The Phases of Disaster as a Relationship Between Structure and Meaning: A Narrative Analysis of the 1947 Texas City Explosion

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Developing disaster phase models has been useful, particularly for understanding response efforts to emergencies and disasters. However, such models are limited in their ability to explain the phases encountered by a social collective, or community, as it progresses through response and recovery efforts. This study examined phases of disaster response and recovery as a sociological problem. A grounded-theory analysis was used to examine 60 personal narratives of the 1947 Texas City explosion, which is an example of a cosmology episode (Weick 1985). Survivors of the explosion provided narrative accounts describing their memories of the incident. Results support the idea that social collectives depend upon a transactional relationship between structure and meaning to make sense of events. The study develops a phase model depicting four phases experienced by the Texas City community prior to, during, and after the disaster. This study reveals contributions gained through analysis of personal narratives to illuminate the relationship between disaster and human activity.

Both scholars and practitioners have routinely described disasters as occurring in phases (Neal 1997). Indeed, phase models have been developed in order to assign order and rationality to the very messy, complex reality of natural and technological disasters, and human responses to them. The most popular of these phase models stems from reports of the National Governor's Association (1979) and Drabek (1986), which suggested that disasters can be delineated into four phases, specifically preparedness, response, recovery, and mitigation. While intended to aid in the organization of disaster research, this phase model, and others like it, have generated just as

much frustration for researchers (Neal 1997). In his review of the disaster phase literature, Neal recognized other scholars' critiques that phases are arbitrary and have limited utility (Haas, Kates, and Bowden 1977), that different groups go through phases at different times (Phillips 1991), and that activities thought to be isolated to one phase often occur in other phases (Neal 1984). Neal (1997) argued that "continued current use of the phases of disaster *may continue to stifle how researchers define and study disasters, and how practitioners manage disasters*" (p. 253; emphasis in original).

For these reasons, Neal called for researchers to employ fresh perspectives in their development of phase models of disaster. This case analysis of the Texas City disaster of 1947 seeks to develop a phase model built upon the relationship between structure and meaning. Structure, in this case, does not refer to physical facilities. Rather, it characterizes the communicative ways in which social collectives organize themselves. Examples of this type of structure include assigning roles, assembling, making rules, and sharing norms and values. The term "meaning" refers to the individual and social collective process of making sense of some phenomenon. While this is an individual behavior, it is influenced through our interactions with others. This model will propose that, for some types of disasters, a social collective will move from one phase to the next based upon their capacity to rebuild structure and assign meaning. Significantly, this model will not address functional activity of disaster phases, but rather the human behavior within disaster response and recovery phases. Thus, the study addresses and makes a contribution to literature examining the sociological problem of a community's reconstruction during disaster.

The paper begins with a description of the Texas City disaster followed by a description of cosmology episodes. Next, the study's method and data analysis procedures are discussed. Results of the analysis are then presented. The paper concludes with implications of the study.

The Texas City Disaster of 1947

On April 16, 1947, a cargo ship carrying a large amount of ammonium nitrate in its hold exploded in the port of Texas City, Texas. About 15 hours later, while response and recovery efforts for

the first explosion were underway, another ship carrying ammonium nitrate also exploded. Estimates by the Red Cross and the Texas Department of Public Safety counted 468 fatalities, 100 persons missing and never found, and approximately 3,500 injured. Property and product loss, including 1.5 million barrels of petroleum products, totaled almost $5.5 billion in 2003 dollars. Finally, two thousand townspeople were left without homes at least temporarily, after one-third of the town's 1,519 houses were condemned.

After contending that "the disaster and surrounding circumstances have never been investigated in their totality," (p. xii), Stephens (1997) described the events leading up to and subsequent to the Texas City explosion. He suggested that four precursor conditions fostered the opportunity for such an explosion. First, the *physical location* and circumstances of the city provided a likely environment for disaster. Four major oil refineries, two aviation gas units, two chemical companies, and a deep-channel port trafficked by ships carrying crude oil and other petroleum products each carried a substantial hazard risk. Second, the *proximity* of these elements heightened the chances for disaster. He suggested that an accident at any one of the above sites could have resulted in a "chain reaction among facilities" (p. 10).

Third, the *social climate* of Texas City was not oriented toward crisis preparation or management. Refineries and port jobs paid well and few community members wanted to upset the local economy by suggesting disaster could occur (see also Minutaglio 2003). Fourth, successful use of chemicals in World War II had created an ingrained trust in this scientific commodity. Such conditions contributed to insufficient *safety and emergency preparation* for both plants and the city. In the event of major crisis, a fragmented, uncoordinated response was likely.

These conditions created a "powder keg" for the Texas City community that lacked only an ignition source. That ignition source arrived in the form of two ships, the *Grandcamp*[1] and the *High Flyer*. The *Grandcamp* was docked at Pier "O" in the port's north slip (Wheaton 1948); its cargo included 16 cases of small arms ammunition, 59,000 bales of sisal binder twine in large balls, 9,334 bags of shelled peanuts, various oil and farm equipment, and an estimated 2,300 tons of ammonium nitrate fertilizer. The *High*

Flyer, docked in Pier "A," held 9,000 tons of ammonium nitrate fertilizer, a large amount of sulfur, and railroad cars.

As the *Grandcamp* was loaded with additional cargo, a dockworker smelled smoke that was eventually seen ascending between the cargo boards and the ship's hull (Stephens 1997). The captain of the *Grandcamp* ordered crewmembers to batten the ship's hatches to in order to suffocate the fire. However, at about 8:30 a.m., the pressure in the *Grandcamp's* hold was so intense that it blew the hatch covers into the air and smoke poured from the ship. While curious onlookers began gathering to gaze at the colorful smoke, fire crews from the Volunteer Fire Department and the Republic Oil Refining Company set up their hoses and began applying water to the ship's deck. The heat was so intense that the water was vaporized upon contact with the deck.   At approximately 8:47 a.m., additional fire fighting equipment arrived. At 9:12 a.m., the heat on the *Grandcamp* reached "boiling point" and the ship violently exploded (Wheaton 1948). The explosion was heard from as far as 150 miles. Stephens (1997) described the explosion as follows:

"A huge mushroom cloud billowed more than 2,000 feet into the morning air, the shock wave knocking two light planes flying overhead out of the sky. A thick curtain of steel shards scythed through workers along the docks and a crowd of curious onlookers who had gathered at the head of the slip at which the ship was moored." (p. 3).

Few people on the wharf at the time of explosion, including 27 Texas City Fire Department members, were ever found. Many of those closest to the explosion disintegrated. Large fragments of the ship, some weighing several tons, rained down upon the port and sections of Texas City. Numerous periphery fires started as pipelines and storage tanks at nearby refineries were torn open by shrapnel.

People within 20 miles of the explosion instantly knew something terrible had happened. Ten miles away, in neighboring Galveston, the force of the blast knocked residents from their feet as they walked through town. Stephens stated that "many agonizing

hours were to pass before a semblance of order began to replace the shock and confusion" (p. 4). To meet the overwhelming need for medical attention, the city auditorium was used as a first-aid center. In less than an hour after the explosion, doctors and nurses arrived unsolicited from Galveston and a nearby military base. Law enforcement officials from nearby towns came to assist with search and rescue efforts and to help maintain order. At about 1:10 a.m., almost 15 hours after the first blast, the *High Flyer* exploded with a force estimated by many to be stronger than that of the original explosion. Witnesses described the explosion as like a "firework display" (Stephens 1997, p. 5) with incandescent chunks of steel reaching high into the air and falling miles from the explosion site. After-shocks of the explosion included fires on nearby crude oil tanks and other industrial structures. As dawn arrived, thick, black columns of smoke were seen by individuals 30 miles from the explosion site. Several days passed before the fires either burned themselves out or were extinguished by fire fighters.

Cosmology Episodes

Before delving into the methods of the study, classifying the type of event with which the residents of Texas City were struggling on April 16, 1947, is necessary. Weick (1985, 1993) used the term "cosmology episode" (1985, p. 51) to describe an event that results in a sudden loss of meaning. Weick (1993) proposed that organizations are sensitive to sudden losses of meaning in the face of highly unlikely events. At the personal level, cosmology provides individuals a "macro-macro" perspective of existence, examining issues such as time, space, and change, and their relationships to the origin and structure of the universe.

Weick suggested that individuals take for granted these macro elements and "act as if events cohere in time and space and that change unfolds in an orderly manner. These everyday cosmologies are subject to disruption" (p. 633). When they are severely disrupted, a cosmology episode has occurred. Weick further argued that such episodes occur when people come to a deep understanding that the universe is not a reasonable and orderly system. The effect on

sensemaking is especially profound as individuals' abilities to make sense of what is happening collapses *concurrently* with their means to rebuild that sensemaking capability. Thus, a cosmology episode is a situation that an individual has never faced before and that strips away all frames of reference by which individuals engage in sense making.

Weick's smokejumpers[2] (1993), as described in his Mann Gulch article, certainly encountered such a situation as an unpredictable forest fire stripped them of their understanding of their roles and of forest fires in general. The disintegration of sensemaking and structure ultimately led to the smokejumpers' demise. Weick recognized a direct relationship between structure and meaning, e.g. less structure leads to less meaning and more structure leads to more meaning. When the smokejumpers lost structure, they likewise lost sensemaking abilities. Weick also argues, however, for an inverse relationship between structure and meaning, e.g. less meaning, more structure. In describing an inverse relationship, Weick proposed that "when meaning becomes problematic and decreases, this is a signal for people to pay more attention to their formal and informal social ties and to reaffirm and/ or reconstruct them" (p. 646). Much like Weick's smokejumpers, the residents of Texas City had never faced an event like the one on April 16, 1947. As a social collective, however, it was able to survive the explosion. Thus, analysis of the Texas City survivor narratives provides an opportunity to understand the inverse relationship between structure and meaning by examining how sensemaking capabilities are reassembled once they have been fragmented.[3]

Method

This study utilized personal biographies in the form of narratives, which were gleaned from a collection in which subjects exercised free rein over their interpretations of the Texas City disaster. Specifically, a published collection of survivor narratives from the Texas City disaster provided the body of data. These narratives were collected from living survivors of the disaster and were published in 1997 as Texas City made plans to commemorate the 50th anniversary of the explosion. According to the book's preface, the stories were edited for length in order to include all of them. However, "In the (editing)

process, every effort was made to preserve the essential content of each story and the words of the writer," (p. iii). This voluminous collection of narratives provided a rich, detailed compilation of community members' personal experiences of a historical tragedy.

The narratives were listed in alphabetical order by last name of author. Consequently, the same family might have consecutive narratives in the collection. In order to prevent over-representing one family's experience, I used a random selection process to select narratives for analysis. I wrote each page number of the book's narrative section on an individual slip of paper. I then placed those numbers into a box and pulled randomly. As each page number was pulled out, the complete stories on that page were included in the sample. Ultimately, 60 narratives were selected for analysis.[4]

The Value of Narratives in Sensemaking

Stories, or narratives, "have been widely told, heard, written, read, analyzed, and theorized throughout history" (Clair, Chapman, and Kunkel 1996, p. 242). Narratives create meaning (Feldman 1990), facilitate sense-making (Coopman et al. 1998), and make sense of the past and present, while projecting the future (Polletta 1998). Narratives serve both a communication and sensemaking function (Clair et al. 1996) by enabling individuals to interpret the world and convey that interpretation to others. The use of narrative as a unit of analysis proved quite valid for the research questions of this study: understanding how individuals "make sense" of a disaster, and the structural and sense-making patterns that emerge for a social collective immediately prior to, during, and subsequent to a major disaster. Weick and Browning (1986) contended that narratives aid individuals in the comprehension of complex environments. Similarly, Maines (1993) posited that narratives are tools people use to understand troubling events whose meanings are not clear (Maines 1993). Bridger and Maines (1998) argued that narratives "are an important interpretive and rhetorical resource that is drawn upon in times of crisis and rapid change," (p. 320). Scholars have made a case for narratives as especially appropriate for discovering individuals' sensemaking of uncommon events and crisis, and were thus used for the present study.

A grounded theory method was used to analyze the data set. The purpose of grounded theory is to generate hypotheses rather than to test data (Browning 1978). I used the approach of constant comparison to generate the data categories (Glaser and Strauss 1967; Strauss and Corbin 1990). First, those complete thought expressions or incidents (Browning 1978) which suggested a theme were "copied and pasted" into a category file. That category file was named with a label that captured the essence of the theme. Each subsequent incident was placed into a data category and was compared to other incidents to check for consistency. Only those incidents that consistently met the theme of the category were maintained. Categories were not mutually exclusive allowing some incidents to be placed into more than one category.

The 27 initial categories that emerged from the grounded theory process are presented in Table One. These categories represent various sensemaking devices employed by Texas City survivors. The labels are descriptive and representative of the incidents, or examples, within each category. For example, the category "God and religion" includes incidents which describe survivors attributing their survival to God or a higher-power. During the initial grounded theory analysis, I made no attempts to determine relationships among categories. Instead, I allowed as many categories as possible to emerge from the data.

Once the categories formed, I sought meta-relationships among categories. To discover meta-relationships, I utilized three perspectives, which could be thought of as lenses through which I viewed the data categories as a set. I will describe each of these perspectives before presenting the relationships. First, I used Weick's (1993) "meaning-framework" relationship, which was built upon Maruyama's (1963) deviation-amplifying causal loops. In his report on the Mann Gulch disaster, Weick argued that when the role system of the smokejumpers lost its structure; the result was a loss of meaning, which amplified and increased the loss of structure. The result was a system breakdown that led to further breakdowns in an exponential (or amplifying) fashion. Weick suggested, "this is the pattern associated with a deviation-amplifying feedback loop in which an initial change unfolds unchecked in the same direction" (p. 646).

Table 1. Data Categories Emerging from Grounded Theory Analysis.

After-effects	God and religion	Rescue
Confusion and shock	Gratitude for helpers	Reunion
Curiosity	Gratitude for life	Searching
Damage	Helping neighbors	Separation
Descriptors	Lack of concern	Uncertainty
Dream or reality	Loss	Unforgettable
First-hand witnesses	Maintaining civility	Unprepared
Flight	Metaphors	What outside communities thought
Fortuitous survival	Oddities	Who's to blame

Next, I sought deviation-amplifying and deviation-counteracting mutual causal processes (Maruyama 1963; Weick 1993). A key difference between deviation-counteracting and deviation-amplifying mutual causal systems is that the former involves mutual negative feedback between elements, and the latter involves mutual positive feedback systems (Maruyama 1963). In essence, deviation-counteracting systems are designed to maintain equilibrium, to return systems to their normal state. Examples of such systems include "thermostats, physiological regulation of body temperature, (and) automatic steering devices" (p. 164). Deviation-amplifying systems, meanwhile, allow elements to build upon themselves or one another. Examples include "accumulation of capital industry, evolution of living organisms, (and) the rise of cultures of various types" (p. 164). A deviation in the system spawns further and increased deviations.

The third framework I used to connect the data categories was a chronological one. The data categories described situations that generally occurred in a sequential order. Specifically, the data categories described survivor perspectives prior to, immediately after, a short time after, and an extended time after the explosion. Using these three frameworks, I constructed a model using 19 of the categories.[5] The Discussion section presents a description of that model's four phases and the categories within each phase.

Discussion

Figure One depicts the phase model developed from the data categories. The model includes four phases, each of which is explicated by data categories. Shifts from one phase to the next are characterized by changes to *structure* and *meaning* caused by the explosion and its aftermath. In Phase One (prior to the explosion), structure is intact and meaning can be assigned. Immediately after the explosion, both structure and meaning disintegrate simultaneously (Phase Two). Phase Three of the model describes structure being reconstituted, while meaning is either suspended or reconstituted. The model's fourth phase describes that stage at which structure is rebuilt and meaning is assigned. While the model suggests a linear path, elements occurring in one phase may also occur in another phase. For example, the category, *flight*, currently resides in the second phase, but could also occur in the fourth phase. Double-sided arrows convey the notion that categories are not mutually exclusive. Each phase is described in greater detail below.

Figure 1. Phases of Structure/Sensemaking Model.

Phase one	↔	Phase Two	↔	Phase Three	↔	Phase Four
Lack of concern Curiosity		Confusion & shock		Rescue		Assigning blame
		Uncertainty		Search		Unforgettable
		Unprepared		Maintain civility		Gratitude for life
		Flight		Reunion		Fortuitous survival
		Separation		Helping neighbors		Loss

Phase One (Structure Intact: Meaning Assigned). The pattern of sensemaking exhibited by the residents of Texas City appeared to proceed through four phases (see Figure 1). First, in the period just prior to the explosion, the residents of Texas City were unconcerned

about the ship that had caught fire in the port. Two categories, "lack of concern" and "curiosity," explicate this period. This phase occurred at a time when the "structure" or framework of the social collective in Texas City remained well-established and comfortable. Residents apparently felt safe as many of them traveled to the docks to observe the strange smoke emitting from the *Grandcamp.* With structure intact, they attempted to make sense of this strange sight. Rather than concern or fright, they exhibited curiosity about the odd colored smoke that several described as "beautiful." Many of the residents took time out of their day to travel to the docks and view the smoke at closer range. Incidents such as the following characterize the "curiosity" category:

> "I was playing in a vacant lot and heard sirens and saw fire trucks and police going to and from the docks, and smoke of many colors. Cutting across the large pasture, known as "La Seccion," where people kept their livestock, I headed to the fire."

Another survivor said, "I told my sister-in-law and my mother-in-law to check out the lime-orange, sherbert sky. We sat with (our babies) and watched people rushing to the fire." This curiosity also was evidenced by a general "lack of concern" from the townspeople, a finding supported by Minutaglio's (2003) recent account of the Texas City disaster. At this time, U.S. citizens had no compelling reason to mistrust chemicals, and public discourse of hazardous materials and their risks was nonexistent. Overall, "naiveté" and even feelings of "safety" pervaded the community; many citizens indicated they had no fear of impending danger. Clearly, the community members had not learned the risks associated with industry.

Incidents from the "lack of concern" category include the following narrative:

> "On April 16, 1947, I woke up to a beautiful spring day. At breakfast, my father said there was a fire at the dock. We lived in a two-story house at 2113 Texas Avenue, and I stood on the banister to watch. It was beautiful with red, yellow and blue flames."

Another survivor's example captures the innocence that preceded the fire:

"I entered Hemandez' Grocery aware of the fire and the rush of sightseers rushing to the docks, but more interested in supper. My mind was on the list of things I needed. I had left my daughter Anita and her aunts, Lupe and Vera Jasso, at home swinging while my mother, Marianna Jasso, watched them and hung out the wash."

Other survivors mentioned school-aged boys playing "hooky" to watch the ship burn, and other townspeople driving to the docks to watch the "pretty orange" smoke. Even workers on the docks stated that "no one seemed worried," even as they loaded more ammonium nitrate into the ship's hold as the smoke rose around them. With the structure fully intact, focus of the social collective was on sense-making, of deriving meaning from a strange sight.

Phase Two (Structure Disintegrating: Meaning Disintegrating). This phase captures those categories that describe the disaster in the moments and hours following the initial explosion. Five categories comprised this section, including "confusion and shock," "uncertainty," "unprepared," "flight," and "separation." From the perspective of double-amplifying causal loops, one element of a system, in this case the *attempts at meaning* in Phase One, become amplified when a cosmology episode occurs. In other words, the lack of meaning in Phase One is magnified in Phase Two as sensemaking collapses with structure.

The loss of structure can be seen in the category "separation." In this category, survivors described being apart from loved ones when they were injured and siblings described getting separated in schoolyard confusion. Obviously, survivors with family members at the docks described moments of intense anxiety as they wondered about their loved ones. As one survivor said, "I watched them bring bodies and put them in the L.A. building. … I went with my cousin (to the L.A. building) while she looked for her husband who was at Monsanto." Although they were separated from their loved ones

before the explosion, only after structure began collapsing did that realization come into their awareness.

Adding to the breakdown of structure was the instant realization that the city was not prepared for such a disaster. From the category "unprepared," one participant said, "Windows shattered, glass flew everywhere, our teacher jumped behind the easel as she yelled for us to run outside. Apparently fire drills had been for naught." Not only were makeshift emergency crews unequipped to handle the situation, but so were social collectives such as schools.

Coinciding with this collapse of framework was the continued disintegration of meaning. The two categories, "uncertainty" and "confusion and shock" best capture this breakdown of sensemaking. Two incidents from the "uncertainty" category are especially telling. One survivor said, "As I was about to enter the store, the explosion occurred, severely damaging the store and sending glass flying. I didn't know what had happened: I saw people running down the street covered with oil, part of their clothing missing." Another reported, "Shortly after I got to study hall, the first explosion occurred, and the teacher told us to get under the tables. The boy besides me asked, 'Is the world coming to an end?' I didn't know what to think." Weick (1993) described that such reactions are typical following a cosmology episode. Individuals often have scarce information and few communication means to address their questions (Auf der Heide 1989). Further, they have no frame of reference to assign meaning as they would with a disaster they knew was approaching, e.g. a hurricane, or that they had seen on television, e.g. a tornado.

Incidents of "confusion and shock" reveal quite similar episodes. One survivor stated, "the school yard was a maze of students and parents gone wild looking for each other." One mother said, "I knew I had to get home to my baby and started running. Then I remembered I had my car and went back to get it." One individual close to the explosion site was knocked unconscious. He later reported, "When I came to my senses, I wondered where all the black folks had come from because everyone was black from molasses or oil. They were dazed as they walked toward town." Another survivor vividly captured the sense of confusion when he reported, "The clinic was complete chaos. People were screaming and crying for help. I calmly

sat in a chair waiting for Mother to be less busy. Finally, she rushed by, and I reached out to her. She shook me off because she didn't recognize me. I was covered with blood and oil."

Breakdowns in framework and meaning possibly led to "flight," the final category in Phase Two. Flight refers to two distinct types of movement. First, some residents described fleeing the city altogether. Possibly, the complete disintegration of structure pushed them out of Texas City. For example, one survivor said that her "Dad insisted we go to Austin to stay with friends." Another described a story in which a neighbor was frantically searching for her son after the blast. She finally found him, and "with her two-year-old safe in her arms, … they left town." Second, some survivors ran toward their homes, potentially seeking that locale where structure, security, and meaning are most likely to be intact. One survivor described what he saw after the explosion. "I looked toward Monsanto and saw a small plane falling from the sky. Chunks of metal sailed through the air, and all of us were knocked off our feet. Dazed and in shock we ran toward our homes." Another student said, "(Our teacher) began throwing us out of what was left of the windows and telling us to run home. Pandemonium reigned."

Significantly, Phase Two seems to be a relatively short time period, particularly in terms of social time. Neal (1997) argued for the use of social rather than objective, or "clock," time for disaster analysis. He contended that disaster events "force us back to social time" (p. 255). In the present case, it is difficult to determine precisely how long Phase Two lasted; however, it was likely a short period relative to Phase Three, which is characterized by the quick, almost instantaneous, emergence of attempts to rebuild structure by the townspeople (Minutaglio 2003). Such efforts align with Tierney's (2002) and Dynes' (2003) arguments that widespread, long-term panic at disaster scenes is largely a media-driven myth. While some panic, confusion, and shock occurred in Texas City, many elements of the community quickly moved to reorganization and rebuilding of structure.

Phase Three. (Structure Reconstruction: Meaning Suspended/ Reconstituted). Phase Two concluded with the social collective of Texas City in self-described "pandemonium." Residents had never

experienced such an episode and attempts at meaning were breaking down. Complicating the matter was the sense that the community's structure had broken down as well. Minutaglio (2003) noted in his account of the Texas City disaster that John Hill, a chemical engineer with Union Carbide, told mayor Curtis Trahan, "… you have to sit down and get this damn thing organized" (p. 139).

Phase Three is comprised of those categories that demonstrate the community's attempts to reestablish structure, while at the same time sensemaking attempts are either temporarily suspended or occurring simultaneously. Rebuilding structure in this context does not refer to long-term building or restoration projects. Rather, it refers to social structure, or organizing for response. This type of rebuilding is accomplished via several processes including (a) the emergence of leaders, (b) the identification of temporary workplaces, e.g. morgues and shelters, and (c) gaining control over communication lines. Drabek and McEntire (2002) characterized such behaviors as emergent phenomena in which individuals and groups assume new roles and take on new tasks that normally would be met by existing organizations. Activities described in this phase support Dynes (2003) contention that although physical and human capital may be lost in crises, social capital, in the form of emergent societal responses, is "renewed and enhanced, quickly in emergency situations" (p. 15). From a theoretical standpoint, this phase also could be thought of as a deviation-counteracting phase (Maruyama 1963) in which the social collective attempts to bring "itself" back to an equilibrium state. The five categories that exemplified this phase were "maintaining civility," "rescue," "helping neighbors," "reunion," and "searching." Each of these categories revealed a bewildered social collective attempting to regain normalcy in some fashion.

One of the largest categories by number of incidents was "helping neighbors," corroborating Quarantelli's (1986) contention that a dominant characteristic of people in the emergency time of disaster is prosocial behavior. Many survivors told stories of townspeople aiding victims without hesitation. Said one survivor, "When I got home the (field near our house) was full of people. We had a milk cow and lots of milk and butter, and also homemade jellies, but no bread. I made biscuits and fed people. Women with babies

sat inside; others sat in the shade of the house." Many narratives revealed survivors helping transport injured victims to makeshift medical facilities. Several survivors, who were young at the time of the explosion, told of older townspeople literally carrying them to first-aid stations. Finally, many survivors told of themselves or relatives "helping out at the docks," removing debris and searching for victims. At this time, Texas City residents are much like Stallings and Quarantelli's (1985) emergent groups, who "can be thought of as private citizens who work together in pursuit of collective goals relevant to actual or potential disaster but whose organization has not yet become institutionalized" (p. 84).

The category "maintaining civility" can be described by what it does not reveal, as much as by what it does reveal. Despite the destruction caused by the blast and the panic that ensued, no one mentions looting, pilfering, or taking advantage of the confusing atmosphere. Instead, the community as a whole focused on reclamation, survival, and recovery. One survivor stated, "On 6th street, I passed jewelry blown out on sidewalks but I did not see one person try to take any of it." Such comments were supported by the literature, which recognizes that looting is a rare and unsupported stereotype (Auf der Heide 1989; Drabek 1986; Quarantelli 1986). Additionally, fatalities were handled in a traditional manner despite the absence of a cemetery in Texas City. One participant said, "There was no cemetery in Texas City, and the churches were damaged, so many funerals were conducted in smaller towns near Texas City." Finally, survivors commented on safely leaving furniture and appliances in their yards unprotected and unharmed.

In the category "searching," survivors described their efforts to find those from whom they had been separated. One survivor described his parents' futile attempts to find his brother. He said, "My parents drove hundreds of miles looking for him. They viewed all the bodies and all the body parts." Another individual spoke of entering her destroyed house and searching for her family. "I yelled. No one answered. I went from room to room, finally finding my daughter and sisters under a bedspread in the kitchen, wide-eyed, scared, shaken but safe." Additionally several individuals involved in rescue efforts spoke of searching for victims, including one

survivor who said, "we went through the office building first looking for survivors and bodies."

The category above is similar to "rescue," which included accounts in which victims were saved. Survivors spoke of their parents "rescuing" themselves and their brothers and sisters. Others described volunteer efforts to "rescue the injured and to retrieve the dead."

Accounts in the category "reunion" represented situations in which a form of personal structure was regained when separated loved ones were reunited. One survivor said, ""After what seemed an eternity, my sister, mother and I found each other on the playground and eventually found my dad on 6th Street looking for us." Another narrative described a reunion between husband and wife as follows: "They were not hurt, and when they returned, we all hugged each other at the same time." Other survivors reported the satisfying feeling that occurred when families were reunited.

Phase Three includes those categories that reveal general themes of organizing, coordinating, and rebuilding structure. As the community transitions from Phase Two to Phase Three, it moves from a state in which structure has been destroyed to one in which structure is being rebuilt. Minutaglio's (2003) account reported that shortly after the explosion an "instant, improvised triage station is developing," (p. 147) and everything from milk trucks to school buses were being used for rescue trips to and from the explosion site. He further described Mayor Trahan as "racing to delegate mammoth priorities to anybody else he thinks is a remotely responsible human being," (p. 158). Texas City's response in Phase Three demonstrated its utilization of its "social capital," (Dynes 2003), or those "aspects of the social structure in which social actors can use resources, in the same fashion that both physical capital and human capital can be seen as resources" (p. 15). In this case, survivors worked longer hours to compensate for those unable to help, community services transferred their capabilities across a range of contexts, and pre-incident authority was maintained, even with the presence of U.S. Military leaders (Minutaglio 2003). Such coordination efforts were required to successfully rebuild structure. The phase model presented here suggests that the community's ability to assign meaning gradually is enhanced as organizing occurs.

Phase Four (Structure Rebuilt: Meaning Assigned). Once the structures of Phase Three are back in place through search and rescue efforts, maintaining civility, and helping neighbors, sensemaking can be reestablished. In this fourth phase, survivors were able to assign meaning to what had occurred.[6] This "meaning" varied as the categories indicate. For some, the fourth phase was a time to reflect on life as was seen in the categories, "fortuitous survival" and "gratitude for life." For others, the fourth phase addressed the seriousness of the explosion as described by the categories "loss," "unforgettable," and "assigning blame."

In the category "gratitude for life," accounts reflected a sense of "thanks" although no specific target, e.g. God, was indicated for the gratitude. Instead, people expressed a general sense of gratefulness for surviving the explosion and happiness their lives had resumed. One survivor, who lost his father in the blast, stated, "I am thankful all other family members were spared." Another reported, "Like many families in Texas City, our experience, while traumatic, pales in comparison to those who were injured or killed or who lost everything. We were most fortunate to escape injury and to be able to repair our house."

The Texas City explosion killed hundreds of people and injured thousands more. Incidents in the "fortuitous survival" category depicted the feelings of survivors as they discussed their own or their loved one's close calls with death. Some clearly stated that they "feel very fortunate to have escaped injury." Another stated, "Our family of relatives were very fortunate, as we suffered no deaths and only minor injuries." One particularly dramatic story captured the close calls some people had and their recognition of how fortunate they were to survive. For example, one survivor told this story:

> "Dad was inside Tomax Lumber Company and Cabinet shop where he worked when he heard the blast. He grabbed his tools and ran to his car but was knocked to the pavement and has never understood how something that profound could knock him down without hurting him."

One framework used by many Texas City survivors to assign meaning was of "God and religion." Incidents in this category were

similar to those of "fortuitous survival," except in this category survivors attributed their survival directly to God or another religious entity. Here, survivors recounted their close calls of survival and "thanked" God or mentioned a guardian angel that looked out for them. For example, one survivor said, "I praise God that Uncle Bobby was the man for the job that day. Otherwise, he would have perished with all the other members of the Volunteer Fire Department." Another indicated, "God saw us through the disaster so we could all get together one more time." Other accounts suggested that God "spared" survivors or decided that it "was not their time." Another religious element mentioned was prayer, specifically how lost family members were remembered through daily prayer. For instance, "So many people lost loved ones. Father Roach had married us, and our best man, Dale Oliver, was killed. Our many friends will always be remembered in our prayers."

The accounts included in the category "loss" described the damage and death incurred because of the Texas City explosion. In this sensemaking effort, survivors came to grips with the loss of loved ones, helping provide closure to the entire episode. Survivors mentioned the loss of friends and family members, homes, property, and even body parts. One survivor reflected, "That day we lost our father, uncles, friends, and our cousin, who was shown in pictures and film fighting the fire on the ship wearing a World War II Air Force hat." Incidents in this category also revealed the devastation and ruin that can occur to a community because of an industrial accident. One survivor recalled, "Later I learned we lost nine students from my school, and I had to go look at them. That was very bad."

Many survivors described the Texas City disaster as "unforgettable," the next category in Phase Four. Said one individual, "The picture of the *Grandcamp* exploding is still vivid, having been replayed in my mind a thousand times." This description is consistent with understanding the explosion as a cosmology episode. Such episodes call the meaning of the universe into question and leave an indelible print on those who experience the episode. One survivor talked of her husband who was near the blast site. "He was facing the *Grandcamp* and was blown through a Quonset hut and lost a leg. He spent many years trying to forget the event before he died."

Some elements of the explosion were so vivid and horrific they did not allow forgetfulness.

"Suddenly all hell broke loose, and I was blown about one hundred feet to the other side of the warehouse. When I came to, I was under a huge bolt storage bin that had toppled over. I climbed out but couldn't get out the normal exit and had to go through Mr. Baumgartner's office. Someone I did not recognize was sitting in his chair, and this is the part I don't like to recall. This person had a piece of radiator pipe driven through his chest."

Many other survivors said that they remember the event as if it occurred yesterday and that it "will always be in my memory."

One final sensemaking effort of Phase Four involved assigning blame. Incidents in the category, "Who's to blame" revealed who individuals suspected was responsible for the incident and (sometimes) their reactions to those groups. As Neal (1984) suggested, most previous studies of blame assignment indicated multiple targets for blame, which was true in the Texas City disaster where at least three targets were identified as blameworthy. For example, one person assigned blame to the Grandcamp's captain who refused to let firemen water the hold for fear of damaging the fertilizer. "(Nearly) six hundred people lost their lives because one man wanted to save his cargo worth approximately $1,200." Another survivor told of his father, who spoke with the fire chief moments before the explosion. "Dad asked the fire chief if putting the suction hose there was wise because of possible chemical reaction. Dad was told the fire department would take care of the fire." Finally, one survivor found fault with the Texas City port, because "(the Grandcamp) was refused dockage by Galveston because of the (threat of) fire. Then Texas City Port Authority received the same request and granted dockage."

Neal (1984) argued "that a function of blame is to attempt to simplify and define the situation after a disaster, especially when someone or something is suspected of having been the cause of the event" (p. 253). In this manner, blame assignment serves as a

sensemaking device enabling survivors to reduce the uncertainty associated with disasters by simplifying a complex experience (Veltfort and Lee 1943). Blame provides a target, or scapegoat, at which to direct and ultimately reduce anger, fear, and anxiety (Allport, 1983). In the present study, survivors assigned blame to a number of targets, possibly because of the complexity and systemic nature of the disaster. Indeed, the port of Texas City, the fire department, and the *Grandcamp's* captain all had a role in causing the disaster. Assigning blame may be particularly challenging in complex disasters resulting from systemic failures.

To summarize, Phase Four includes those sensemaking efforts that continue once structure is reestablished. Hypothetically, this phase begins once individual community members feel that structure has been rebuilt to a satisfactory extent. Naturally, individuals come to such conclusions at idiosyncratic points based on experience. For example, some are comfortable with assigning meaning as structure is being rebuilt, while others feel secure enough to assign meaning only after structure is nearly intact.

To review, seventeen data categories emerged from a grounded theory analysis of a group of narratives from survivors of the Texas City Disaster and were used to develop a phase model of a community's attempts to make sense of a disaster. In the first phase, the structure of the townspeople was in place. They were free to assign meaning to the strange site of the burning ship at the Texas City port. Phase Two represented the moments immediately after the initial blast, in which the search for meaning was amplified through a collapse of structure. This phase also could be characterized as a deviation-amplifying causal loop (Maruyama 1963; Weick 1993) or as a vicious organizing cycle (Weick 1979). In Phase One, Texas City's social collective attempted to make sense of an odd scene. This process was amplified, or heightened, in Phase Two when the explosion occurred. Attempts to assign meaning during the second phase were much more difficult as the once-intact framework had been lost (Weick 1993). Survivors described feelings of uncertainty, confusion, and shock. Simultaneously, the social collective's structure was in disarray as its members realized that they were unprepared for such a disaster.

Phase Three picks up where the Mann Gulch disaster leaves off. In that tragedy, both sensemaking and structure collapsed, resulting in untimely deaths. At Texas City, deaths occurred, but the social collective survived. During the third phase, the actual processes through which structure is rebuilt are evident. Although the town had no formal emergency response plans, the townspeople maintained civility with one another. Through emergent processes (Drabek and McEntire 2002), they began rescue and clean-up efforts in order to regain control over the collapsed structure. I previously described this response as a deviation-counteracting mutual causal loop. Indeed, the rebuilding of structure on behalf of the Texas City residents can be likened to a move toward an equilibrium state, in which a semblance of normalcy begins to return. Phase Four reveals the sensemaking efforts of individuals once structure has been restored and the social collective assigns meanings to what it has witnessed.

Implications

This study provides three key contributions to disaster scholarship. First, the model provides a crucial first step in addressing Neal's (1997) call for enhancing theoretical approaches to disaster phases. The present model positions disaster phases as a sociological problem occurring at the community level. With the present model, researcher *and* community determine disaster phases. In fact, it is the community that determines when procession to the next phase occurs through its attempts at sensemaking. Descriptors such as "shock," "confusion," and "apocalypse," for example, would indicate a community in Phase Two. While "organizing," "coordination," and "rebuilding" would signal a community in Phase Three. Neal (1997) further recognizes that "disaster phases overlap" (p. 254) and that we should recognize the interconnectiveness among phases. The phase model presented above highlights that structure and meaning are inextricably linked. What happens to one of these elements affects the other. For example, as structure breaks down, so does sensemaking. As mentioned in the discussion of Phase Two, Neal endorses the use of social rather than objective time for disaster analysis. He argues that disaster events "force us back to social time" (p. 255). The proposed model

likewise relies on social time and utilizes those points where society, or a segment of it, is rebuilding structure, or assigning meaning, as delineation points.

Second, the model provides a continuation and a test of Weick's (1993) meaning-framework concept as it applies to a social collective. Weick suggested that according to writings of structuration theory (e.g. Ranson, Hinings, and Greenwood 1980) structure and meaning can be tied together in such a direct way that a breakdown in one of the two results in a deviation-amplifying causal loop. Therefore, when either of the two elements breaks down, the other element breaks down as well. A snowball effect results as structure and meaning, which again are linked, amplify out of control simultaneously. Weick proposed that an inverse relationship between structure and meaning could enable organizations facing a breakdown in either element to regain control over a crisis situation. Consequently, when meaning dissolves, organizational members should pay more attention to internal social ties in order to reaffirm structure. Once structure has been reestablished, attention can turn to sensemaking. At that point, a 1:1 relationship between meaning and structure can continue, such that structure has been reconstituted at the same time as sensemaking.

Additionally, results of this study suggest that social collectives can indeed organize in such a way as to demonstrate the inverse relationship between structure and meaning. This occurred during Phases Two and Three. After the initial explosion, the social collective was in disarray, struggling to assign meaning to what they were witnessing. Making matters more difficult was their lack of pre-crisis preparation, which resulted in a total collapse of structure within the town. Rather than continuing to assign meaning while simultaneously attempting to rebuild structure, it appears they turned their attention foremost to organizing themselves and focused the bulk of their efforts on rebuilding structure. Once they organized to the point of recognizing that structure had been reestablished, they were able to turn their attention toward sensemaking. Even under situations of extreme duress, a necessary relationship exists between organizing and sensemaking. These findings support Weick's proposal that inverse relationships between structure and meaning can prove beneficial during a cosmology episode.

Finally, this study demonstrates the power of narrative communication as a data set. Narratives provide rich descriptions of an event that cannot be captured with traditional data collection methods. An event like the Texas City disaster results in such a wide range of emotions, experiences, and perceptions, that an open-ended data collection forum must be utilized. Narratives are especially useful in sensemaking studies as they provide respondents an "open page" on which to describe precisely how they were able to make sense of a disaster or emergency (see also Hoffman 1999).

Acknowledgements

Notes

1. Wheaton (1948) spelled the *Grandcamp* with two words, Stephens with one word. I use the one-word spelling throughout.
2. Smokejumpers are firefighters who specialize in parachuting to fires in remote, mountainous terrains.
3. This study will not attempt to present the residents of Texas City as an organization. Instead, the purpose here is to present the affects of a major disaster on a community, using narratives which could be said to represent the collective memory (Hasian and Frank 1999) of the Texas City community in 1947. Dynes (1998) suggested that a community be used as the unit of analysis for conceptualizing disaster because it is based on a social unit that has cross-national and cross-cultural applicability, and has the capacity and resources

to activate a response to the disaster. The Texas City community fits this conceptualization and did indeed activate a response to the disaster.

4. After analyzing about 50 narratives, each additional narrative added less to the number of categories being developed, which suggested the point of theoretical saturation (Glaser & Strauss, 1967) was being reached. Still, I analyzed 10 more narratives and, although additional examples within categories were identified, no new categories emerged which provided confidence that saturation had occurred.

5. The categories *After-effects, Oddities, First-hand witnesses, Damage, Metaphors, Gratitude for helpers, What outside communities thought, Dream or reality,* and *Descriptors* were not included in the model because they exhibited clear relationships with the other elements.

6. Assessing precisely when "meaning" or "sensemaking" are occurring is difficult. This phenomenon might have occurred as structure was being rebuilt, or years later as survivors recalled their experiences.

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