

## A Motivational Model of Alcohol Use

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The final, common pathway to alcohol use is motivational. A person decides consciously or unconsciously to consume or not to consume any particular drink of alcohol according to whether or not he or she expects that the positive affective consequences of drinking will outweigh those of not drinking. Various factors (e.g., past experiences with drinking, current life situation) help to form expectations of affective change from drinking, these factors always modulated by a person's neurochemical reactivity to alcohol. Such major influences include the person's current nonchemical incentives and the prospect of acquiring new positive incentives and removing current negative incentives. Our motivational counseling technique uses nonchemical goals and incentives to help the alcoholic develop a satisfying life without the necessity of alcohol. The technique first assesses the alcoholic's motivational structure and then seeks to modify it through a multicomponent counseling procedure. The counseling technique is one example of the heuristic value of the motivational model.

This article presents a motivational formulation of alcohol use. The formulation is intended to incorporate advances made in understanding the inheritable constitutional factors (e.g., Goodwin, in press; Schuckit, Li, Cloninger, & Deitrich, 1985) and the appetitive systems (T. B. Baker, Morse, & Sherman, 1987) in alcohol-related behavior, and also the array of other motivational factors that are increasingly recognized to play decisive roles in understanding and treating addictive behavior patterns (e.g., Klinger, 1977; Marlatt & Gordon, 1985; Miller, 1985). The particular benefit of this formulation is to place alcoholic behavior in the context of contemporary theory of motivation and emotion, as they relate both to alcohol use in the narrow sense and to the life context in which the alcoholic continually makes choices between drinking and alternative actions. The formulation thereby suggests additional contributory factors, treatment strategies, and conceptual approaches.

Despite the fact that there are multiple factors that influence drinking, the final common pathway to alcohol use is, in our view, motivational. The net motivation to drink, moreover, is closely tied to people's incentives in other life areas and to the affective changes that they derive from their incentives. We begin, therefore, by defining incentive motivation and affective change and showing how these two concepts are related to people's use of alcohol.

### Incentive Motivation

The term *incentive motivation* was introduced by Clark L. Hull (1951, 1952) as a theoretical construct to account for the vigor and intensity of behavior. Previously, Hull (1943) had assumed that organisms can perform a learned response to the

extent that they have acquired habit strength (the learned association between a stimulus and the response) and that the response is energized solely by the organism's current level of drive (which was assumed to be proportional to its physiological need). Subsequent experiments, however, prompted Hull to modify this view.

These landmark experiments were conducted by Crespi (1942) and Zeaman (1949), who trained albino rats to traverse a straight runway for one magnitude of food reward and then shifted them to either a larger or smaller magnitude of reward. The shifts in reward were accompanied by precipitous changes in the speeds with which the rats traversed the apparatus. With an increase in reward, the rats abruptly increased their running speeds and ran more rapidly than a control group that received only the large reward (a positive incentive contrast effect). With a decrease in reward, the rats abruptly decreased their running speeds and ran more slowly than a control group that received only the small reward (a negative incentive contrast effect). Since the rats' performance of the learned response was a function of the current attractiveness of their incentive (relative to what it had been previously), and since their current performance could not be explained entirely by drive and habit strength, Hull (1951, 1952) introduced the new motivational construct of incentive motivation to account for their behavior. By citing Crespi and Zeaman's work here, we do not intend to imply that their work is the foundation of our motivational model of alcohol use. Instead, the results of their experiments illustrate the necessity of having a motivational construct like incentive motivation and why Hull introduced that construct in the first place. Later we shall discuss subsequent work on incentive contrast effects that is specifically related to alcohol.

Other learning theorists (Black, 1965, 1968, 1969, 1976; Spence, 1956) have modified and extended Hull's view of incentive motivation and have elaborated on the manner in which it combines with other learning and motivational constructs. Stewart (e.g., Stewart, de Wit, & Eikelboom, 1984) has specifi-

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cally interpreted drug-taking behavior as an incentive-motivational phenomenon. Stewart views psychoactive drugs and the conditioned stimuli associated with them as generating positive appetitive states that maintain drug-taking behavior. Although accepting this view, our position additionally draws attention to the balance between the organism's chemical and nonchemical incentives. Not only does alcohol alter the incentive value of nonchemical incentives, but the relative incentive value of alcohol is itself partly determined by the value of the organism's nonchemical incentives.

The concept of drive has a number of limitations as a motivational construct in addition to the one that Hull recognized. (For an elaboration of the argument, see Klinger, 1971, Chapter 8). Drive states are neither necessary nor sufficient for the initiation of behavior (Bindra, 1968, 1976); reinforcement can take place in the absence of drive reduction (Cox, 1976); and powerful behavioral effects can be observed under extremely low drive states by the offering of appropriate incentives (Black & Cox, 1973; Cox, 1976; Mendelson, 1966). In fact, under some circumstances, reinforcement takes place with increases in drive levels. Unlike the constructs of affect or emotion, the drive construct is unable to account for foresightful behavior (McClelland, Atkinson, Clark, & Lowell, 1953; Tomkins, 1962). The class of effective incentives includes events that cannot reasonably be equated with drive reduction or explained by association with drive reduction. Therefore, comprehensive models of motivation must include explanatory constructs other than drive and drive reduction. Furthermore, adding the concept of expectancy to that of drive fails to provide a comprehensive explanatory model, since a large part of the expected events that motivate organisms are not drive-related. Contemporary approaches to motivation (e.g., Frese & Sabini, 1985; Halisch & Kuhl, 1987; Heckhausen, 1980) are therefore couched in terms of goals, incentives, current concerns, and related constructs such as values (Atkinson, 1964; Pervin, 1983), personal projects (Palys & Little, 1983), and personal strivings (Emmons, 1986). As we shall see, these are, in turn, often conceptualized in terms of or in close relation to changes in affect (Buck, 1985; Klinger, 1971, 1977, 1982, 1987a; Pervin, 1983).

In the present article, we use the term *incentive motivation* simply to refer to an organism's motivation to pursue incentives: positive incentives to which it is attracted and negative incentives by which it is repelled. An incentive becomes a goal when an organism has become committed to pursue it. Incentive motivation forms an integral part of organisms' psychological functioning. In fact, in the case of the human organism, people's lives are organized around the pursuit and enjoyment of incentives (Klinger, 1975, 1977). A person who is committed to pursue an incentive, moreover, is characterized by a distinctive motivational state, or current concern, that lasts from the time of the initial commitment until the incentive is either consummated or relinquished. According to our model of alcohol use, which shall be introduced shortly, a person's motivation to use alcohol is intertwined with his or her incentive motivation in this and other life areas and the affective changes that result from that motivation.

#### Affective Change

Affect refers to the psychological, or experiential, component of an emotional response. By affective change we mean a change

in affect from its current state—a change that may be either quantitative or qualitative in nature. Even though affective changes may occur for reasons other than through organisms' commerce with their incentives, the incentives in their lives—and their relationship to them—are a major source of organisms' affective changes. In current motivational theory (see Halisch & Kuhl, 1987; Klinger, 1975, 1977, 1987a; Pervin, 1983), there is an emerging consensus that an incentive is any object or event that has the capacity to produce an affective change. In the positive case, achieving positive incentives, avoiding or escaping negative incentives, or even imagining these events temporarily shifts affect in a positive direction. On the negative side, the vicissitudes of goal pursuit make a decisive difference in the individual's affective life. Frustration—difficulties with attaining goals—engenders anger and depression (Klinger, 1975, 1977, 1987a). Signals of impending frustration and punishment engender fear (Gray, 1982). Thus, the success of goal striving determines a substantial part of an individual's affective changes. Furthermore, as we shall see, the prospect of affective change in turn appears to constitute the motivating factor in incentive motivation.

Among both animals (Black, 1976) and humans (Heckhausen, 1977; Heckhausen & Kuhl, 1985; Klinger, 1975, 1977), moreover, it is organisms' expectations about incentives that appear to govern their goal striving. That is, the empirical evidence indicates that appropriate expectations about incentive attainment (instead of drive reduction or operant reinforcement) together with the values of the incentives are both necessary and sufficient for goal-directed behavior to occur. For instance, as indicated earlier, vigorous goal-directed behavior can occur in the virtual absence of drive (e.g., Black & Cox, 1973; Cox, 1976). Analyses of human motivation indicate that goal striving is the organizing force behind behavior and that people strive for goals because they expect that reaching them will produce affective changes (Klinger 1975, 1977; Pervin, 1983). Organisms strive to achieve positive incentives in order to enhance positive affect and seek to rid themselves of negative incentives in order to reduce negative affect.

In the case of humans' motivation to use alcohol in particular, it has been demonstrated that clear expectations about the effects of alcohol are formed prior to the time that a person consumes any alcohol (Christiansen, Goldman, & Inn, 1982) and that people's expectations about imbibing alcohol dramatically influence their motivation to drink and the actual effects that drinking has on their behavior (Marlatt & Rohsenow, 1980). Our model of alcohol use suggests that the many variables demonstrated to have an impact on people's motivation to drink do so by helping to form expectations about the affective changes that will occur if a person drinks, as compared with affective changes produced by nondrinking, alternative behaviors.

#### Alcohol Use

There are two ways in which drinking alcohol can bring about affective changes, and there are two corresponding types of effects that people expect to achieve by drinking. The first way is through the direct, chemical effects of alcohol on emotion. Alcohol clearly has mood-altering effects that are usually

described as either "tension reducing" or "mood enhancing" (Langenbucher & Nathan, in press; West & Sutker, in press). However, people's expectations about the mood-altering effects of alcohol are often a more potent source of actual changes in mood than is the pharmacological action of alcohol itself (Lang & Michalec, in press; Marlatt & Rohsenow, 1980). The second way in which drinking brings about affective changes is indirect and occurs by virtue of the fact that drinking alcohol can be instrumental in regulating the other incentives in one's life. That is, imbibing alcohol might either facilitate or interfere with a person's reaching nonchemical positive or negative goals, thereby indirectly bringing about affective changes. For instance, many of the social variables that influence drinking do so indirectly because drinking alcohol is instrumental in achieving peer approval (White, Bates, & Johnson, in press). Later in the article, we provide other specific examples of how the indirect, instrumental effects of drinking alcohol can bring about affective changes.

Regardless of whether an affective change that is produced by drinking alcohol is direct or indirect, alcohol use is intertwined with people's incentive motivation and the affective changes that they experience as a result of the incentives in their lives. Thus, for example, the affect that people experience prior to imbibing alcohol, and that they expect to change by drinking, is likely to have arisen from their goal striving and their success or lack of success in reaching their goals. In turn, drinking alcohol, especially in excessive quantities, changes people's affect, their incentive motivation, and their subsequent motivation to use or not use additional alcohol. Thus, either directly or indirectly, drinking alcohol influences and is influenced by the other incentives in people's lives.

### Modifying Incentive Motivation With Alcohol

W. Miles Cox's initial investigation of incentive motivation, affective change, and alcohol use was with albino rats in an instrumental conditioning situation similar to the one used by Crespi (1942) and Zeaman (1949). Specifically, the aim of these studies was to determine if incentive contrast effects resulting from shifts in the magnitude of food reward could be modified by alcohol.

According to one view (Amsel, 1958, 1962; Crespi, 1942; Hull, 1952; Zeaman, 1949), the sudden changes in behavior that accompany incentive shifts are mediated by emotional reactions to the shift. According to this explanation, incentive contrast effects that are ordinarily observed should be modified among animals that experience the mood-altering effects of alcohol at the time that the incentive shift occurs. That is, alcohol, through its attenuation of the negative emotional reaction to a downshift in reward, might reduce or eliminate the negative incentive contrast effect. Through its enhancement of a positive emotional reaction to an upshift in reward, alcohol might contribute to a positive incentive contrast effect.

To explore these possibilities, Cox and colleagues (Cox, 1981, 1988; Cox, Klinger, & Kemble, 1987) compared reactions to incentive shifts of rats that had consumed an alcoholic solution prior to their conditioning trials with those that had consumed a nonalcoholic solution. Results obtained with the sober rats were consistent with those of the many incentive contrast stud-

ies that have followed those of Crespi (1942) and Zeaman (1949). That is, negative contrast effects have been consistently obtained with incentive downshifts, but positive contrast effects with incentive upshifts have usually not occurred in discrete-trial instrumental conditioning situations involving immediate reward. For a review of these incentive contrast studies involving both human and animal subjects, see Cox (1975) and Flaherty (1982).

Different results, however, were obtained when the animals were under the influence of alcohol. In one experiment (Cox, 1981), the inebriated rats (unlike the sober rats) showed a pronounced positive contrast effect. In another experiment (Cox, 1988), the negative contrast effect differed among inebriated and sober rats in that the inebriated rats initially showed less abrupt reductions in running speeds than the sober ones, but the inebriated animals were slower to recover from the reduction in reward. The latter result suggests that coping with an incentive loss by drinking alcohol might be maladaptive. Finally, Cox et al. (1987) found that alcohol altered the orderly sequence of changes in rats' level of activity that follows an incentive loss.

These experiments on the effects of alcohol on incentive contrast effects provide the only evidence of which we are aware that alcohol changes organisms' reactions to incentives, presumably by changing their evaluation of incentives and their emotional reactions to them. Moreover, the results of these experiments with animals on the apparent effects of alcohol on incentive motivation underscore the importance of understanding how humans' incentive motivation is interrelated with their motivation to use alcohol. Our motivational model of alcohol—and our research program that is based on the model—is designed to address this issue.

### Motivational Model of Alcohol Use

In the preceding sections, we have suggested that the nonchemical incentives in people's lives, and the affective changes that they experience as a result of their relationship to these incentives, are intertwined with their use of alcohol. We have also suggested that nonchemical incentives—as well as the other parameters of alcohol as a reinforcer—have their ultimate influence on people's use of alcohol because they contribute to people's motivation to drink. We believe, moreover, that each variable has an impact on a person's motivation to use alcohol insofar as that variable contributes to that person's expectations about the effect that drinking will have on his or her affect. Thus, our model of alcohol use depicts people as deciding to drink or not to drink on the basis of whether the positive affective consequences that they expect to derive from drinking outweigh those that they expect to derive from not drinking. (It should be noted that similar reasoning has been presented by Peele, 1985a, 1985b.)

A flow diagram of the model is shown in Figure 1. cursory inspection of Figure 1 will indicate that the variables are grouped into categories; the interrelations among the variables are indicated by solid and broken lines that connect the variables. The solid lines lead from variables that strengthen a decision to drink, whereas the broken lines lead from variables that strengthen a decision not to drink. Thus, the version of the

model that is shown in Figure 1 depicts each variable as dichotomous. An eventual aim of our research program, however, is to determine weights to assign to each variable—weights that will differ from one individual to another and within a given individual from one point in his or her life to another.

It is also important to recognize that the motivational model views different drinking styles and frequencies at which people drink (e.g., “addictive” versus “nonaddictive”) not as discrete entities but as ranging along a continuum. According to the model, addictive drinking occurs when factors that contribute to the decision to drink (e.g., an individual’s positive biochemical reactivity to alcohol) strongly outweigh factors that contribute to the decision not to drink (e.g., the interference with positive, nonchemical incentives that drinking will cause). Addictive drinking is mediated by the same decision process that governs all drinking, and this process is no less salient in addictive than in nonaddictive drinking. Like any decision, the decision to drink involves value as well as expectancy components, and value is based on emotional processes (Klinger, 1977; Pervin, 1983).

In guiding the reader through the flow diagram, we shall first discuss the endpoint—the final decision to drink or not to drink (depicted at the extreme right of Figure 1). We shall then discuss in turn each category of variables that leads to the decision, proceeding across the flow diagram from left to right until we return to the point of the final decision.

*Decision to Drink or Not to Drink*

The model assumes that a person makes a decision about whether or not he or she will consume any particular drink of alcohol. Rational decision making always involves values which are emotionally based. The decision to drink is therefore a combination of emotional and rational processes in that the decision is made on the basis of the affective change that the person expects to achieve by drinking compared with not drinking. For instance, the alcoholic may reasonably expect that continuing a binge will endanger his or her position at work and at home, and the thought of getting fired or divorced may be aversive enough to create apprehension. Nevertheless, the expected pleasure or relief of the present drinking situation may outweigh these more remote negative emotional consequences.

A person, however, is not necessarily aware of either having made a decision to drink or not to drink or the factors that affected the decision. In point of fact, decisions about drinking often are nonconscious and automatized. As with any well-practiced behavioral sequence, the conscious aspects of the decision process tend to occur toward the beginning of the sequence. For instance, a person consciously decides whether or not to play a game of tennis, but decisions about individual strokes to make during the course of the game are more non-conscious and automatic. Similarly, a veteran drinker of alcohol consciously decides whether or not to take a drink of alcohol, but after an initial decision to drink is made, decisions concerning the particular circumstances under which drinking will occur and the amount that will be consumed occur more automatically. The effect of automatization is therefore primarily to limit the range of decision factors to those already integrated into the sequence. Nevertheless, these decisions are voluntary,

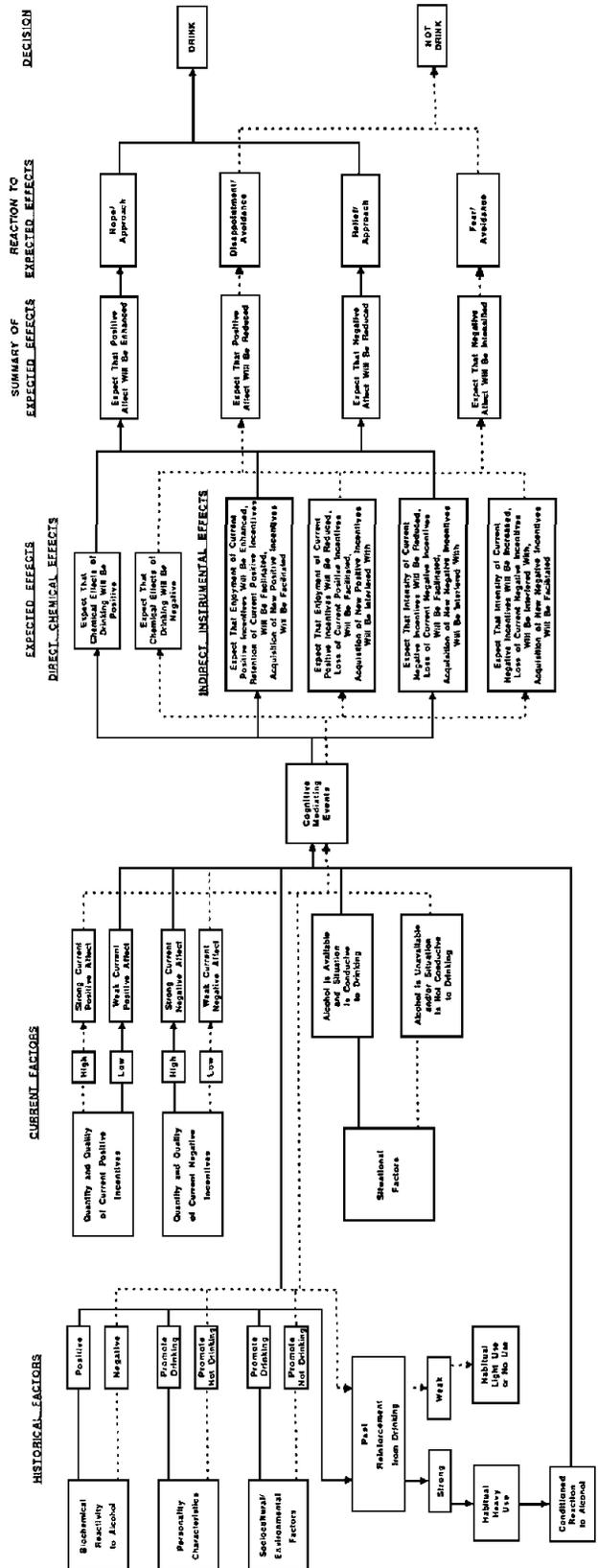


Figure 1. Motivational model of alcohol use.

and a person can exercise control over them. Consider, for example, how often a person would take that next drink if he or she knew that it had been poisoned!

The principal theoretical advantage of the decision-making view of alcohol use is that it places the phenomenon in the context of a well-researched theoretical domain, one that makes possible a detailed analysis of the cognitive, affective, and other motivational processes that determine the molecular structure of addictive behavior. This view not only constitutes a shift in focus from the classical view (Jellinek, 1960; Rush, 1943/1975)—a shift away from ascribing addiction to uncontrolled drug-produced craving while failing to consider the alcoholic's motivational context. Without denying the brain changes produced by extended use of alcohol (Parsons, Butters, & Nathan, 1987), the peculiarities of the appetitive systems that subserve the pursuit of alcohol (T. B. Baker et al., 1987), or the inheritable individual differences in reactions to alcohol (Cloninger & Li, 1985), the decision view additionally insists that decisions to drink entail choices. The decision for the alcoholic, in this view, is a usually conflicted choice between the next drink and all of the alcoholic's various competing incentives with whose attainment continued drinking is incompatible. This means that addictive behavior is determined by the alcoholic's total motivational nexus, and it is determined through a process susceptible to formal analysis in terms of incentive values, expectancies, affective processes, and decision functions. Such a view therefore relates drinking behavior to the framework of contemporary motivational theory, which, we believe, has much to offer theories of alcoholism and treatment approaches. In particular, it can account for the failures of reinforcement and other approaches aimed purely at the drinking behavior. It can account for relapses that occur long after the last inebriation and at a time when the alcoholic's life fabric has seemingly been restored. It is also consistent with repeated clinical observations that abstinence is associated with the strength of the nonchemical incentives in the patient's life. (Evidence for this is discussed in the following sections.)

Experimental analyses of drinking behavior lend empirical support to our contention that people decide whether to drink or not and how much alcohol to consume on the basis of the particular emotional effect they wish to achieve, rather than being driven, as classical theory seems to imply, by unmediated chemical effects or withdrawal symptoms (cf. Marlatt & Gordon, 1985; Peele, 1985b). It has been shown, for example, that alcoholic patients placed in experimental drinking situations will decide to endure withdrawal symptoms in order to "save up" for the opportunity to go on a binge (cf. Langenbucher & Nathan, 1983). In his analysis of relapses among alcoholics, Marlatt (1985) has found that alcoholics often set the stage for a relapse to occur through a series of "mini-decisions," each of which taken individually does not appear to be related to the alcoholic's final goal of returning to drinking. In Marlatt's words,

Each mini-decision must be justified by an "explanation" that satisfies the self and others and which does not "blow the cover" on the covert nature of the operation. The use of Apparently Irrelevant Decisions . . . is crucial to this process of self-deception and minimization of social surveillance. At each choice-point, the client makes a decision that leads closer to the brink of relapse and justi-

fies the decision that leads [to a] bolstering strategy such as rationalization or denial. As such, the decision is rendered "apparently irrelevant" to the goal of relapse. Each such "move" on the checkerboard leading to relapse can be thought of as a chain . . . culminating in the final set-up. (Marlatt, 1985, p. 271)

### *Historical Factors*

The category of variables that we refer to as the historical factors is shown at the extreme left of Figure 1. Each of the variables in this category is historical in the sense that it has helped to determine the nature of an individual's past experiences with drinking, which in turn influence that person's current motivation to drink. There are three kinds of historical factors: a person's biochemical reactivity to alcohol, his or her personality characteristics, and the sociocultural environment in which he or she lives.

*Biochemical reactivity to alcohol.* Research on biochemical reactivity to alcohol (Cloninger & Li, 1985; Hunt, in press-a, in press-b; Schuckit et al., 1985) points to the biochemical mechanisms that appear to underlie the reinforcing effects of alcohol. These mechanisms, moreover, seem to be under genetic control and to predispose certain people to develop problems with alcohol (Goodwin, in press; Nathan, 1986), although the role of genetic factors in alcoholism may have been overstated (Peele, 1985a).

The exact biochemical mechanisms that are responsible for the reinforcing effects of alcohol are still hypothetical. What is clear, however, is that there are wide differences among people in the manner in which they metabolize alcohol and its metabolic byproducts—differences that are controlled by the genetically determined level of metabolic enzymes in the body (Cloninger & Li, 1985; Hunt, in press-a). In particular, people whose enzymes are insufficient for the rapid metabolism of acetaldehyde (the first metabolic product of alcohol) experience stronger negative physical effects of drinking than do people with adequate levels of these enzymes. As a consequence, the former individuals are biologically predisposed not to drink large quantities of alcohol and, hence, not to develop problems with alcohol. On the other hand, the biochemical mechanisms that determine the intensity of positive effects that a person derives from alcohol (mechanisms that might also be under genetic control) seem to be related to the particular effects that alcohol and its metabolites have on neuronal membranes and neurotransmitters and their receptor sites in the brain (Hunt, in press-b).

To the extent that a person's biochemical reaction to alcohol is such that he or she has experienced strong positive effects but weak negative effects, his or her expectations about the positive effects of drinking will have been raised and his or her current motivation to drink will be enhanced. However, it should be noted that the weight contributed by biochemical reactivity to alcohol to decisions about drinking can be overridden by other factors. For example, the fact that Native Americans and Eskimos experience negative biochemical reactivity to alcohol from acetaldehyde build-ups does not prevent them from drinking heavily, due presumably to the stronger weight contributed by psychological and sociocultural factors that promote drinking (Peele, 1985b).

The development of tolerance with successive administra-

tions of alcohol is, of course, an important factor that modifies people's biochemical reactivity to alcohol. Tolerance, in turn, changes the incentive value of alcohol and the balance between a person's chemical and nonchemical incentives. Evidence is accumulating on the mechanisms that underlie the development of tolerance at a neurological level (Murphy, McBride, Gatto, Lumeng, & Li, 1988; Tabakoff, Hoffman, & Melchior, 1983). However, the manner in which tolerance to the affective changes elicited by alcohol occurs is a separate issue and one that has not yet been addressed by empirical research. The motivational model is useful in that it raises this and other questions that have not heretofore been directly addressed.

*Personality characteristics.* The notion of an "alcoholic personality" is currently passé. However, certain personality characteristics have been frequently observed among people who develop problems with alcohol (Barnes, 1983; Cox, 1983, 1985, 1987, in press; Lang, 1983). Characteristics such as nonconformity, impulsivity, and reward seeking are often seen both before the problems with alcohol develop and among alcoholics undergoing treatment. On the other hand, low self-esteem and negative affect seem typically to be a consequence of excessive drinking. However, although the initial pattern of reward seeking seems to characterize a large proportion of problem drinkers, a smaller proportion are initially characterized by punishment avoidance and use alcohol to cope with anxiety and depression (MacAndrew, 1983).

In our view, personality affects people's motivation to use alcohol because it modulates the impact of the other variables that influence drinking. For instance, a person whose personality characteristics are like those of the typical problem drinker and who also derives positive biochemical effects from alcohol would be more likely than another person—with different personality characteristics but a similar reaction to alcohol—to indulge impulsively in drinking while discounting the delayed negative consequences of doing so. Such an individual would also be more likely than others to adhere to social pressures to drink while discounting social strictures against using alcohol excessively.

Personality also affects the motivation to drink because of the impact that drinking has on the nonchemical incentives in a person's life. Thus, the impulsive reward seeker who tends not to place importance on traditional societal values is less likely than other people to pursue incentives that are difficult to achieve but that potentially will be enduring sources of emotional satisfaction. Such a person is also less likely than others to persevere when frustrated in goal pursuits and at such times is likely to turn to alcohol as a means of coping. As a consequence of having fewer nonchemical resources with which to regulate his or her affect, this person's motivation to use alcohol would be further strengthened.

*Sociocultural/environmental influences.* It is clear that sociocultural and environmental factors are potent determinants of people's motivation to use or not to use alcohol. There are, in fact, striking examples of the influence that anthropological and cultural factors have on people's drinking behavior (Heath, in press). For example, among northern European cultures such as the Irish and French, there are high rates of alcohol consumption and problems associated with the use of alcohol that appear to result from the unhealthy drinking practices that these cul-

tures foster. On the other hand, although groups such as Italians and Jews also have high rates of alcohol consumption, problems associated with the use of alcohol among these groups are low, apparently because of the healthy drinking practices that these cultures reinforce. Such vastly different drinking practices are culturally transmitted, in part, by basic views about alcohol and drinking that are communicated to children growing up in a culture. However, the views that a culture has about alcohol often reflect broader cultural values (Peele, 1985b). From the perspective of our model of alcohol use, it is important to understand that differences among people in their past use of alcohol and their current motivation to use or not use additional alcohol might be traceable, in part, to the drinking practices that are instilled by the culture in which they live.

Besides the pervasive cultural influences, there are additional social variables within particular cultural groups that help to determine why the drinking practices of one individual in that group differ from those of another (White et al., in press). For instance, individuals model their drinking behavior after that of their family, friends, and peer groups, who also provide direct social rewards for drinking or not drinking. In addition, the mass media to which an individual is exposed help to instill drinking habits, especially through the drinking practices that they portray.

*Past reinforcement from drinking.* A person will have been reinforced for drinking in the past to the extent that the biochemical reactivity to alcohol has been positive, his or her personality characteristics have promoted drinking, and sociocultural and environmental influences have also promoted drinking. It is likely that a person who has been strongly reinforced for drinking in the past will have become a habitual heavy user of alcohol. Such a person would expect that he or she will be reinforced for drinking in the future, and when faced with a choice between imbibing a drink or not doing so, this person would be more likely than other people to decide to drink. Conversely, a person will not have been reinforced for drinking in the past to the extent that the biochemical reactivity to alcohol has been negative, his or her personality characteristics have promoted not drinking, and sociocultural and environmental influences have also promoted not drinking. A person who has not been reinforced for drinking in the past will probably use alcohol lightly, if at all. Such a person would hold expectations of not being reinforced for drinking in the future. Thus, when faced with a choice between drinking or not drinking, it is likely that this person would decide not to drink.

*Conditioned reaction to alcohol.* To the extent that the aforementioned historical variables have promoted an individual's drinking in the past, he or she will have developed classically conditioned emotional responses to alcohol and the stimuli that have been associated with drinking. These conditioned responses will add further weight to the person's decision to drink or not to drink. Thus, the historical factors contribute both to the habit of drinking and the incentive value of drinking.

Classically conditioned responses to alcohol and its cues have been investigated within the framework of several different conditioning models of drug dependence. These include the withdrawal model (e.g., Ludwig & Wikler, 1974), compensatory-response model (e.g., Siegel, 1983), and opponent-process model (e.g., Solomon, 1980). Each of these models predicts that classi-

cally conditioned responses that are antagonistic to the direct effects of alcohol can contribute to the motivation to use alcohol, and there is considerable empirical support for this point of view (T. B. Baker et al., 1987; Brick, in press; Shipley, 1987). However, there is also evidence that responses that are in the same direction as the pharmacological effects of alcohol can be classically conditioned and that such responses, among other factors, may activate positive motivational systems and lead to the consumption of alcohol (T. B. Baker et al., 1987).

In terms of our motivational model, when a person emits classically conditional responses that are antagonistic to the direct effects of alcohol, that person's expectations of relieving such responses with alcohol will be raised, and hence weight will be added to that person's decision to drink. However, the impact that classically conditioned responses that are in the same direction as the pharmacological effects of alcohol have on decisions about drinking are less clear-cut. Such responses, in some cases, might add weight to a person's decision to drink, for example, by "whetting" the appetite for alcohol or lowering inhibitions and eroding the person's resolve not to drink. In other cases, however, classically conditioned responses that are similar to the pharmacological effects of alcohol may serve as a substitute for drinking alcohol, thereby contributing to a person's decision not to drink. For instance, at an informal party at which we served near beer to uninformed guests (Cox & Klinger, 1983), classically conditioned responses presumably served this latter function.

### *Current Factors*

Two sets of factors from people's current life situation have an impact on their decisions about drinking: (a) the situation in which an individual is located at any point in time and (b) his or her current positive and negative incentives that are sources of the positive and negative affect that he or she experiences. These current factors are the major group of variables depicted second from the left in Figure 1.

*Situational factors.* By situational factors, we mean the immediate environmental context in which a person is located when he or she decides whether to drink or not. McCarty (1985) refers to these situational factors as "microenvironmental" influences and includes among them such considerations as the physical setting, whether a person is alone or with other people, and, if with other people, the degree to which they encourage or discourage drinking. To the extent that alcohol is available and the immediate situation is conducive to drinking, weight will be added to a person's decision to drink. To the extent that alcohol is unavailable and the immediate situation is not appropriate for drinking, weight will be added to a person's decision not to drink. The microenvironmental influences are distinguished from ubiquitous, broadly based macroenvironmental influences such as governmental regulation of the price and availability of alcohol, sociocultural factors, and urbanization (Conners & Tarbox, 1985).

*Current positive and negative incentives.* As we have discussed earlier, the positive incentives that are currently available to a person to pursue and enjoy are a primary source of the positive affect that that person currently experiences. In a similar manner, the negative incentives that are noxious elements

in a person's life are, to a large extent, responsible for the negative affect that that person currently experiences. In short, the intensity of a person's current positive affect and current negative affect is determined largely by the quality and quantity of that person's current positive and negative incentives. As Figure 1 suggests, if a person does not have satisfying positive incentives to pursue or is not making satisfactory progress toward reaching goals that will produce positive incentives, weight will be added to that person's expectations that he or she can better enhance positive affect by drinking. Insofar as a person's life is burdened by noxious elements or he or she is making unsatisfactory progress toward removing these elements, weight will be added to that person's expectations that he or she can better counteract negative affect by drinking.

Prior research indicates, in fact, that drinkers act as if they choose alcohol to obtain particular emotional effects that they are unable to obtain through nonchemical incentives. They drink, for example, to feel more powerful (McClelland, Davis, Kalin, & Wanner, 1972), more womanly (Wilsnack, 1974, 1976; Benson & Wilsnack, 1983), more optimistic (Klinger, 1977), and less anxious and depressed (Langenbucher & Nathan, 1983). The choice between drinking and not drinking, moreover, has been shown to vary as a function of other activities that are available to a person to enjoy and the constraints that inhibit access to them (Vuchinich, 1982; Vuchinich & Tucker, 1983).

The evidence is particularly compelling that alcoholics' positive and negative incentives are potent determinants of their decisions about drinking. Tucker, Vuchinich, and Harris (1985), for instance, reviewed a variety of evidence indicating that alcoholics who do not return to drinking following formal treatment have more positive changes and fewer negative changes in their lives (in areas such as intimate relations, vocational functioning, financial status, and physical and emotional health) than alcoholics who do return to drinking. Similarly, Vaillant (1983, p. 190) found that developing substitute activities (e.g., work, hobbies, meditation, or helping other people) was the factor to which abstinent alcoholics most frequently attributed their ability to alter their drinking habits. With regard to determinants of particular relapse episodes, both Marlatt and his colleagues (e.g., Marlatt & Gordon, 1985; Marlatt, 1978) and Sanchez-Craig and her colleagues (e.g., Sanchez-Craig, Wilkinson, & Walker, 1987) have reported that frustration of goal-directed activities and other negative affects are the most common reason that alcoholics give for their returning to drinking. Finally, Perri (1985) followed persons with serious drinking problems prospectively from the time that their efforts to change were initiated. Those persons who ultimately succeeded were distinguished from those who did not succeed primarily by having developed some form of alternative, satisfying behavior to take the place of drinking (e.g., a new hobby, physical exercise, or consumption behaviors such as eating particular snack foods or drinking nonalcoholic beverages). Successful more than unsuccessful persons, moreover, had family and friends who supported their efforts, and they more often attended Alcoholics Anonymous. Thus, the empirical evidence clearly suggests that in order for alcoholics not to return to abusive drinking once they have stopped, it is necessary for them to develop meaning-

ful sources of satisfaction to compete with the satisfaction that they have previously sought by drinking alcohol.

### *Cognitive Mediating Events*

The historical and current factors give rise to the cognitive mediating events represented by the box at the center of Figure 1. The cognitive processes that this box contains include people's thoughts, perceptions, and memories that determine the nature of their expectations about the direct (chemical) and indirect (instrumental) effects that taking a drink will have on their affect. These expectations might concern both positive and negative effects of drinking and effects that are immediate or delayed. Also, the expected effects might not correspond to the actual effects of drinking. For example, a person might place too much emphasis on positive, immediate effects, while discounting the delayed, negative effects. The specific kinds of expectations that a person might have about the effects of drinking are shown in the next boxes in the flow diagram and are described in the paragraphs that follow.

### *Expected Chemical Effects of Drinking*

A person has expectations about how drinking will modify his or her affect directly through the chemical effects of the alcohol. To the extent that a person expects that the chemical effects of drinking on his or her affect will be positive, weight will be added to that person's decision to drink. To the extent that a person expects that the chemical effects of drinking on his or her affect will be negative, weight will be added to that person's decision not to drink.

### *Expected Instrumental Effects of Drinking*

A person also has expectations about how drinking will modify his or her affect indirectly by enhancing or interfering with his or her nonchemical incentives. There are four possible expected instrumental effects of drinking that are depicted in Figure 1. The first two have to do with the expected, indirect effects of drinking on one's positive affect: A person may expect that drinking will be instrumental in enhancing or in reducing positive affect because drinking facilitates or interferes with the enjoyment of nonchemical, positive incentives. For example, a person might expect that drinking will enhance positive affect because drinking brings approval from peers. He or she might expect that drinking will reduce positive affect because drinking brings strife to his or her marriage. The second two expected instrumental effects of drinking have to do with the expected, indirect effects of drinking on one's negative affect: A person might expect that drinking will be instrumental in facilitating or in interfering with the nonchemical, negative incentives in his or her life. For example, a person might expect that he or she could reduce negative affect by drinking because drinking will relieve suffering from a physical disease. On the other hand, he or she might expect to intensify negative affect by drinking because drinking will solidify his or her identity as an alcoholic.

Since conflict is involved in all decision making, the motivational model implies that the drinker will experience conflict when faced with the choice between alternative decisions about

drinking. This may occur, for instance, when the expected direct and indirect effects of alcohol are in conflict with each other (e.g., a man uses alcohol in a seductive ploy but finds that his sexual performance is negatively affected by alcohol). The drinker may also experience conflict because the desired direct effects of alcohol (e.g., reduction of anxiety) and the undesired, delayed, indirect effects (e.g., negative feedback from significant others) are incompatible. In fact, the conflict between strong immediate emotion and even stronger anticipated emotion is particularly plain in alcohol abuse. According to the model, conflicts about drinking decisions are resolved according to the balance in the anticipated affect that accompanies the conflicting choices. Since, of course, conflicts about drinking decisions are similar to other types of psychological conflict, it would be valuable to apply scientific knowledge about conflict and decision theory generally (e.g., Grossberg & Gutowski, 1987) to decisions about drinking.

### *Summary of Expected Effects of Drinking*

The direct (chemical) and indirect (instrumental) effects that a person might expect that drinking will have on his or her affect can be summarized into four categories that are shown next in the flow diagram: (a) expectation that positive affect will be enhanced, (b) expectation that positive affect will be reduced, (c) expectation that negative affect will be reduced, and (d) expectation that negative affect will be intensified. To the extent that a person expects that the effects of drinking on his or her affect will be positive (i.e., categories a and c), weight will be added to that person's decision to drink. To the extent that a person expects that the effects of drinking on his or her affect will be negative (i.e., categories b and d), weight will be added to that person's decision not to drink.

### *Reaction to Expected Effects of Drinking*

People derive emotional satisfaction or dissatisfaction from their anticipation of future events that they expect to be pleasant or unpleasant. With respect to taking a drink, people react affectively to the affective changes that they expect drinking will produce. Four relevant affective reactions (hope, disappointment, relief, and fear; Mowrer, 1960) are shown in the next-to-last group of boxes in Figure 1. We see here that a person will feel hopeful if he or she expects drinking to enhance positive affect, but will feel disappointed if he or she expects drinking to reduce positive affect. A person will feel relieved if he or she expects that drinking will reduce negative affect, but will feel fearful if he or she expects that drinking will intensify negative affect. Two of these affective reactions to the expected effects of drinking (hope and relief) will add additional weight to a person's decision to drink and his or her actual approach of alcohol. The other two affective reactions (disappointment and fear) will add additional weight to the person's decision not to drink and his or her actual avoidance of alcohol.

### *Implications for Treatment*

The person who enters treatment for alcohol problems has a long history of emotional and motivational difficulties that he

or she has attempted to resolve by drinking alcohol. Such a person's goal striving and the nonchemical incentives produced by that striving do not provide emotional satisfaction that competes successfully with the emotional satisfaction attainable by drinking alcohol. There are various reasons why this is so (Klinger, 1977; Pervin, 1983). The person may, for instance, have an inadequate number of positive incentives to pursue, or the person's pursuit of positive incentives may be unrealistic or inappropriate, making goal attainment unlikely. Alternatively, the person's positive goals—even if appropriate, realistic, and sufficient in number—may conflict with one another, making goal attainment unlikely or impossible. In addition, the person's life may be burdened by a preponderance of aversive incentives, and the person may be unable to make progress toward removing these noxious elements. Drinking alcohol may be the only resource for coping that is currently available to such a person.

Current treatment approaches frequently deal with the alcoholic's motivational dilemma by focusing directly on alcohol, attempting to reduce the attractiveness that alcohol holds for the person or to teach the person to avoid it altogether. This approach is exemplified by the disease model of alcoholism as practiced by Alcoholics Anonymous, whose foremost goal is to instill in the alcoholic the necessity for a lifetime of abstinence. Pharmacological therapies and conditioning therapies, on the other hand, seek to reduce the incentive value of alcohol. The use of pharmacotherapeutic agents (e.g., disulfiram) has not met with much success (L. H. Baker, Cooney, & Pomerleau, 1987; Miller & Hester, 1986). Conditioning methods, however, have succeeded in reducing drinking behavior temporarily (L. H. Baker, Cooney, & Pomerleau, 1987), but this is a goal that should be regarded as merely the first step in treating alcohol problems (Miller & Hester, 1986).

Current treatment programs also attempt to correct the problems in the alcoholic's life that may have caused or were caused by excessive drinking, providing patients with such services as assertiveness training, social skills training, and employment counseling. It is unclear, however, whether alcoholics are deficient in the skills that are taught to them and whether such training is actually beneficial (Riley, Sobell, Leo, Sobell, & Klajner, 1987). In fact, in their recent, comprehensive review of behavioral and nonbehavioral treatment techniques, Riley et al. (1987) concluded, "treatments for alcohol problems with demonstrated enduring effectiveness do not exist, regardless of treatment orientation or treatment goals" (p. 107).

In our view, any treatment technique will be doomed to failure if it enables alcoholics to stop drinking but does not provide them with alternative sources of emotional satisfaction. Even if a treatment (such as the pharmacological interventions that are currently being tested; Naranjo et al., 1984) were discovered for effectively reducing the incentive value of alcohol, alcoholics would eventually choose not to participate in the treatment if it did not provide them with satisfactory, alternative means of resolving the motivational problems that they have sought to resolve by drinking alcohol. That is, the alcoholic would remember how good it felt to drink alcohol before he or she started taking the pharmacological agent and would likely go off the medication in an attempt to regain that good feeling.

For these reasons, we have developed a motivational counsel-

ing technique for alcoholics that directly modifies the motivational basis for alcoholism. We emphasize, however, that the treatment technique is described here merely as one illustration of how the motivational model can have practical applications for the treatment and prevention of alcohol problems. The effectiveness of the treatment technique will be tested in future research, but the utility of the model does not by any means rest entirely on the efficacy of the treatment. Instead, we discuss the technique here because it helps to clarify the practical and heuristic value of the model.

Our treatment technique is intended to complement rather than to supplant other treatments for alcoholism. The technique is entirely consistent, for example, with the efforts of Alcoholics Anonymous to accentuate the negative aspects of drinking and the positive aspects of not drinking. Our technique focuses on alcoholics' nonchemical incentives, aiming to help them find meaningful sources of satisfaction and to rid themselves of sources of frustration. The technique consists of two major parts. First, we carefully assess the alcoholic's motivational structure (the goals that are the compelling forces in his or her life), in order to identify points for intervention. Second, we undertake a multicomponent counseling procedure to modify the alcoholic's motivational structure, helping him or her to develop a meaningful life without alcohol.

#### *Motivational Structure Questionnaire for Alcoholics*

To assess alcoholics' motivational structure, we have developed the Motivational Structure Questionnaire for Alcoholics (MSQ-A). The questionnaire is based on Klinger's (1987b) Interview Questionnaire Technique, which combines idiographic and nomothetic assessment of motivation. The technique is idiographic because each alcoholic completing the questionnaire lists his or her own current concerns, which may be conceptualized quite differently from the concerns of another alcoholic. The technique is also nomothetic, however, because each alcoholic also characterizes his or her current concerns on a number of variables that allow comparisons to be made across individual alcoholics. The Interview Questionnaire Technique has been demonstrated to be reliable (as evaluated by a modified stability measure) and valid (in the sense of predicting future behavior) (Klinger, 1987b).

After first listing his or her goals, concerns, activities, and involvements in the various life areas that are provided on the answer sheet, the alcoholic then indicates the action that he or she wishes to take vis-à-vis each concern that was listed. The verb that the alcoholic chooses to indicate the desired action allows us to classify each goal as appetitive (e.g., to get, obtain, accomplish), aversive (e.g., to get rid of, prevent), agonistic (e.g., to attack), or epistemic (e.g., find out more about, resolve questions about), hence providing valuable information about the relative strength of the alcoholic's positive motivation (i.e., feeling impelled to achieve, positive attractive goals) and negative motivation (i.e., feeling impelled to avoid negative, aversive goals). For each concern, the alcoholic also indicates his or her role in relation to the goal (i.e., the degree to which he or she is actively participating in goal striving) and the degree to which he or she is committed to attaining the goal.

Next, the alcoholic rates each goal along a series of dimen-

sions. The value ratings include (a) the amount of joy that the alcoholic imagines feeling if the goal were actually accomplished and (b) the amount of sorrow that he or she imagines feeling if the goal cannot be attained. The alcoholic also conveys (c) ambivalence for the goal by indicating the amount of unhappiness that he or she imagines feeling upon attaining the goal. The ratings along expectancy and other reality factors include the alcoholic's expected (a) probability of success in attaining each goal, (b) probability of success in attaining each goal if no action is taken, (c) time available before action must be taken on each goal, and (d) nearness to goal attainment. Finally, the alcoholic rates the impact that he or she expects continued alcohol use will have on each goal, ranging from "my old drinking pattern would virtually assure that I will reach this goal" to "my old drinking pattern would entirely prevent me from reaching this goal."

From the preceding ratings, we derive summary indexes for each alcoholic regarding the value, perceived accessibility, and imminence of his or her goals, as well as patterns of commitment to these goals and the nature of the alcoholic's desires and roles in regard to them. These indices, and other information obtained from the MSQ-A, provide the basis for beginning the motivational counseling procedure.

### *Motivational Counseling for Alcoholics*

The counselor uses the information obtained from the MSQ-A in order to help the alcoholic achieve positive goals that will bring emotional satisfaction and eliminate negative goals that are sources of frustration. We summarize the major components of the counseling procedure here, but additional details about the individual elements are presented elsewhere (Cox & Klinger, 1987).

During the initial stages of counseling, the counselor and alcoholic review together the information that the alcoholic provided on the MSQ-A. The aim is to determine whether the alcoholic depicted his or her current concerns accurately and whether his or her goals are appropriate and realistic. People do not always realize the value that they accord to their goals, and the discussion between the counselor and alcoholic of the alcoholic's assigned values allows discrepancies between the alcoholic's actual and stated values to be identified and gives the alcoholic the opportunity to reevaluate goals to which he or she assigned inaccurate values on the MSQ-A. The assigned values, moreover, may not reflect the degree of satisfaction that the alcoholic will ultimately derive from his or her goals, and the counselor helps the alcoholic to reevaluate goals to which disproportionate values were assigned. Finally, discrepancies between stated expectancies about achieving goals and the alcoholic's apparent chances of doing so are noted, and the alcoholic is helped to acquire more accurate and more realistic expectations.

During subsequent stages of the counseling, a goal matrix—similar to that used by Emmons (1986) and Palys and Little (1983)—is completed that depicts interrelationships among the alcoholic's goals. For each pair of goals, a decision is made about whether having one goal facilitates, interferes with, or has no effect on the attainment of the other goal. The alcoholic is encouraged to pursue goals that will facilitate the attainment of

other goals. When conflicts among goals are identified, however, ways to resolve them are sought. If viable alternative means of pursuing two conflicting goals cannot be found, then the alcoholic is encouraged to work toward achieving the more valuable goal, while disengaging himself or herself from the less valuable goal. Disengagement from goals is deemed appropriate not only when conflicts among goals are unresolvable, but also when goals are judged to be unachievable and when an alcoholic over-values a goal that does not contribute much to his or her emotional satisfaction.

Throughout the course of counseling, the counselor and alcoholic together formulate weekly goals for the alcoholic to work toward achieving. The alcoholic is encouraged to pursue two kinds of goals: (a) daily or weekly activities that will be gratifying in their own right and (b) subgoals that will lead to the attainment of long-range goals that the alcoholic named on the MSQ-A. The alcoholic is also helped to discover new incentives. Unmet needs are explored, and goals that will help to achieve those needs and serve as new sources of satisfaction are identified.

The counselor continually helps the alcoholic reexamine sources of self-esteem and self-condemnation. Alcoholics often have unrealistically high standards and lack the capacity to forgive themselves for not meeting these standards (Cox, 1983; Klinger, 1977). Such standards are often related to negative goals that alcoholics feel compelled to avoid in order to maintain their self-esteem, but which are not inherent sources of emotional satisfaction. The counselor attempts to reduce the self-punitiveness of such alcoholics and their tendency to turn to alcohol to cope with frustration.

Another motivational counseling technique for alcoholics has been developed by Miller (1983, 1985). Miller's aim is to maximize those factors that are related to an alcoholic's entering treatment and complying with it, and he considers the therapist's style of interviewing to be particularly crucial in this regard. Miller uses a drinker's "check-up" to assess the quantity of alcohol that alcoholics consume (compared with other people) and provides them with feedback about the negative consequences of their drinking (e.g., neurological impairment caused by alcohol). Unlike traditional alcohol counselors, however, he does so in a supportive, nonconfrontative manner. Using these interviewing tactics, Miller has found both that alcoholics readily recognize their problems with alcohol, and that they are motivated to change their drinking behavior.

Although Miller's technique is very different from ours, the general aim of both approaches is to help the alcoholic want to change his or her drinking behavior. Our technique seeks to accomplish this end by modifying alcoholics' motivational structure in such a way that they will have appropriate and realistic nonchemical goals to pursue and can make satisfactory progress toward reaching those goals. We believe that by achieving such a motivational structure alcoholics will through nonchemical means find the emotional satisfaction that they have previously sought to find by drinking alcohol.

### Summary and Conclusions

In this article, we have presented a motivational model of alcohol use that takes into account all the variables that are

known to affect drinking and shows how these variables are interrelated. According to the model, people decide to drink or not to drink on the basis of whether the positive affective consequences that they expect to achieve by drinking outweigh those of not drinking. Thus, according to the model, the final, common pathway to alcohol use is motivational, in spite of the variety of factors that impinge on people's decisions about drinking.

A primary determinant of people's motivation to use alcohol is the nonchemical incentives in their lives. People are motivated to bring about affective changes through the use of alcohol to the extent that they do not have satisfying positive incentives to pursue and enjoy and to the extent that their lives are burdened by negative incentives that they are not making satisfactory progress toward removing. Accordingly, we have developed a motivational counseling technique for alcoholics that carefully assesses alcoholics' motivational structure and then seeks to modify their motivational structure, helping them to find nonchemical sources of positive affect and eliminate nonchemical sources of negative affect.

The motivational model of alcohol use that we have presented in this article seeks to bring together two bodies of literature: the literature on alcohol use and the literature on emotion and motivational theory. By interrelating these two bodies of literature, we have interpreted alcohol use in terms of an existing theoretical structure for emotion and motivation and decision theory. The motivational model represents a far-reaching reformulation of alcohol use. The model depicts all of the major categories of variables that are known to affect drinking and suggests (a) ways in which they are channeled through an emotional and motivational system and (b) their decision theory applications.

Viewing alcohol use in terms of emotional and motivational principles promises to increase considerably our understanding of why people drink. At the present time, we are unable to supply specific parameters, values, and shapes of functions for the motivational model of alcohol use. This limits the completeness of the model, but at the same time it is consistent with its heuristic value. Many research questions are suggested by the model, and the answers to these questions will supply the missing values. The model in general has considerable practical and heuristic value.

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