomes salient, will result in structure development and expectations will be changed or modified.

Behavior patterns, unlike status characteristics, are temporal in nature. That is, they refer to behavior which necessarily occurs over time, and a salient behavior pattern need not be visible at all times. We believe that once a behavior pattern is established and becomes salient it will remain salient even if it is not visible. However, a new behavior pattern which reverses the parts of the actors may become salient, in which case the older pattern loses saliency. Thus if there is a salient behavior interchange pattern such that actor A defers to actor B, but over time a new behavior interchange pattern emerges such that actor B defers to actor A, it is not so much that a new status element has been added to the existing, but that a status element has been changed. The new pattern replaces the old, and the earlier pattern is no longer a part of the structure. The assumption is given below.

Assumption* 3 (Structure Completion of Behavior Patterns) *Everytime a new behavior interchange pattern becomes salient, the structure will be further completed through the action of the burden of proof process. If a new behavior interchange pattern emerges in which the pattern parts possesed by two actors are reversed, then lines joining the actors with these new pattern parts are added to the graph structure replacing the old possesion lines which are dropped.*

At this point it may be worthwhile to look at an example of a situational structure. Figure 1 shows a situational structure with two male and one female actors who are designated by a_i. The task is not sex typed, and a behavior pattern, represented by $b(+)$ and $b(-)$ between the two males

has emerged. The diffuse status characteristic gender, which we designate by D in diagrams, discriminates between the actors, and therefore becomes salient in the situation. The behavior pattern also becomes salient as the two males, a_1 and a_2, are not discriminated by a status characteristic. Since all these elements are not initially relevant to the task, they become task connected through the burden of proof process, and the structure is completed. The burden of proof connection of the behavior pattern parts is through the induced states of abstract behavior type, represented by $B(+)$ and $B(-)$. The connection of the diffuse status characteristic is through the activated states of generalized expectations represented by $\Gamma(+)$ and $\Gamma(-)$.

Figure 1 about here

A graph such as the one above can be used to analyze each actors task connections. The basic idea is to determine the lengths and signs of the paths connecting each actor to the task outcome states. The length of a path is the number of lines which make up the path, and the sign of a path is the product of the signs of the lines it contains, and the sign of the outcome state it connects to.[8] In this example the actor a1 is connected to the positive task outcome state by two positive paths of lengths four, and to the negative outcome state by two positive paths of lengths five, for a total of four positive paths. We assume that the strength, or the contribution to expectations of each path is given by a function $f(i)$, where i is the length of the path. The function yields values in the range $(0, 1)$, and is a decreasing function of path length.

The *formation of aggregated expectation states* assumption (assumption 4) which is the central assumption of the mathematical formulation, describes how paths are combined to yield overall expectation values for actors. Like signed paths are combined according to the rule,

$$f(i \cup j) = f(i) + f(j) - f(i) \cdot f(j)$$

to yield a positive expectation value, and a negative expectation value for each actor. Then the overall expectation value for an actor is obtained by

[8]For a detailed description of path counting see Berger et.al. (1977).

substracting his negative expectations from his positive expectations. The resulting value is in the interval $(-1, 1)$, and is the aggregated expectations of the actor in the situation.

The important point to note is that behavior interchange patterns enter into the formation of aggregated expectations exactly like other status elements, and combine with them in the formation of expectations. This unified treatment of different status elements allows us to capture the entirety of the "expectations to behavior to expectations" cycle within one formulation. We can now describe the emergence of power and prestige orders on the basis of status characteristics, behavioral feedback, and the combination of both status characteristics and behavior. In this way the formulation can be used to explain and to predict behavior in both heterogenous and homogenous groups.

Given the values of the function $f(i)$ we can compute expectation values, and expectation standings for actors in a given situational structure. However, even without knowing the function values we can use the formulation to make statements about actors relative expectations in given situational structures. For example, in the structure given in Figure 1 we can see that actor a_1 is task connected with positive paths only, and that similarly actor a_3 is task connected by negative paths only. On the other hand, actor a_2 has, for each of his positive paths, a negative path of the same length. Therefore we can say that in this situation the actor a_1 has the highest, and the actor a_3, the lowest expectations, with the actor a_2 having expectations in between the other two.

Expectation standings are assumed to be the determinants of the power and prestige order. We present below a version of the *Basic Expectation Assumption*, formulated for our current purposes.

Assumption 5 (Basic Expectation Assumption) *Given that p has formed aggregated expectation states for self and others, p's power and prestige position will be a direct continous function of p's expectation standing in S.*

This assumption has been stated in general terms, and we express these concepts in functional form when we construct specific models. However, before we undertake specific model construction, legitimation effects need to be included in the formulation. We believe that when a sufficiently large

number of actors have established behavior patterns with respect to the same single actor, such that each defers to him then they will all come to behave as though he was their legitimate leader, and that their power and prestige order was legitimate. We believe that this can only happen if the top actor does not posses any status characteristics which are socially recognized as non-leader characteristics. We generalize this latter notion as the actor not having negative reward expectations (Ridgeway and Berger, 1986) in formulating our last assumtion.

Auxilliary Assumption 1 (Legitimation on the Basis of Behavior) *Given that a sufficiently large subset of actors have formed low-high behavior patterns with respect to the top actor in the power and prestige order, and given that they do not have expectations that he will hold a lower status position, the actors will come to behave as if their power and prestige order is a legitimate one.*

This assumption is called the "legitimation on the basis of behavior assumption" because we believe that, as the literature suggests (Ridgeway and Berger,1986), legitimation of the power and prestige order can come about in different ways. The implication of the assumption is that legitimation results in a change in how expectations are translated to behavior. As our previous discussion suggests, this change is of special importance for the behavior of the top actor in the power and prestige order as he takes on a leadership role. The assumption tells us that the prediction function has to have a different form for groups with and without legitimated power and prestige orders. This assumption completes the formulation.

The Specific Model

The formulation is quite general. Within its scope conditions the effects of a number of situational variables may result in quite different configurations of behavior patterns. This formulation does not attempt to describe the process of emergence of behavior patterns, but takes the results of the process as given.[9] Different kinds of groups operating under different conditions can develop linear structures, or segmented structures, or incomplete

[9]The formulation does make probabilistic statements about the emergence of behavior patterns: That is, status characteristics will lead to formation of expectations, and power

structures, or even no stable structure at all. The formulation can be applied to the analysis of different kinds of groups working under different conditions. However, in order to do so it is necessary to construct specific models for given types of groups, by making additional assumptions about the process of emergence of behavior patterns. We will now construct such a specific model for the Bales group setting.

The pertinent features of the early Bales group setting is that it is a laboratory situation where a number (usually from two to twelve) previously unacquainted subjects are given a discussion task and are asked to reach a group decision in a limited amount of time. The discussion topic is usually a human relations case, involving basic values, and as such is intrinsically interesting. The cases are usually complicated enough that the group has a real task in marshalling all the facts, evaluating them, and reaching a group decision. Given the nature of the task and the experimental instructions, it is reasonable to assume that a group in this setting is collectively oriented, and that the task is valued. However, the subjects have no expectations for extended interaction as a group, and therefore are unlikely to have a high level of personal investment in the group.

The time limitation forces the group to develop a structure quickly, and the collective orientation coupled with the relative lack of personal investment works against status struggles, although they do occur. These conditions also make it unlikely that behavior patterns develop inconsistently with any existing status characteristic differences. That is, the actor who possess the high state of a status characteristic with respect to another actor is also likely to possess the positive part of the behavior pattern, if one develops between the two actors. By the same token, an established behavior pattern is unlikely to be reversed during a group session. At the same time, the literature on Bales groups suggests that power and prestige orders appear very quickly, and are usually linear (Bales, 1955; Bales *et al.*, 1951; Fisek and Ofshe, 1970; Rosa and Mazur, 1979). We therefore make the simplest assumption which will generate a unique pattern that is

and prestige differences, which in turn, will make some patterns more likely to appear than others. However, the patterns of importance, i.e. the ones to become salient, are the ones which develop between initial status equals, or are inconsistent with status characteristics. Therefore the formulation has little to say about what specific configurations will come to exist.

consistent with these points.

Specific Model Assumption 1 *In the Bales group setting the configuration of behavior patterns develops in a transitive manner consistent with salient status characteristics, and is fully completed.*

Full completion of the configuration of behavior patterns refers to those patterns which can be salient; that is those between initial status equals, as behavior patterns consistent with status characteristic differentiation will not become salient. The assumption is, obviously, a simplfying one, which we use as a first approximation. Given the distribution of salient status characteristics, if any, in the situation, this assumption enables us to compute expectations for all actors in a given situation. Thus, for example, in a four person homogenous group, one actor would possess three positive behavior pattern parts, one actor two positive and one negative pattern parts, one actor one positive and two negative pattern parts, and finally the last actor would posess three negative pattern parts. Each positive pattern part provides two positive paths of lengths four and five, and each negative pattern part provides two negative paths of the same lengths, and it is straightforward to compute the expectations and the expectation standing of each actor.

Computing expectations does presuppose that we know the values of the function $f(i)$. These function values have traditionally been treated as empirical parameters to be estimated from data; however recent developments have made it possible to generate a priori values on theoretical grounds (Fisek, Norman, and Nelson-Kilger, 1989). We use these theoretically derived values to compute expectation standings.

The next issue in specific model construction is the size of the "core" group necessary to generate a legitimate power and prestige order. This issue has been identified earlier as an empirical issue, that is we have a parameter to be estimated. Our approach to this estimation problem is quite informal: we look for a reasonable assumption rather than applying formal estimation procedures. Table 1 below gives the rates of participations of the top two initiators for group sizes of three through eight for the original Bales data (Bales, 1970).[10]

[10]The participation rates of actors of lower initiation ranks have not been reported here

Table 1 about here

The top part of the table gives the total rates of participation, and displays a trend which is one of the earliest to be noted in studies of Bales groups (Bales *et al.*, 1951): The difference in participation rate between the top two actors increases with group size. This trend has obvious implications for the development of leadership. However, our discussion of legitimation suggests that it would be more appropriate to look seperately at rates of addressing the group as a whole and addressing individuals, because leadership is more likely to be manifested in addressing the group as a whole. The rest of the table gives the rates for addressing the group as a whole and individuals seperately. It is clear that the observed trend of the differences between the two top actors is enhanced when rates of speaking to the group as a whole are considered, but disappears when the rates of addressing individuals are considered. This result is very much in line with our account of legitimation. This seperation also highlights the shape of the trend: The trend is not linear, but is very much like a step function. The difference in rates is small for group sizes of three and four, increases dramatically for group size of five, and then remains essentially constant. Thus it seems unlikely that the trend is due to quantitative factors like an increase in the need for leadership behaviors as group size increases. However, the trend is consistent with our account of legitimation, and suggests that legitimate leadership may become possible in groups of size five. Thus we take five as our estimate of this parameter.

To complete the specific model we need to specify the forms of the prediction functions. Before we do so however, a brief discussion of the general nature of such functions is necessary. We believe that expectation standings are the primary determinants of power and prestige behaviors, but that they are not the only determinants. Thus for any function to predict such behaviors in a concrete setting must take other considerations into account. First of all, consider the fact that we lump together a number of different behaviors such as producing performance outputs, receiving action opportunities, accepting and rejecting influence, and other similar behaviors as power and prestige behaviors. It is reasonable to assume

to conserve space as they are not germane to the current argument. However we should note that the rates for the lower ranking actors decrease in a fairly linear way.

that for the same expectation standings, the differentiation in the rates of initiating or receiving these different behaviors will vary. For example, for a given distribution of expectation standings we would expect more differentiation in the rates of successful influence attempts than in the rates of overall participation. Clearly, actors are more likely to let an actor with low expectation standing speak than they would be to accept his opinion.

Second, given the same kind of power and prestige behaviors, the degree of differentiation is likely to differ depending on a number of contextual variables. For example, we would expect that the degree of differentiation of participation rates would increase with increasing task orientation. Similarly we would expect that the nature of the sentiment relations in a group to increase or decrease the degree of differentiation on a given type of power and prestige behaviors for the same expectation standing differences.

These arguments suggest a prediction function with parameters to account for these effects. However a systematic body of evidence on the effects of contextual variables on power and prestige behaviors is not available. Therefore we shall not attempt to formulate a general function, but instead formulate the simplest possible one which can be used to predict participation rates. This seems reasonable because overall participation rates in the Bales group setting are a composite of different power and prestige behaviors some of which are more and some of which are less differentiated. Further, we assume that there has been no particular attempt to manipulate contextual variables. Even with this limited objective, we need to formulate more than one function.

The need for more than one prediction function stems from the need to treat speaking to individuals and speaking to the group as a whole as different kinds of power and prestige behaviors. Our account of legitimation dynamics asserts that rates of speaking to the group as a whole will change when the power and prestige order is legitimated in a group. The argument is that when the power and prestige order is legitimated in a group, the top actor in the order will behave as the group's leader. There is a new relationship between the leader and the other members of the group. The leader interacts with the others as a single entity, a massed other. Thus speaking to the group as whole becomes the leaders special province and his rate increases while the rates of the others decrease. These ideas require that the most parsimonious model will involve two different functions, one

for predicting both rates of participation in situations where there is no legitimate order, and rates of speaking to individuals in situations where there is a legitimate order, and another one for predicting rates of speaking to the group as a whole for situations with legitimated orders.

Considering the relationship between expectation standings and participation rates in general, the simplest possible functional relationship is that of equality. Both variables are measured in the same interval, $(0, 1)$, they both sum to one for a given group, and the substance of the relationship is that the greater the expectation standing the greater the participation rate. Therefore we use the identity function in the simpler case, that is for rates in groups without legitimated orders, and for rates of speaking to individuals in groups with legitimated orders. However, something a little more complicated is called for in predicting the rates of speaking to the group as a whole in groups with legitimated orders. The idea is that when addressing the others as a single entity, the leader is interacting with them as if they were a single individual with status typical for their numbers. Therefore the massed other's expectation standing is simply expressed as the arithmetic mean of the expectation standings of the others. To obtain the leader's and the others' total share of speaking to the group as a whole from these two expectation standings, we normalize them, so that they sum to one. The total share of the others can then be allocated among them in proportion to their expectation standings. These ideas are summarized in the assumption below.

Specific Model Assumption 2 *In the Bales group setting an actor's rate of participation will be equal to the actor's expectation standing, except for the rate of speaking to the group as a whole in groups with legitimated power and prestige orders, in which case the rate for the leader will be given by*

$$g_1 = \frac{s_1}{s_1 + \frac{1-s_1}{n-1}}$$

and for the others by,

$$g_i = (1 - g_1)\frac{s_i}{1 - s_1} \qquad i = 2, \ldots, n.$$

The first formula gives the leader's rate of addressing the group as a whole. The fraction in the denominator is the mean expectation standing of

the others in the group: Since expectation standings sum to one, one minus the leaders expectation standing gives the sum of the others' expectation standings, and $(n-1)$ where n is the number of actors in the group, is the number of others. Thus the entire first formula is the normalization of the leader's expectation standing with the mean expectation standing of the others in the group. The second formula gives the rates for the other members: $(1-g_1)$ is the others' total share, and the second factor is the actor's expectation standing renormalized by leaving out the leader's expectation standing. This assumption completes the specific model for the Bales group setting.

Goodness of Fit

The formulation was motivated by the problems posed by the mixed sex groups in the Bales' setting studied by Skvoretz. We would like to evaluate the fit of the model we have constructed to this set of data. We have also sought data from other groups in Bales-type settings where actors are systematically discriminated by status characteristics. A set of studies carried out by E. G. Cohen and her associates (Cohen, 1972; Cohen and Roper 1985) provide data on four person groups composed of two "high status" and two "low status" actors discriminated by one characteristic, the characteristic being different in each study. We will also assess the fit of the model to this set of data. Finally, we explore the fit of model to the original Bales data as examples of homogenous groups. Since all the data predate the construction of the model, our evaluation of goodness of fit is not a test of the model, but only an assessment of consistency of the model with the data.

We evaluate the fit of the model to the mean rates of participation for groups of given size and compostion. There are good reasons to expect individual groups to deviate considerably from the predictions of the model, and no reason to be dismayed by such deviations. Certainly individual dispositional variables have a lot to do with participation rates. A group where, by chance, a number of actors of high disposition to participate have come together may not show the same participation rates as a group of actors with low dispostions. Our model can capture some of the effects

of dispositional differences through behavior interchange patterns, as the actors with the higher dispositions to participate will tend to possess positive pattern parts, and those with lower dispositions will tend to possess negative pattern parts. However, the model cannot account for all dispositional differences, and cannot be expected to fit individual groups well. At the same time, experimental conditions cannot be expected to match the theoretical conditions of the model exactly. Whatever care experimenters take to match their subjects to form homogenous groups, there can be no guarantee that no status characteristics will become salient in the situation. Nor can one guarantee that all groups have the same level of task orientation, or the same levels of any other relevant contextual variables. However, given a sample of groups of the same size and composition, and assuming there is no systematic bias, we can expect such differences of individual dispositions and experimental conditions to average out, leaving visible the social structural effects which we are trying to model.

Our first assessment of fit is simply the comparison of predicted and observed participation rates for each set of data, and where possible, we use the standard error of the observed value to assess the goodness of fit. This common sense approach has traditionally been used with participation rate models for Bales' groups (cf. Kadane and Lewis, 1969). The second step is to do a regression of the observed rates on the predicted rates. Regression analysis offers some important advantages in assessing goodness of fit. First, it provides a summary measure, R^2, for the entire data set. Furthermore, the measure has a very straightforward interpretation as the percentage of the variation explained in the observed by the predicted, and is a commonly used measure in most quantitative work. Second, examination of the regression coefficients and the residuals can tell us about systematic biases the model might have. However, our use of the regression model requires a word of caution because there is dependence in our data: If the model overpredicts a participation rate for one rank for a given group, it is going to have to underpredict another; participation rates for a given type of group sum to one. This makes autocorrelated error very likely. Serial autocorrelated error in time series, and autocorrelation in spatial distributions have been studied in detail (see Cliff and Ord, 1972; Judge, Griffiths, Hill and Lee, 1985), but there is no reference in the literature to this particular type of autocorrelation structure that we can find. Going

by general principles, it is known that the presence of autocorrelated error does not bias parameter estimates but reduces their efficiency and makes their standard errors unreliable (Hanushek and Jackson, 1977). Along similar lines positive autocorrelation can supuriously inflate R^2. However, in our case autocorrelation is likely to be negative: Over or underprediction in one case requires that an error in the opposite direction be made in at least one other case, within the same size and composition group. In fact since the data is ordered in terms of participation rank, autocorrelation should appear to be serial. The Durbin-Watson statistic indicates the sign of the first order serial correlation, and therefore can be used to alert us to possible inflation of the R^2 statistic. The dependence also requires that we reduce the degrees of freedom for the residual by one for each type of group in a given data set. The regressions are also weighted by the square root of the sample size for each group size and composition, since within a set of data there usually are different numbers of given types of groups.

The Skvoretz Data

This data is from six person groups in the Bales setting, where the sex composition of the groups has been systematically varied from all male to all female. The subjects are university undergraduates. In assessing the fit of the model to this data we encounter the following problem: Our model predicts that in all male, and in five male - one female groups the power and prestige order will be legitimated, so the participation directed to individuals, and to the group as a whole have to be predicted seperately. But in the available data participations to the group as a whole, and to individuals are not reported seperately. We at least need to know the overall proportion of acts directed to the group as a whole in order to combine the predicted to-individual and to-group participation rates, to obtain a predicted total participation rate. Therefore we estimate this proportion as a parameter by doing a simple grid search optimizing the fit of the regression model for these two types of groups. The estimate we obtain is that 17% of the acts are directed to the group as a whole.[11]

[11] This value is low compared to the original Bales groups where it is about 40%. However, these groups differ from Bales groups in important ways: The discussion sessions are twenty minutes long, compared to 45 minutes for the original Bales groups, so that

We use this value to generate total participation predictions for the all male, and five male - one female groups, and reduce the residual degrees of freedom by one in the regression analysis. Table 2 gives the observed and predicted proportions of participation for each initiation rank within each sex for these groups.

Table 2 about here

In this table, for each group composition the first column gives the predicted participation rate, the second column the observed participation rate, and the third column the sample standard error. Asterisks indicate those predictions which are more than two standard errors away from the observed. For each group composition, the males are listed first in order of their participation rank among themselves, and than the females are listed in the same order. Examining the table, the first thing we note is that out of the 42 predictions 10 differ from the observed by more than two standard errors. This relatively large number of poor predictions can be partially explained by the dependency in the data, since given one prediction is off for in a particular type of group, a second prediction is also likely to be off. It is also probably the case that the sample sizes are too small to wash out individual differences, so that predictions for particular ranks are not successful. However, the model does capture the the general features of the distributions, such as the fact that the the proportions of participation for the top actor in all male and five male, one female groups are higher than in the other groups, as predicted by the model. Therefore we feel justified in looking further at the over all fit of the model. The regression results are given in Table 3.

Table 3 about here

Quite obviously the R^2 value obtained is quite high. Thus it seems that although the model's point predictions are off on a number of cases, the model does describe the overall features of the data quite well. Examining the coefficients of the regression equation, we see that the regression

there is less time for the development of leadership. The discussion task is a more emotionally neutral task than Bales' human relations cases, and calls for less management of the discussion.

coefficient is larger than one by more than two standard errors and the intercept is also less than zero by more than two standard errors. This indicates that the model is underpredicting the higher participation rates, and overpredicting the the lower rates. The effect is not very large, however. The residual plots indicate a strong autocorrelation effect, but the Durbin-Watson statistic is not high enough to indicate a significant first order serial correlation, and is in the negative direction.

There is one further way we can evaluate the goodness of fit of the predictions of the model to the data. The model predicts the rank positions of the males and the females for each gender composition, so that these orders can be compared to the observed orders. The data is reported in this form in Table 4.

Table 4 about here

There are no measures of concordance for rankings where the elements ranked are not individually identified. Therefore we have constructed an *ad hoc* index whose values are given in the table. The index is the ratio of the correctly predicted pairwise orderings to the total pairwise comparisons, excluding the ties. The agreement between the predicted and observed orders is perfect in three cases out of five, slightly off in one case, and not very good in the fifth case. Our general evaluation is that the model does well in describing the overall distribution of participation rates.

The Cohen Situation Data

E. G. Cohen and her colleagues have conducted a series of studies to develop intervention techniques for changing expectations to counteract the negative effects of status charcteristic discrimination in educational contexts (Cohen, 1972; Cohen and Roper, 1985). Each study in this set contains a control condition used to evaluate the effect of interventions in the experimental conditions. These control conditions meet the conditions of the Bales setting, the only difference being that in most of the studies the task is playing a board game instead of the typical Bales discussion task. However, the actors have to discuss their moves and come to a joint group desicion as to how they are going to move the marker on the game board.

The game is not competitive, but cooperative, the goal being to reach the target and win as a group as quickly as possible. Each group is composed of four actors, two from a "high status" category, and two from a "low status" category.

We will examine data from five studies in this series. Three of these studies use the game task. Of these studies, one by Lohman (1970) uses black and white junior high school students as subjects. The other two studies, by Morris (1977) and by Rosenholtz (1977) look at the effects of a specific characteristic - reading ability reputation. Of the four elementary school students who participate in a group two are reputed good readers, and two are reputed poor readers. The remaining two studies, one by Hall (1972), and one by Lockheed (1976) use a discussion task and look at male and female subjects who are teacher trainees. The participation rates observed in these groups and the model's predictions are given in Table 5.

Table 5 about here

We do not have the standard errors for these observed participation rates, and therefore cannot evaluate the closeness of the predictions in such terms. However, the agreement between the predicted and the observed looks reasonable by visual inspection. The average difference between them is .0147, that is it is less than one and a half percent. It is interesting to note that the model predicts that the less active actor of the higher status category and the more active actor of the lower status category will have equal participation rates. In four of the five cases, this prediction is in good agreement with the data, in the fifth case, the Hall study, there is a fairly marked differentiation between the two actors. Despite this deviation, our evaluation is that the model describes the data quite well. Table 6 presents the regression results.

Table 6 about here

The R square is high, even higher than for the Skvoretz data. The coefficient of regression, and the intercept indicate a tendency to underestimate high, and overestimate low values. This same tendency was also observed for the Skvoretz data; as in that earlier case, there is little reason to be concerned with this small effect at this stage of theoretical development.

Residual plots indicate the existence of autocorrelated error, however the Durbin-Watson statistic is not large enough to indicate a significant first order serial effect, and again is in the direction of negative autocorrelation. We have to conclude that the model fits this set of data, which includes data from groups with fairly different tasks, with different subject populations and discriminated by different status characteristics, quite well.

The Original Bales Data

Finally, we would like to assess the fit of the model to the original Bales data (Bales,1970). Bales data are coded seperately for to-individuals and to-group participations, so we can fit the model seperately for the two kinds of behaviors. This enables us to evaluate the legitimation aspects of the model in direct terms. Tables 7 gives the distributions of the observed and predicted to-individual participation rates.

Table 7 about here

It should be pointed out that the basic initiation rank of actors was determined using total participations by Bales. Therefore when to-individual and to-group participations are seperated, their orderings can disagree. This is seen to happen for the top ranks in groups of five. Such a reversal is not consistent with our model; however the difference in the magnitudes of the two rates is small, and given the small number of groups of this size, need not cause serious concern. In fact, the general agreement between the predicted and observed participation rates seems to be quite good by visual inspection. The mean difference between them is .015, similar to the fits of earlier models (see Kadane and Lewis,1969). We do two seperate regression analyses: One is for the total participation rates in group sizes two through four (for these groups the model does not predict different to-group and to-individuals participation rates), and to-individuals participation rates in group sizes five through eight. The second is for the to-group participation rates in group sizes five through eight. The results of these regression analyses are given in Table 8.

Table 8 about here

For the first regression, the R^2 value is large. Both the regression coefficient and the intercept differ from one and zero, respectively, by about one standard error. The Durbin-Watson statistic, though on the positive side, is close to 2, which is the mean value under the null hypothesis. We conclude that the model fits the data well.

For the second regression, the R^2 value is even higher; however, the Durbin-Watson statistic is quite low - though not low enough to be significant (at $\alpha = .05$ with $n = 25$ the critical values of D are $D_L = 1.29$ and $D_U = 1.45$). Residual plots also indicate that there is autocorrelation, and therefore spurious inflation of the R^2 is a distinct possibility. However, even given this precautionary note, we still have to conclude that the fit is good, and that overall the model is in good agreement with the original Bales' data.

Summary Statement

We started out to formulate a theory which could account for the structuring of power and prestige orders in both status heterogenous, and status homogenous groups in open interaction situations. We have done so by integrating two theories within the expectation states theory framework, the theory of status characteristics, and the theory of evolution of expectations. We have also introduced elements of legitimation dynamics into the theory. The resulting formulation, which is an extension of the mathematical of the theory of status characteristics and expectation states, can be used to predict the power and prestige orderings in status heterogenous, and initially status homogenous groups.

We have constructed a specific model, based on the theory, to predict rates of participation in Bales type settings. We believe that this model fits the data reported by Skvoretz quite well. We have demonstrated that the same model also fits well another set of data on heterogenous groups, data which has been collected by E. G. Cohen's associates. We have also shown that the model fits the original Bales data as well. The goodness of fit in each case, as measured by R^2, is good. It should also be noted that the model requires very little in the way of estimating parameters. The only such quantities to be used in the assessment of fit presented above were

the size of the core group necessary for legitimation and the proportion of to-group participations in the Skvoretz data. The model could be further refined by including an empirical parameter of "degree of differentiation". However, at this point of theoretical development this would essentially be curve fitting, and could possibly be misleading. What is called for is research into conditions which lead a group into greater or lesser degrees of differentiation given the same expectation structure. When such research is available then the fine tuning of the model can proceed. We believe our formulation, incorporating as it does the full feedback cycle of expectations to behavior and behavior to expectations, has furthered our understanding of the evolution of power and prestige orders, and is capable of generating further empirical and theoretical research.

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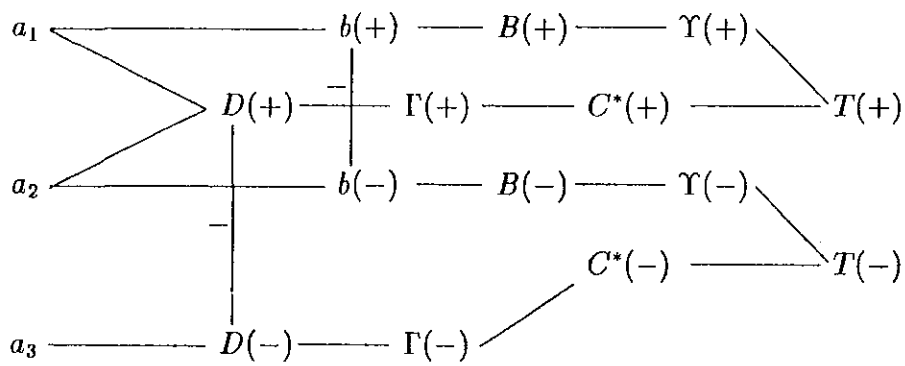

Figure 1: A Situational Structure with Two Male Actors with a Behavior Interchange Between Them and a Female Actor

Table 1: Participation Rates of the Two Top Actors in the Original Bales Groups by Group Size

	Group Size					
Actor	3	4	5	6	7	8
	Total					
One	.444	.322	.469	.431	.431	.398
Two	.327	.289	.219	.188	.152	.166
	To Group					
One	.512	.365	.707	.621	.638	.577
Two	.272	.291	.119	.131	.087	.090
	To Individuals					
One	.393	.296	.271	.288	.247	.249
Two	.363	.288	.302	.231	.209	.229
N	26	89	9	18	15	8

Table 2: Predicted and Observed Participation Rates in the Skvoretz Groups

	All male			5 Male - 1 Female			4 Male - 2 Female		
Rank	Pred.	Obs.	SE	Pred.	Obs.	SE	Pred.	Obs.	SE
1	.337	.367	.041	.317*	.372	.016	.251	.264	.037
2	.209	.238	.031	.193*	.233	.013	.204	.174	.018
3	.171*	.143	.012	.159	.145	.019	.161	.134	.016
4	.133	.106	.018	.124	.122	.021	.117	.080	.022
5	.096*	.076	.008	.089*	.035	.011	.161	.207	.032
6	.056	.070	.008	.122	.094	.029	.107	.142	.050
N		5			5			5	

	3 Male - 3 Female			2 Male - 4 Female		
Rank	Pred.	Obs.	SE	Pred.	Obs.	SE
1	.242	.254	.020	.231*	.312	.032
2	.192	.220	.028	.173*	.109	.026
3	.142	.100	.028	.220*	.299	.019
4	.192	.218	.051	.173	.155	.022
5	.142	.131	.011	.126*	.091	.015
6	.091	.077	.015	.077	.035	.070
N		4			5	

	1 Male - 5 Female			All Female		
Rank	Pred.	Obs.	SE	Pred.	Obs.	SE
1	.213	.275	.062	.273	.292	.012
2	.247	.271	.024	.229	.229	.011
3	.202	.173	.025	.187*	.216	.007
4	.158	.151	.021	.146	.137	.013
5	.113	.075	.021	.105	.086	.013
6	.066	.056	.015	.061	.040	.015
N		3			4	

Table 5: Observed and Predicted Participation Rates in the Cohen Situation

	Predicted	Lohman 2 White 2 Black	Hall 2 Male 2 Female	Lockheed 2 Male 2 Female	Morris 2 HiRead 2 LoRead	Rosenholtz 2 HiRead 2 LoRead
H1	.333	.330	.354	.329	.364	.364
H2	.250	.230	.205	.245	.240	.246
L1	.250	.270	.278	.248	.248	.237
L2	.167	.170	.163	.174	.147	.152
N		14	20	8	18	20

Table 6: Regression Results for the Cohen Situation Data

R^2 =	.935	F(1,13) =	260.526
b =	1.140	SE(b) =	.071
Constant =	-.035	SE(C) =	.018
Durbin-Watson =	2.177	Significant Residuals=	0

Table 7: Predicted and Observed Participation Rates in Bales Groups

Total Participation Rates for Group Sizes 2-4						
	Two Actor		Three Actor		Four Actor	
Rank	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.
1	.591	.573	.444	.444	.364	.322
2	.409	.427	.333	.327	.287	.289
3			.223	.229	.213	.228
4					.137	.161
N	41		26		89	

To-individual Participation Rates for Group Sizes 5-8								
	Five Actor		Six Actor		Seven Actor		Eight Actor	
Rank	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.
1	.311	.271	.273	.288	.243	.247	.220	.249
2	.254	.302	.229	.231	.208	.209	.190	.229
3	.200	.209	.187	.185	.175	.158	.163	.158
4	.146	.141	.146	.136	.143	.128	.138	.125
5	.089	.077	.105	.094	.111	.115	.113	.117
6			.061	.065	.078	.077	.087	.060
7					.043	.064	.060	.042
8							.031	.020
N	9		18		15		10	

To-Group Participation Rates for Group Sizes 5-8								
	Five Actor		Six Actor		Seven Actor		Eight Actor	
Rank	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.
1	.643	.707	.652	.621	.658	.638	.663	.577
2	.132	.119	.109	.131	.094	.087	.082	.090
3	.104	.088	.089	.084	.079	.074	.070	.090
4	.075	.057	.070	.075	.065	.066	.059	.066
5	.046	.029	.050	.049	.050	.053	.049	.048
6			.029	.040	.035	.047	.038	.048
7					.019	.034	.026	.044
8							.013	.013

Table 8: Regression Results for Bales Data

Total (Group Sizes 2-4) and To-Individual (Group Sizes 5-8) Participation Rates			
R Squared =	.978	F(1,26) =	1446.226
b =	.972	SE(b) =	.026
Constant =	.006	SE(C) =	.007
Durbin-Watson =	1.916	Significant Residuals=	0
To-Group Participation Rates (Group Sizes 5-8)			
R Squared =	.989	F(1,20) =	2083.811
b =	.956	SE(b) =	.021
Constant =	.007	SE(C) =	.006
Durbin-Watson =	1.572	Significant Residuals=	1