Understanding Mass Panic and Other Collective Responses to Threat and Disaster

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While mass panic (and/or violence) and self-preservation are often assumed to be the natural response to physical danger and perceived entrapment, the literature indicates that expressions of mutual aid are common and often predominate, and collective flight may be so delayed that survival is threatened. In fact, the typical response to a variety of threats and disasters is not to flee but to seek the proximity of familiar persons and places; moreover, separation from attachment figures is a greater stressor than physical danger. Such observations can be explained by an alternative "social attachment" model that recognizes the fundamentally gregarious nature of human beings and the primacy of attachments. In the relatively rare instances where flight occurs, the latter can be understood as one aspect of a more general affiliative response that involves escaping *from* certain situations and moving *toward* other situations that are perceived as familiar but which may not necessarily be objectively safe. The occurrence of flight-and-affiliation depends mainly on the social context and especially the whereabouts of familiar persons (i.e., attachment figures); their physical presence has a calming effect and reduces the probability of flight-and-affiliation, while their absence has the opposite effect. Combining the factors of perceived physical danger and the location of attachment figures results in a four-fold typology that encompasses a wide spectrum of collective responses to threat and disaster. Implications of the model for predicting community responses to terrorist attacks and/or use of weapons of mass destruction are briefly discussed.

The collective response to threat and disaster is often portrayed as tending toward hysteria and social breakdown, with mass panic (and/or violence) as the natural response to physical danger and perceived entrapment. However, mass panic is uncommon in situations such as combat (L'Etang, 1966), air-raid or bombing attacks (Janis, Chapman, Gillin, & Spiegel, 1955), structural fires (Best, 1978; Keating, 1982; Proulx, 2002), and disasters (Fritz & Williams, 1957; Kinston & Rosser, 1974; Noji, 1997; Quarantelli, 1960, 2001). On the contrary, expressions of mutual aid are common and tend to predominate. Nonethe-

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less, given the September 11, 2001, attacks on the World Trade Center and Pentagon, the immediately subsequent anthrax letters, and widespread continuing concerns regarding population behavior in the event of terrorist attacks using weapons of mass destruction (Durodié & Wessely, 2002; Hyams, Murphy, & Weesely, 2002; Levy and Sidel, 2003), a fresh appraisal of the literature on collective responses to threat and disaster is needed.

The review indicates that the typical response to a variety of physical threats is neither "fight nor flight" but affiliation—that is, seeking the proximity of familiar persons and places, even though this may involve approaching or remaining in a situation of danger; indeed, separation from attachment figures is a greater stressor than physical danger itself. Such observations can be explained by an alternative, "social attachment" model of collective behavior under threat, a model that recognizes the fundamentally social nature of human beings and the primacy of attachments. In the relatively rare instances where flight does occur, the latter can be understood as one aspect of a more general affiliative response that involves escaping *from* certain situations and moving *toward* other situations that are perceived as familiar, but which may not necessarily be objectively safe. The occurrence of flight-and-affiliation depends mainly on the social context and especially the location of familiar persons (attachment figures); that is, their physical presence is calming and reduces the probability of flight-and-affiliation, while their absence has the opposite effect. Combining the factors of perceived physical danger and the location of attachment figures results in a four-fold typology that encompasses a broad spectrum of collective responses to threat and disaster. Implications of the social attachment model for predicting community responses to terrorist attacks and/or the use of weapons of mass destruction are briefly discussed.

TERMINOLOGY

The term "panic" refers to *inappropriate* (or excessive) fear and/or flight and highly *intense* fear and/or flight. But whether defined as inappropriate or as highly intense fear or flight, instances of panic are difficult to identify in practice. The judgment of panic is usually made retrospectively, especially if serious loss of life occurred, but what may be considered inappropriate, excessive, irrational, or highly intense by observers may not be so judged by the participants themselves (Foreman, 1953; Mawson, 1978, 1980; Schoch-Spana, 2003; Sime, 1980; Swartz, 1980; Wood, 1972). For instance, rushing for the exits in a structural fire may be the only rational course of action to take (Lazarus, 1966). Hence, the decision to label instances of collective flight as panic is arbitrary. Common symptoms of intense fear, such as anxiety, nausea, vomiting, and dizziness, can be normal reactions to abnormal events (Lacy & Benedek, 2003; Pastel, 2001). This discussion focuses on individual and collective *flight* behavior, recognizing that such behavior can assume varying degrees of intensity.

THE CAUSES OF GROUP FLIGHT

According to the classical "entrapment theory" of mass panic (e.g., Chandessais, 1971; Fritz & Marks, 1954; Fritz & Williams, 1957; Janis, 1971; Janis et al., 1955; Killian, 1972; Mintz, 1951; Quarantelli, 1954, 1957, 1977; Smelser, 1963; Turner, 1964), flight occurs if people believe that 1) major physical danger is present or imminent, and 2) escape routes are either limited or rapidly closing. Conditions 1 and 2 are individually necessary; together they provide sufficient conditions for group flight. According to Janis and Leventhal (1968), "It is this combination of cognitions, whether or not they are correct inferences about the situation . . . designated as 'perceived entrapment,' which is most likely to lead to wild flight, trampling of fellow victims, and other uncontrollable, distraught reactions of the type referred to as panic" (p. 1061).

A specific *belief in danger* can be inferred from the circumstances of many instances of mass flight, for example, from theater fires (Smelser, 1963, p. 151), but the existence of such beliefs among participants in some cases of troop flight has been questioned. For in-

stance, Marshall (1947) states that "every large panic starts with some very minor event . . . (T)roops will always run if they see others running and do not understand why" (p. 145). A *belief in limited or closing escape routes* appears to have been a necessary condition in many historic cases (Smelser, 1963, p. 137), but some military panics have occurred in situations where escape routes were virtually unlimited (Schultz, 1964a, p. 11).

Are both beliefs sufficient to cause flight? The theory accounts successfully for the classic, theater-fire type panics, such as the Chicago Iroquois Theater Fire of 1906, and the February 17, 2003, fire at South Side Chicago's Epitome nightclub, in which 21 people were killed and 19 others critically injured (Rosengren et al., 1975; see http://www.cnn.com/2003/US/Midwest/02/17/chicago.nightclub/index/html). But flight does not always occur even though both beliefs, or conditions, are present. Tyhurst (1951) studied reactions to community disasters and found that only 12% to 25% of adults responded by fleeing when informed that their apartment house was on fire or that a flash flood was imminent. Three-quarters or more engaged in aimless and irrelevant movements rather than the expected flight behavior.

Convincing evidence against the theory comes from two detailed case studies specifically concerned with mass flight. The famous Orson Welles radio broadcast, "War of the Worlds," in October 1938 dramatically depicted the advance of Martians in terms of *partial encirclement*—precisely the conditions for flight stipulated by the theory. The broadcast occurred when radio listening was at a peak in the United States and took the form of a newscast, that is, "news" being reported in a highly realistic manner. According to estimates made at the time (Cantril, Gaudet, & Herzog, 1940), 6 to 12 million people heard the broadcast and 28% (i.e., 2.5 million) believed the program was an actual newscast. Of these 2.5 million, 70% were "excited" or afraid (Lemkau, 1973). No estimate was provided of the number of persons who fled, but of those who listened to the broadcast, believed what they heard, and were frightened, the vast majority did not flee but instead contacted relatives and friends. Most of those who fled were either unattached to families in the area or fled only after other family members had assembled (Cantril et al., 1940, pp. 144–146). This was contrary to newspaper reports at the time, of a mass exodus from New York City.

A Swedish study of responses to a radio broadcast of a fictitious radioactive leak from a nuclear power plant (Rosengren, Arvidson, & Sturesson, 1975) involved a telephone survey of a representative sample of the population and unstructured interviews with police and other authorities. Contrary to media reports of widespread "panic," only about 1% reacted behaviorally to it, consisting "as a rule . . . of contacting family members, relatives or neighbors, over the telephone or face-to-face . . ." (p. 307). Not a single case was found among the 1,089 respondents of anyone actually fleeing. If such reactions occurred, the authors suggested, they were very rare.

As mentioned, mass flight from the scene of community disasters is uncommon. "Organized" and often altruistic behavior is the rule (Edwards, 1976; Feinberg & Johnson, 2001; Glass & Schoch-Spana, 2002; Johnson, 1987; Keating, 1982; Kinston & Rosser, 1974; Proulx, 2002, 2003; Quarantelli & Dynes, 1977; Schoch-Spana, 2003). Although the conditions for flight stipulated by the theory do not exist in most disasters, in those where the conditions would be expected to prevail, such as anticipated bombing raids, approaching tidal waves, or fires in high-rise buildings, evacuation has often been minimal (Edwards, 1976; Kinston & Rosser, 1974; Lachman, Tatsuoka, & Bonk, 1961; Proulx, 2002).

ASSUMPTIONS IN THE "ENTRAPMENT" THEORY OF FLIGHT

Earlier views of mass panic rested on the following assumptions:

1. The *typical response to danger is self-preservative aggression or flight* (see, for example, Brown, 1954; Cannon, 1929; McDougall, 1920; Petersen, 1953). According to McDougall (1920),

"(T)he sudden appearance of imminent danger may instantaneously convert any concourse of people into a crowd and produce the characteristic and terrible phenomena of a panic. In each man, the instinct of fear is intensely excited; he experiences that horrible emotion in full force and is irresistibly impelled to save himself by flight" (p. 24).

2. *Flight is directed toward an objectively safe place, away from danger.* In his classic text on collective behavior, Smelser (1963) defined panic as "collective flight based on a hysterical belief," and asserted that when people have accepted a "belief about some generalized threat [they] flee from established patterns of social interaction in order to preserve life, property, or power from that threat" (p. 131). Quarantelli (1957) also noted the typically short duration of flight and suggested that this related directly to the individual's perception of having reached a safe distance from the threat.
3. Implicit in the disaster literature is that *physical dangers are more disturbing or stressful than other kinds of events.*
4. *Flight is prevented from occurring in danger situations by social control* in the form of regimentation, discipline, firm leadership (Boring, 1945, p. 456; Kelland, 1930; LaPiere, 1938; L'Etang, 1966; Rickman, 1938), and other social norms (Smelser, 1963, pp. 157–163) that take effect by regulating or constraining the individual's natural tendency to flee.

RESPONSE TO THREAT

Evidence suggests that each of the above assumptions is questionable.

1. *Self-Preservative Flight.* Human beings under threat of death are not motivated by a simple drive for physical safety. Rather than fight or flight, the typical response to danger is affiliation, that is, seeking the proximity of familiar conspecifics and places, even if this involves remaining in or approaching a situation of danger (Baker & Chapman, 1962; Henderson, 1977; Kinston & Rosser, 1974). Bowlby (1973, p. 91) has suggested that attachment behavior serves the evolutionary-adaptive function of providing protection from natural predators, and notes that in young animals of many species, attachment behavior frequently takes precedence over escape. Both Cantril et al. (1940) and Rosengren et al. (1975), in their studies of responses to threatening radio broadcasts, found that individuals sought out loved ones and only fled when all family members had assembled. In the devastating Southeast Michigan Flint-Beecher tornado of June 1953, people tended to turn to and protect loved ones rather than flee from the threat (Form & Nosow, 1958, pp. 26–27). Studies of behavior in structural fires likewise show that occupants tend to converge and cluster (Bryan, 1985, 1986, 2002).

Governments and other official organizations have great difficulty getting people to evacuate before and during disasters; "traditional family ties often keep individual members in the danger zone until it is too late" (Hill & Hansen, 1962, p. 217). In England during World War II, evacuation programs were seriously hampered because parents preferred to keep their children with them at home in the cities rather than send them away to the safety of the countryside (Titmuss, 1950). Studies indicate that most residents tend to remain in the disaster area, while those who flee are unattached to the area (Cantril et al., 1940, pp. 144–146; Quarantelli & Dynes, 1977). When residents are forced to evacuate, they tend to do so as a group (e.g., Cantril et al., 1940; Freeman & Cooper, 1940) or in family units (Quarantelli & Dynes, 1977), thereby maintaining proximity and contact with familiars. Remaining close to companions in combat is also more important to the individual than avoiding enemy fire (Marshall, 1947, p. 195).

2. *Direction of Flight.* Flight is not always directed toward an objectively safe place, away from danger, but tends to be part of a wider response that simultaneously involves move-

ment away from danger and movement toward objects and situations that are familiar and perceived as safe. Studies of young animals and children indicate that flight is usually directed not simply away from danger but toward familiar conspecifics and places. In many species, "to move away from an alarming situation is . . . only half the picture of fear behavior. The other half is to move towards some place treated as though safe or to make physical contact with companions" (Bowlby, 1973, p. 129). Salzen (1978) also suggests that flight or escape serves to move organisms from areas of strange to areas of familiar stimulation, and Gray (1971) hypothesizes that active avoidance behavior is motivated by the search for, and reinforced by, the attainment of "safety signals" in the environment.

In the classic cases of flight from theaters and other buildings, where *escape* seems to be the single overriding motive, little consideration has been given to the sequelae and directionality of flight. Although the initial response to sudden danger may be unidirectional escape, the immediately subsequent response is to contact relatives and friends by telephone or by going home, as soon as the individuals concerned can do so. In general, evacuees orient themselves in the direction of relatives whose homes are outside the danger area (Drabek & Boggs, 1968; Moore, Bates, Laymon, & Parenton, 1963, p. 57). Evacuating families forced to go to official evacuation sites tend to form clusters that partially duplicate their old neighborhoods (Bates, 1963), suggesting an "intention to restore the familiar in the midst of unfamiliar surroundings" (Bolin, 1976, p. 268). Affiliative behavior continues at a high level of intensity after disasters involving escape behavior, and after disasters in general (Bloch, Silber, & Perry, 1956; Newman, 1976). Interactions with family members are also more frequent up to three years after disasters (Bates, 1963; Bolin, 1976; Drabek & Key, 1976; Erickson, 1977, 1995).

All of the conditions known to elicit flight in humans also elicit attachment behavior (Bowlby, 1969). *Precipitating conditions* for flight include "alarming events" of many different kinds (Schultz, 1965) such as fires, the appearance of new types of weapon on the battlefield, explosions, flooding, disease epidemics, military invasion, and the like. *Predisposing conditions* implicated in cases of mass flight (Schultz, 1965; Strauss, 1944) include fatigue, illness, malnutrition, and excessive heat or cold (Boring, 1945; Dollard, 1944; Lang & Lang, 1961; Meerloo, 1950), as well as psychosocial factors such as isolation, poor morale, loss of confidence in leaders, and the absence of leaders or companions (Boring, 1945; Janis, 1963; Lang & Lang, 1961; Marshall, 1947; Meerloo, 1950; Quarantelli, 1954, 1957, 1977; Schultz, 1964b, 1971a).

Attachment behavior is similarly elicited by alarming events such as the appearance of unfamiliar persons, by strange and unfamiliar surroundings (Bowlby, 1969, p. 259; Bowlby, 1973, pp. 96–123), as well as by the predisposing conditions listed above: fatigue, hunger, ill-health, cold, and actual or threatened separation (Alloway, Pliner, & Krames, 1977; Bowlby, 1969, p. 259; Bowlby, 1973).

3. *Physical versus Psychosocial Stress*. Physical danger, as a whole, appears to be far less disturbing or stressful than separation from familiar conspecifics and surroundings (Janis & Leventhal, 1968, pp. 1061–1064; Kinston & Rosser, 1974; Edwards, 1976). During the bombing raids on London in World War II, children showed no particular signs of distress, even if exposed to extremely violent scenes, if they were with a parent during such incidents. It was only if children were separated from parents under these conditions that serious psychological disturbances occurred (Freud & Burlingham, 1945), suggesting that disruption of the family bond was a more traumatic factor than the air raids (Glover, 1942). Glass (1954) similarly found that only 15% of psychiatric casualties evacuated from battle zones and, given intensive psychotherapy, could subsequently be returned to combat. If these men were kept in the battle zones with their own units, the rate of return to combat was much higher. In analyzing the social and psychological effects of tornado disasters, Moore (1958) found more frequent symptoms of disturbance among persons forced to move because of serious damage

to their homes than among those who were able to remain. Non-returning evacuees experience significantly more fearful reactions, injuries, and other problems than those remaining in the disaster area (Milne, 1977a, b). In general, separation from or the loss of familiar persons and surroundings has profoundly adverse effects on mental and physical health (DeVries, Glasper, & Detillion, 2003; Erickson, 1977; Henderson, 1977; Jacobs & Ostfeld, 1977; Lynch, 1998; Rutter, 1972).

4. *Prevention of Panic.* The rarity of mass flight among combat troops has often been attributed to regimental discipline and firm leadership, but social control in the form of coercion does not account for persistent combat effectiveness in the face of danger (Keegan, 1976, p. 277). Individuals of many species often remain calm and unafraid in danger situations, an effect that seems to depend largely on the immediate social context; that is, individuals are calmed by the presence of attachment objects, while the reverse is true if they are alone, with strangers, or in unfamiliar surroundings (Bovard, 1959; Bowlby, 1973, p. 297; DeVries et al., 2003; Epley, 1974; Gunnar, 1998; Kamarck, Annunziato, & Amateau, 1995).

Fighting effectiveness and the willingness to engage in combat depend on the establishment and maintenance of "primary group" relations between officers and men rather than on loyalty to political ideals or fear (Grinker & Spiegel, 1945; Janis, 1963; Marshall, 1947: 150; Phillips, 1943; Shils & Janowitz, 1948; Stouffer et al., 1949). As Marshall (1947) eloquently states: "I hold it to be one of the simplest truths of war that the thing which enables an infantry soldier to keep going is the presence of a comrade . . . The other man may be almost beyond hailing distance, but he must be there somewhere within a man's consciousness or the onset of demoralization is almost immediate . . ." (p. 17). Morale surveys conducted in World War II showed that many soldiers were reluctant to be allocated to other units because they felt safer with their own group (Janis, 1963). The most extreme stresses, including drowning at sea, can be calmly faced if the individual is not separated from his fellows (Burns & Kimura, 1963, p. 170) or if morale is high (LaPiere, 1938, pp. 458–459). Conversely, being alone, in an unfamiliar environment, or with strangers heightens the response to stress (Back & Bogdonoff, 1964; Edwards, 1976; Henderson, 1977; Kaplan, Cassel, & Gore, 1977; Kinston & Rosser, 1974) and increases the probability of flight (Keegan, 1976, p. 271; Lanham, 1943).

THE RARITY OF FLIGHT IN COMMUNITY DISASTERS AND COMBAT

Flight is said to be rare in these situations because the necessary and sufficient conditions (belief in imminent danger and limited escape routes) do not usually hold, and because social controls are operative. However, flight does not always occur even when both conditions appear to be present. As we have seen, physical danger tends to elicit approach to familiar persons and places; most disasters tend to occur in familiar surroundings; and both disaster victims (and troops in the combat zone) tend to be with individuals to whom they are attached. Hence, affiliative "bunching" in the danger zone would be the expected outcome rather than flight. The rarity of flight in community disasters and combat may also be explained by the fact that both the appraisal of and response to danger are diminished by the presence of attachment objects, as noted above. The observations that visitors tend to be the ones to flee disaster areas, and that "panic" is more common in recently assembled than in long-established military units (Shils & Janowitz, 1948) can be explained by the fact that the persons concerned are in unfamiliar territory and with comparative strangers, and would thus be expected to have an increased tendency for flight-and-affiliation to their own objects of attachment and familiar locations.

Explaining the Occurrence of Flight in Non-Threatening Situations

Collective flight on the battlefield has been precipitated by the appearance of new types of weapons (Auld, 1918; Meerloo, 1950,

p. 49). However, flight can occur in the absence of danger and in situations where escape routes are virtually unlimited (Freud, 1922; Marshall, 1947; Schultz, 1964a, p. 11). Marshall (1947) describes seven such incidents in World War II, and noted their common origin:

> [I]t can be laid down as a general rule that nothing is more likely to collapse a line of infantry than the sight of a few of its number in full and unexplained flight to the rear . . . That was how each of these seven incidents got its start. One or two or more men made a sudden run to the rear which others in the vicinity did not understand . . . [I]n every case the testimony of all witnesses clearly developed the fact that those who started the run . . . had a legitimate or at least a reasonable excuse for the action. (pp. 145–146)

Two explanations have previously been suggested for such cases. First, according to Smelser (1963):

> *[T]he initial flight itself creates*—as the remarks of Marshall show—*a new set of necessary conditions for panic*. To see someone running wildly is *prima facie* evidence that he is seeking to escape through limited exits . . . and that he is anxious. Furthermore, this observed flight is a precipitating event for the observer, and gives rise to the belief that something frightening is present, even though this "something" may not be identical to that which caused the original flight. (p. 154)

Smelser proposes that those who ran after seeing others doing so believed that danger was imminent and that escape routes were closing. This explanation cannot be entirely discounted. However, the explanation dwells exclusively on what the initial flight means to the observer in terms of objective dangers to be anticipated rather than what it means in light of the observer's *relationship* to the fleeing individual(s), and it underemphasizes the nuances of meaning that can arise when one or more men, in whom confidence and trust have been placed, behave contrary to expectations.

A second hypothesis begins with the observation that strong affectional ties existing between the members of most military units make the danger of combat seem relatively slight. Panic arises because of the "loss of the leader in some sense or other, the birth of misgivings about him . . ." (Freud, 1922, p. 29), or because of the flight of a leader, entailing the break-up of affectional ties (Schultz, 1964b). As a result, the individual flees because he suddenly feels alone and because his fears are intensified. The difference between the theories is that group ties must "break down" before external danger leads to flight. However, when these ties have disintegrated, the behavior of individuals is the same, that is, a Hobbesian struggle for survival in the face of closing escape routes.

Here we suggest an alternative hypothesis: namely, that the initial run is experienced by the observer as a threat to social ties, and more specifically, as signaling abandonment and separation. Thus, we interpret the subsequent action of the observer not as an attempt to escape real or imagined dangers but as an attempt to *maintain proximity* with those who started the run, including the group leader, that is, an *affiliative* response designed to reaffirm social bonds (Mawson, 1978).

In support of this interpretation, it has been noted that combat troops and their officers—separated from family and familiar surroundings—grow fiercely attached to each other; and these bonds are especially strong prior to and during combat (Ambrose, 2002, p. 109, but *see* Moskos, 1975, on the Vietnam War; Dasberg, 1976; George, 1971; Janis, 1963; Little, 1964; Sohlberg, 1976; Stouffer et al., 1949; Teichman, 1977). The threat of separation is also a major determinant of affiliative behavior as well as a common experience on the battlefield (Dasberg, 1976, p. 311), and there is much evidence that attachment behavior occurs under such conditions. Individual soldiers try to avoid being separated; they will go through danger to be reunited with their unit, and tend to bunch together in combat (Marshall, 1947, p. 340).

THE SOCIAL ATTACHMENT MODEL OF HUMAN BEHAVIOR IN DISASTERS

The social attachment model (Mawson, 1978, 1980) represents a synthesis of the above observations and conclusions. Its central tenets are as follows:

1) Maintaining proximity to familiars is the dominant motive in disasters, an intense expression of the fundamentally gregarious nature of human beings.
2) Flight can be considered the reverse side of the coin of affiliative behavior, that is, one aspect of a more general response that involves movement away from danger and toward people and places viewed as familiar.
3) The occurrence of flight-and-affiliation depends not only on the perceived degree of danger but, more importantly, on the social context, that is, the location or whereabouts of familiar persons and places.
4) The presence of familiar persons influences the perception of and response to danger, in that fear is diminished by proximity to attachment figures.
    a. In situations where individuals are close to attachment figures, not even the most severe environmental threats ordinarily cause flight; the usual outcome is intense affiliative behavior.
    b. On the rare occasions when flight does occur, individuals tend to move away as a group, thereby maintaining proximity with attachment figures.
    c. However, in situations where the individual is alone or with strangers, even mild threats can precipitate flight-and-affiliation to familiar persons and locations at a distance.

TYPOLOGY OF RESPONSES TO DISASTER

Based on the foregoing, a typology of individual and collective reactions to threatening situations is proposed, combining the factors of perceived degree of physical danger (*precipitating condition*) and levels of social support available in the situation (i.e., the presence or absence of attachment objects) (*predisposing condition*). Whether a particular threat leads to flight-and-affiliation depends largely on the severity of predisposing conditions. If precipitating and predisposing conditions are subdivided, respectively, into two extremes—"anxiety versus fear or terror" and "attachment figures present/absent"—a fourfold typology of progressively more intense responses emerges (labeled Outcomes A, B, C, and D) that incorporates a wide spectrum of collective reactions to threats and disasters (Figure 1).

Outcome A—Affiliation

Where the level of physical danger is low (causing anxiety) and individuals are in the presence of attachment figures or objects, the threshold for flight-and-affiliation is high, and flight from the vicinity is rare; *the usual outcome is increased attachment behavior*. This is the most common response to community threats and disasters. Individuals tend to contact relatives and friends and/or remain together at home. Other examples of Outcome A are increased bunching activity among troops in the combat zone, and the myriad everyday instances of attachment behavior shown by children and adults in the face of mild threats (e.g., calling or going home).

Outcome B—Orderly Evacuation by Non-Residents

Where the degree of danger is low, but individuals are alone or with strangers, the threshold for flight-and-affiliation is still relatively low, and *flight-and-affiliation of low intensity would be expected to occur*. Such behavior is often described not as panic but as orderly flight or evacuation. Exemplifying Outcome B would be the flight-and-affiliative behavior of those temporarily away from home towards their own homes and families. At this level of perceived danger (which tends to be minimized or downplayed in the home environment), *local inhabitants* tend to remain in their familiar environment.

Outcome C—Evacuation by Community Residents

Where the danger level is high (intense fear or terror) but people are with familiars, *flight-and-affiliation occurs occasionally* in spite

Perceived Degree of Physical Danger (Precipitating Conditions)	Location of Attachment Figures (Predisposing Conditions): *Present*	*Absent*
Mild (Anxiety)	**Outcome A: Affiliation** Increased attachment behavior, that is, individuals seek proximity with familiar people and locations, as occurs in most community disaters.	**Outcome B: Orderly Evacuation by Non-Residemts** Flight-and-affiliation of low intensity. Orderly movement away from danger and toward the familiar, for example, evacuation by tourists in "mild" community disasters and "bunching" among combat troops.
Severe (Fear, Terror)	**Outcome C: Evacuation by Community Residents** As in Outcome A, or occasional low-to-intense flight-and-affiliation, for example, orderly evacuation in major disasters: occasional "panic" in seasoned combat units due to the appearance of new weapons.	**Outcome D: Intense Flight-and-Affiliation** Intense flight-and-affiliation, that is, responses commonly labeled "mass panic," as in structural fires, and in unattached or weakly attached combat units.

Figure 1.
Typology of individual and collective reactions to threat and disaster (Outcomes A–D), based on a combination of precipitating conditions—degree of physical danger, ranging from anxiety ("mild") to fear and/or terror ("severe")—and predisposing conditions—the whereabouts of attachment figures (physically present or absent).

of exceptionally strong bonds to persons and places in the danger zone. In such cases, individuals tend to evacuate as a group, either as families or neighborhood groups, thereby keeping close together. The intensity of egress depends on the magnitude and imminence of the threat. Examples of Outcome C include occasional "panics" in seasoned military units in the face of overwhelming or unexpected danger, and large-scale community evacuations during major fires or other disasters.

Outcome D—Intense Flight-and-Affiliation

Where the danger level is high (inducing fear or terror) and individuals are either alone or with strangers, *flight-and-affiliative behavior of high intensity would be expected to occur*. This response is often described as "mass panic." Examples include the classic, entrapment-type "panics," together with cases of flight-and-affiliation in combat units where attachments between individuals are either weak or nonexistent and where, in effect, each person experiences the stress of combat as an isolated individual. In these types of situations, flight-and-affiliation sometimes takes the form of highly individualistic and competitive behavior. However, such behavior can be viewed as an attempt to seek proximity and contact with *distant* attachment objects. Immediately or very shortly after vacating a burning building, individuals attempt to contact relatives and/or go "home", that is, seek the familiar.

BEHAVIOR IN STRUCTURAL FIRES

Aspects of the typology can be illustrated by noting the importance of the social context in understanding collective responses to different types of structural fire. In the case of fires in theaters and clubs, people generally encounter danger in an unfamiliar place, surrounded by unfamiliar people. Intense flight-and-affiliation to attachment objects outside the theater (Outcome D) would therefore be the expected behavior pattern. On the other hand, in the case of fires occurring in familiar locations such office buildings (and especially homes), people would be expected to show a tendency to increase their attachment behavior within the structure (Outcome A) rather than evacuating it (Outcome C). Affiliative tendencies would presumably be shown particularly strongly by children in their own homes, and perhaps also by the frail elderly. In fact, research is needed to determine whether young children are more apt to engage in attachment behavior under such conditions and whether this may account, in part, for the increased susceptibility of children to injury and death in residential fires. In residential fires in general, the model would predict a) numerous manifestations of attachment behavior to persons and places within the structure, b) a widespread tendency to downplay the danger, c) a general reluctance to evacuate, d) prolonged delays in departure, and e) far less precipitous and intense escape behavior than if the fire had occurred in an unfamiliar location. Several observations on behavior during and after a fire in an apartment building in Winnipeg, Canada, support these predictions (Scanlon, 1979):

- "former residents could not resist wandering back to the abandoned building";
- "44 percent of the occupants said that when the alarm was sounded they assumed it was a false alarm";
- "Many of those who reacted to the alarm . . . went looking for confirmatory evidence of a fire";
- "Despite the evidence of their own senses, some people decided not to evacuate immediately . . . more than half took their time leaving";
- "Some people, despite hearing an alarm, carried on with incredibly inappropriate behavior and took enormous risks";
- "Many people wandered around in the building before they finally left"; and
- "One in six people who left the building, in spite of seeing smoke and flames while they were in the open, went back inside."

In his review of the literature on behavior in fire, Bryan (1986) cites numerous obser-

vations consistent with social attachment theory.

RESEARCH ON THE SOCIAL ATTACHMENT MODEL

The social attachment ("affiliative") model of group behavior in emergencies has been formally tested in a number of studies. Noting that the "panic model" assumes that escape involves a homogeneous mass of people competing for limited exits, whereas the "affiliative" model predicts that individuals with close ties first seek and find each other and then attempt to escape as a group, Sime (1983, 1985) studied responses to fire in a large resort complex (Summerland) in the United Kingdom based on accounts collected from 500 survivors. About 3,000 vacationers were present and 50 people died. Accounts of the fire and behavior in the fire, collected from survivors by the police, formed the basis of the study. This was a classic entrapment situation in which a complete breakdown of psychological ties would have been expected on the "panic" model. However, about 50 percent of those in the sample who were initially separated from primary group members managed to escape with the rest of their primary group, and 73 percent escaped with one or more group members (79 percent were members of families). Consistent with the social attachment model, mixed-group members were less likely to stay together in intact groups while escaping, and separated individuals did not try to re-form into intact groups unless they had family group attachments somewhere in the building. Supporting the notion that movement toward familiar persons and places characterizes flight behavior, most of those studied headed toward the familiar main entrance. A detailed analysis of behavior in one area of the building (Marquee Show Bar—MSB) showed that individuals who were separated from their group had positioned themselves near, and left near, the entrance they were familiar with; restaurant staff left by *their* familiar route to work (the fire exit staircase); and most of the separated individuals had positioned themselves close to the familiar entrance. Thus, the direction of movement in the area was based on a combination of the person's role (and hence familiarity with a particular escape route), affiliative ties to individuals who were in another location in the building, and consequent proximity to one exit or the other. The contribution of group ties to deaths and injuries resulting from the Summerland fire was also analyzed by Sime. He found that all of the 13 people in the MSB who died were attached to their groups when alerted to the fire, but "[t]hese groups evidently delayed their departure. In trying to escape in groups . . . these people were caught by the encroaching smoke and flames" (Sime, 1983, p. 38). Affiliative behavior increased the danger to the family groups because the latter were slower to escape. On the other hand, separated individuals were quicker to respond to the ambiguous cues by escape behavior and hence none was seriously injured. Thus, group ties and affiliative patterns of behavior in entrapment situations created by building fires can increase the risk of injury and death to attached individuals by delaying their departure.

In a study of the evacuation behavior of occupants of the former World Trade Center following the explosion on February 26, 1993, based on interviews with 350 participants, Aguirre, Wenger, & Vigo (1998) found that evacuating groups comprising a high proportion of acquainted persons with deep social ties were the slowest to begin evacuating. Other research consistently shows that people are slow to react to initial warnings and wait to evacuate with their primary group (Fitzpatrick & Mileti, 1991; Perry, 1994). In high-rise buildings, a lethargic reaction is usually observed in response to fire alarms, voice communication instructions, or even initial cues of a fire, and occupants are generally reluctant to leave their floor (Proulx, 1999).

In the Beverly Hills Supper Club fire in Southgate, Kentucky, in May 1977, which resulted in 165 fatalities, social ties existing among the occupants of the club (family, social, and occupational ties) profoundly influenced behavior in the fire. A high level of assistance and civility was shown to others, and it was concluded that the data supported a "social organization" rather than a "social

breakdown" model of behavior in fire (Feinberg & Johnson, 2001; Johnson, 1988).

When the *M/V Estonia* car ferry sank in 1994, 851 passengers and crew died and only 137 (14%) survived. The high fatality rate was due to the rapid sinking of the vessel, coupled with physical barriers to escape caused by severe listing. This made it virtually impossible for family members or the crew to help one another. However, eyewitness testimony revealed that people tried to form human chains by holding on to one another's legs in the struggle to reach the upper deck, and great efforts were made to provide mutual aid. There were also many accounts of men fleeing with wives, mothers, or girlfriends, and of people attempting to stay together during the escape (Cornwell et al., 2001).

Following the more recent attack on the World Trade Center in September 11, 2001, 480 first-person accounts were collected from survivors about their evacuation, of which 324 accounts were available for analysis (Proulx, 2003). As many as 83 percent judged the situation to be very serious in the first few minutes after the strike. Yet despite seeing flames, smoke, or falling paper, only 55 percent of the survivors evacuated immediately; another 13 percent stopped to retrieve belongings, and 20 percent secured files and searched floors before evacuating. Initially, eight percent decided to stay but changed their minds, and four percent were trapped due to collapsing ceiling and walls, but then managed to escape. Many commented on how calm and helpful the occupants were during the evacuation (http://irc.nrc-cnrc.gc.ca).

Other reviews of behavior following the 9/11 attacks on the World Trade Center and Pentagon and the subsequent anthrax letter mailings (Glass & Schoch-Spana, 2002; Schoch-Spana, 2003) similarly discounted long-held views that terrorist attacks would cause mass panic and social disorder (DiGiovanni, 1999; Stern, 1999; WHO, 1970). On the contrary, a broad range of positive public responses were noted, including rescue work, volunteering, providing resources, and donating blood, indicating that "health and safety professionals need to reassess their assumptions about the public's capacity to respond constructively after a terrorist attack" (Schoch-Spana, 2003, p. 132).

RESPONSE TO NUCLEAR ATTACK

It is uncertain how the general population would respond to an unprecedented act of terrorism using biological, chemical, or nuclear weapons. The nuclear bombings of Hiroshima and Nagasaki in 1945 may provide a guideline. Some reports gave accounts of confusion, hysteria, and mass flight (U.S. Strategic Bombing Survey, 1946, p. 28; Avalon Project, 1996–2003, ch. 23); however, these were not the typical behavioral responses of survivors. Both cities were evacuated due to hazardous conditions resulting from radioactive substances in the immediate environment, but initial evacuations by survivors were carried out calmly and in an organized way. The unexpected calmness of disaster victims has been termed "post-disaster utopia" (Cuthbertson & Nigg, 1987, pp. 444–462). As in most disasters, people expressed a longing for the familiarity of home and sought out other survivors. One woman stated that "she struggled to her feet and joined a band of other survivors . . . . Home, she had to get home . . ." (Kurzman, 1986, pp. 14, 413–114). Survivors were described as attempting to leave the city to get to the suburbs, but most people lived in the suburbs and were trying to get home. They were seeking the familiar rural or suburban communities where they lived and where the bombs' effects were not felt. "All the people were going in that direction and so I suppose I was taken into this movement and went with them," said one survivor, implying that many people assembled into groups and evacuated in an organized manner (Lifton, 1967, pp. 20, 21–40). Similar accounts of responses to the bombings were given, mentioning acts of bravery and the strong sense of companionship that developed among the survivors as they came together and returned to their homes (Barker, 1985; Linner, 1995; Wyden,

1984, p. 255). Many *hibakushas* (survivors of the atomic bomb) related their experiences on a video (*Hiroshima Witness*, 1990) produced by the Hiroshima Peace Cultural Center. These graphic personal descriptions of events in August 1945 show that although most survivors were terrified and in a state of shock, their overriding goal was to be reunited with familiar people and surroundings. One witness, Hiroko Fukada, stated that he "went out of the building because I thought it would be dangerous to stay inside. Soon I found soldiers walking in this direction. I was with my friends and we thought it would be safe to go with soldiers, and so we (did) . . ." This account shows neither hysteria nor panic but calm decision-making and a desire for companionship.

CONCLUSIONS

Until recently, mass panic (and/or violence) was thought to be the natural response to physical danger and perceived entrapment. However, contrary to the "panic" or social breakdown model of collective behavior, the typical response to a variety of threats and disasters is not to flee or attack but rather affiliation, that is, to seek the proximity of familiar persons and places; moreover, separation from attachment figures is a greater stressor than physical danger. Multiple social ties existing among participants in disaster situations profoundly influence behavior. Men flee with their wives, families, or girlfriends, and attempt to stay together during escapes. Nor do employees abandon their responsibilities toward patrons. A high degree of civility is shown, and heroic efforts are made to provide mutual aid and assistance.

Such observations can be understood in terms of an alternative, "social attachment" model of behavior that recognizes the fundamentally gregarious nature of human beings and the primacy of attachments. In the relatively rare instances where flight does occur, the latter can be viewed as one aspect of a more general affiliative response that involves escaping *from* certain situations and moving *toward* other situations that are perceived as familiar but which may not necessarily be objectively safe. We have suggested that some military "panics" occurring in the apparent absence of physical threat or danger, but triggered by the sudden departure of one or more men to the rear, may in fact be affiliative responses to the perceived threat of abandonment by or separation from comrades.

The occurrence of flight-and-affiliation depends mainly on the social context and, more particularly, on the whereabouts of familiar persons (i.e., attachment figures); their presence has a calming effect and reduces the probability of flight-and-affiliation, while their absence has the opposite effect. Combining the factors of perceived physical danger and the location of attachment figures, and categorizing them respectively as "mild/severe" (i.e., anxiety versus fear or terror) and "present/absent," results in a fourfold typology that encompasses a wide spectrum of collective responses to threat and disaster.

Studies of collective behavior in disasters thus show that fear tends to be minimal and expressions of mutual aid predominate. On the negative side, however, people in groups of familiars are generally slow to react to initial warnings, slow to leave work areas, and wait to assemble with their primary group before evacuating. Thus, evacuation may be so delayed that survival is threatened. In certain situations, such as structural fires, the tendency to seek the familiar in the face of imminent physical danger can have disastrous consequences in terms of increasing the risk of severe injury or death. Ironically, because tendencies toward hysteria and mass panic on the part of the public are widely assumed, officials are often reluctant to issue warnings, or delay doing so, for fear of causing panic (Sime, 1980). Yet delays in providing correct or sufficient information can result in entrapment and death as a result of inactivity or active attachment behavior. Thus, from a public health or safety point of view, the problem in disasters is not that people tend to panic and act precipitously in response to danger, but that people typically delay or fail to take appropriate evasive action when it is needed.

In recent decades, there has been an explosion of research interest in human bonds and the way in which they modulate the effects of environmental stress and influence health and social behavior (Beatson & Taryan, 2003; Berkman, Glass, Brissette, & Seeman, 2000; Bowlby, 1969, 1973; Brown et al., 1975; Cobb, 1976; Henderson, 1977; Kaplan et al., 1977; Kiritz & Moos, 1974). Under a variety of stressful conditions, individuals approach familiar persons and places and are calmed by their presence. In sociological terms, there is an increase in "we-feeling," solidarity and morale, but also a parallel increased sensitivity to perceived deviance and a tendency toward social exclusion, scapegoating, and hate crime (Taintor, 2003). The study of responses to stress thus provides clues for understanding human bonds and behavior, the dynamics of which are more difficult to observe under non-emergency conditions. Collective social phenomena, long considered a backwater of sociology, can be seen as continuous with—and as illustrating—a broader model of human social behavior that emphasizes the primacy of attachments, not in the Durkheimian sense (Mawson, 1970), in which social relationships "restrain" an inherently selfish human nature, but in a profoundly interactionist sense in which attachments are essential for normal human growth, development, and social functioning as well as health and longevity.

We have seen that close personal relationships strongly determine individual and collective responses to threat, but the policy implications of the social attachment model for public health and safety remain largely unexplored, for example, with respect to fire safety and all aspects of preparedness, including counterterrorism. It remains now to apply the social attachment model of behavior in disaster, as well as observations indicating that people generally show an unexpectedly strong capacity to organize and respond positively and unselfishly under such conditions, such as, providing valuable back-services for overworked "first-responders." As recently emphasized (Glass & Schoch-Spana, 2002; Schoch-Spana, 2003; http://www.upmc-biosecurity.org/pages/events/peoplesrole/ursano/ursano_trans.html), these findings need to be incorporated into new models of health education and promotion so that community ties and strengths can be actively harnessed by public health and other governmental agencies to prepare and respond more effectively to future disasters and possible terrorist attack.

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