The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster

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This is a revised version of the Katz- Newcomb lecture presented at the University of Michigan, April 23-24, 1993. The 1993 lecture celebrated the life of Rensis Likert, the founding director of the Institute for Social Relations. All three people honored at the lecture-Dan Katz, Ted Newcomb, and Ren Likert-were born in 1903, which meant this lecture also celebrated their 90th birthdays. I am grateful to Lance Sandelands, Debra Meyerson, Robert Sutton, Doug Cowherd, and Karen Weick for their help in revising early drafts of this material. I also want to thank John Van Maanen, J. Richard Hackman, Linda Pike, and the anonymous ASQ reviewers for their help with later drafts.

The death of 13 men in the Mann Gulch fire disaster, made famous in Norman Maclean's ***Young Men and Fire***, is analyzed as the interactive disintegration of role structure and sensemaking in a minimal organization. Four potential sources of resilience that make groups less vulnerable to disruptions of sensemaking are proposed to forestall disintegration, including improvisation, virtual role systems, the attitude of wisdom, and norms of respectful interaction. The analysis is then embedded in the organizational literature to show that we need to reexamine our thinking about temporary systems, structuration, nondisclosive intimacy, intergroup dynamics, and team building.

The purpose of this article is to reanalyze the Mann Gulch fire disaster in Montana described in Norman Maclean's (1992) award-winning book ***Young Men and Fire*** to illustrate a gap in our current understanding of organizations. l want to focus on two questions: Why do organizations unravel? And how can organizations be made more resilient? Before doing so, however, l want to strip Maclean's elegant prose away from the events in Mann Gulch and simply review them to provide a context for the analysis.

The Incident

As Maclean puts it, at its heart, the Mann Gulch disaster is a story of a race (p. 224). The smokejumpers in the race (excluding foreman "Wag" Wagner Dodge and ranger Jim Harrison) were ages 17-28, unmarried, seven of them were forestry students (p. 27), and 12 of them had seen military service (p. 220). They were a highly select group (p. 27) and often described themselves as professional adventurers (p. 26). A lightning storm passed over the Mann Gulch area at 4 p.m. on August 4, 1949 and is believed to have set a small fire in a dead tree. The next day, August 5, 1949, the temperature was 97 degrees and the fire danger rating was 74 out of a possible 100 (p. 42), which means "explosive potential" (p. 79). When the fire was spotted by a forest ranger, the smokejumpers were dispatched to fight it. Sixteen of them flew out of Missoula, Montana at 2:30 p.m. in a C-47 transport. Wind conditions that day were turbulent, and one smokejumper got sick on the airplane, didn't jump, returned to the base with the plane, and resigned from the smokejumpers as soon as he landed ("his repressions had caught up with him," p. 51). The smokejumpers and their cargo were dropped on the south side of Mann Gulch at 4:10 p.m. from 2000 feet rather than the normal 1200 feet, due to the turbulence (p. 48). The parachute that was connected to their radio failed to open, and

the radio was pulverized when it hit the ground. The crew met ranger Jim Harrison who had been fighting the fire alone for four hours (p. 62), collected their supplies, and ate supper. About 5:10 p.m. (p. 57) they started to move along the south side of the gulch to surround the fire (p. 62). Dodge and Harrison, however, having scouted ahead, were worried that the thick forest near which they had landed might be a "death trap" (p. 64). They told the second in command, William Hellman, to take the crew across to the north side of the gulch and march them toward the river along the side of the hill. While Hellman did this, Dodge and Harrison ate a quick meal. Dodge rejoined the crew at 5:40 p.m. and took his position at the head of the line moving toward the river. He could see flames flapping back and forth on the south slope as he looked to his left (p. 69).

At this point the reader hits the most chilling sentence in the entire book: "Then Dodge saw it!" (p. 70). What he saw was that the fire had crossed the gulch just 200 yards ahead and was moving toward them (p. 70). Dodge turned the crew around and had them angle up the 76-percent hill toward the ridge at the top (p. 175). They were soon moving through bunch grass that was two and a half feet tall and were quickly losing ground to the 30-foot-high flames that were soon moving toward them at 610 feet per minute (p. 274). Dodge yelled at the crew to drop their tools, and then, to everyone's astonishment, he lit a fire in front of them and ordered them to lie down in the area it had burned. No one did, and they all ran for the ridge. Two people, Sallee and Rumsey, made it through a crevice in the ridge unburned, Hellman made it over the ridge burned horribly and died at noon the next day, Dodge lived by lying down in the ashes of his escape fire, and one other person, Joseph Sylvia, lived for a short while and then died. The hands on Harrison's watch melted at 5:56 (p. 90), which has been treated officially as the time the 13 people died.

After the fire passed, Dodge found Sallee and Rumsey, and Rumsey stayed to care for Hellman while Sallee and Dodge hiked out for help. They walked into the Meriwether ranger station at 8:50 p.m. (p. 113), and rescue parties immediately set out to recover the dead and dying. All the dead were found in an area of 100 yards by 300 yards (p. 111). It took 450 men five more days to get the 4,500-acre Mann Gulch fire under control (pp. 24, 33). At the time the crew jumped on the fire, it was classified as a Class C fire, meaning its scope was between 10 and 99 acres.

The Forest Service inquiry held after the fire, judged by many to be inadequate, concluded that "there is no evidence of disregard by those responsible for the jumper crew of the elements of risk which they are expected to take into account in placing jumper crews on fires." The board also felt that the men would have been saved had they "heeded Dodge's efforts to get them to go into the escape fire area with him" (quoted in Maclean, p. 151). Several parents brought suit against the Forest Service, claiming that people should not have been jumped in the first place (p. 149), but these claims were dismissed by the Ninth Circuit U.S. Court of Appeals, where Warren E. Burger argued the Forest Service's case (p. 151).

Since Mann Gulch, there have been no deaths by burning among Forest Service firefighters, and people are now equipped with backup radios (p. 219), better physical conditioning, the tactic of building an escape fire, knowledge that fires in timber west of the Continental Divide burn differently than do fires in grass east of the Divide, and the insistence that crew safety take precedence over fire suppression.

The Methodology

Among the sources of evidence Maclean used to construct this case study were interviews, trace records, archival records, direct observation, personal experience, and mathematical models.

Since Maclean did not begin to gather documents on Mann Gulch until 1976 (p. 156) and did not start to work in earnest on this project until his seventyfourth birthday in 1977, the lapse of almost 28 years since the disaster made interviewing difficult, especially since Dodge had died of Hodgkin's disease five years after the fire (p. 106). Maclean located and interviewed both living witnesses of the blaze, Sallee and Rumsey, and persuaded both to accompany him and Laird Robinson, a guide at the smokejumper base, on a visit back to the site on July 1, 1978. Maclean also knew Dodge's wife and had talked to her informally (p. 40). He attempted to interview relatives of some who lost their lives but found them too distraught 27 years later to be of much help (p. 154). He also attempted to interview (p. 239) a member of the Forest Service inquiry team, A. J. Cramer who, in 1951, had persuaded Sallee, Rumsey, and ranger Robert Jansson to alter their testimony about the timing of key incidents. Cramer was the custodian of seven or eight watches that had been removed from victims (p. 233), only one of which (Harrison's) was released and used as the official time of the disaster (5:56 p.m.). To this day it remains unclear why the Forest Service made such a strong effort to locate the disaster closer to 6:00 p.m. than to 5:30, which was suggested by testimony from Jansson, who was near the river when the fire blew up, and from a recovered watch that read 5:42. Maclean had continuing access to two Forest Service insiders, Bud Moore and Laird Robinson (p. 162). He also interviewed experts on precedents for the escape fire (p. 104) and on the nature of death by fire (p. 213).

The use of trace records, or physical evidence of past behaviors, is illustrated by the location during a 1979 trip to the gulch, of the wooden cross that had been placed in 1949 to mark the spot where Dodge lit his escape fire (p. 206). The year before, 1978, during the trip into the gulch with Sallee and Rumsey, Maclean located the rusty can of potatoes that had been discarded after Hellman drank its salty water through two knife slits Rumsey had made in the can (p. 173). He also located the flat rocks on which Hellman and Sylvia had rested while awaiting rescue, the juniper tree that was just beyond the crevice Sallee and Rumsey squeezed through on the ridge (p. 207), and Henry Thol, Jr.'s flashlight (p. 183). Considering the lapse of time, the destructive forces of nature over 28 years, and the power of a blowup fire to melt and displace everything in its path, discovery of these traces is surprising as well as helpful in reconstructing events.

Archival records are crucial to the development of the case, although the Forest Service made a considerable effort after its inquiry to scatter the documents (p. 153) and to classify most of them "Confidential" (p. 158), perhaps fearing it would be charged with negligence. Records used by Maclean included statistical reports of fire suppression by smokejumpers in Forest Service Region 1 (e.g., p. 24); the report of the Forest Service Board of Review issued shortly after the incident (dated September 29, 1949, which many felt was too soon for the board to do an adequate job); statements made to the board by people such as the C-47 pilot, parents of the dead crew (p. 150), and the spotter on the aircraft (p. 42); court reports of litigation brought by parents of smokejumpers against the Forest Service; photographs, virtually all of which were retrieved for him by women in the Forest Service who were eager to help him tell the story (p. 160); early records of the smokejumpers organization, which was nine years old at the time of the disaster; reports of the 1957 task force on crew safety (p. 221); and contemporary reports of the disaster in the media, such as the report in the August 22, 1949 issue of ***Life*** magazine.

Direct observation occurred during Maclean's three visits to Mann Gulch in 1976, 1977, and 1978 (p. 189), trips made much more difficult because of the inaccessibility of the area (pp. 191- 192). The most important of these three visits is the trip to the gulch with Sallee and Rumsey, during which the latter pair reenacted what they did and what they saw intermittently through the dense smoke. When their accounts were matched against subsequent hard data (e.g., their estimation of where Dodge lit his escape fire compared against discovery of the actual cross planted in 1949 to mark the spot), it was found that their reconstruction of events prior to the time they made it to safety through the crevice is less accurate than their memory for events and locations after they made it to safety. This suggests to Maclean that "we don't remember as exactly the desperate moments when our lives are in the balance as we remember the moments after, when the balance has tipped in our favor" (p. 212). Direct observation also occurred when Maclean and Robinson themselves hiked the steep slopes of Mann Gulch under summer conditions of heat and slippery, tall grass that resembled the conditions present in the disaster of 1949. The two men repeatedly compared photos and maps from 1949 with physical outcroppings in front of them to see more clearly what they were looking at (e.g., photos misrepresent the steepness of the slope, p. 175). There were also informal experiments, as when Rod Norum, an athlete and specialist on fire behavior, retraced Dodge's route from the point at which he rejoined the crew, moved as fast as possible over the route Dodge covered, and was unable to reach the grave markers as fast as the crew did (p. 67). During these trips, Maclean took special note of prevailing winds by observing their effect on the direction in which rotted timber fell. These observations were used to build a theory of how wind currents in the gulch could have produced the blowup (p. 133).

Personal experience was part of the case because, in 1949, Maclean had visited the Mann Gulch fire while it was still burning (p. 1). Maclean also was a Forest Service firefighter (not a smokejumper) at age 15 and nearly lost his life in the Fish Creek fire, a fire much like the one in Mann Gulch (p. 4). Maclean also reports using his practical experience as a woodsman to suggest initial hypotheses regarding what happened at Mann Gulch (e.g., he infers wind patterns in the gulch from observations of unusual wave action in the adjacent Missouri River, p. 131).

Having collected data using the above sources, but still feeling gaps in his understanding of precisely how the race between fire and men unfolded, Maclean taught himself mathematics and turned to mathematical modeling. He worked with two mathematicians, Frank Albini and Richard Rothermel, who had built mathematical models of how fires spread. The group ran the predictive models in reverse to see what the fire in Mann Gulch must have been like to generate the reports on its progress that were found in interviews, reports, and actual measurements. It is the combination of output from the model and subjective reports that provide the revealing time line of the final 16 minutes (pp. 267-277).

If these several sources of evidence are combined and assessed for the adequacy with which they address "sources of invalidity," it will be found that they combat 12 of the 15 sources listed by Runkel and McGrath (1972: 191) and are only "moderately vulnerable" to the other three. Of course, an experienced woodsman and storyteller who has "always tried to be accurate with facts" (p. 259) would expect that. The rest of us in organizational studies may be pardoned, however, if we find those numbers a good reason to take these data seriously.

Cosmology Episodes in Mann Gulch

Early in the book (p. 65), Maclean asks the question on which I want to focus: "what the structure of a small outfit should be when its business is to meet sudden danger and prevent disaster." This question is timely because the work of organizations is increasingly done in small temporary outfits in which the stakes are high and where foul-ups can have serious consequences (Heydebrand, 1989; Ancona and Caldwell, 1992). Thus, if we understand what happened at Mann Gulch, we may be able to learn some valuable lessons in how to conceptualize and cope with contemporary organizations.

Let me first be clear about why I think the crew of smokejumpers at Mann Gulch was an organization. First, they have a series of interlocking routines, which is crucial in Westley's (1990: 339) definition of an organization as "a series of interlocking routines, habituated action patterns that bring the same people together around the same activities in the same time and places." The crew at Mann Gulch have routine, habituated action patterns, they come together from a common pool of people, and while this set of individual smokejumpers had not come together at the same places or times, they did come together around the same episodes of fire. Westley's definition suggests it doesn't take much to qualify as an organization. The other side is, it also may not take much to stop being one.

Second, the Mann Gulch crew fits the five criteria for a simple organizational structure proposed by Mintzberg (1983: 158). These five include coordination by direct supervision, strategy planned at the top, little formalized behavior, organic structure, and the person in charge tending to formulate plans intuitively, meaning that the plans are generally a direct "extension of his own personality." Structures like this are found most often in entrepreneurial firms.

And third, the Mann Gulch crew has "generic subjectivity" (Wiley, 1988), meaning that roles and rules exist that enable individuals to be interchanged with little disruption to the ongoing pattern of interaction. In the crew at Mann Gulch there were at least three roles: leader, second in command, and crewmember. The person in the lead sizes up the situation, makes decisions, yells orders, picks trails, sets the pace, and identifies escape routes (pp. 65-66). The second in command brings up the rear of the crew as it hikes, repeats orders, sees that the orders are understood, helps the individuals coordinate their actions, and tends to be closer to the crew and more of a buddy with them than does the leader. And finally, the crew clears a fire line around the fire, cleans up after the fire, and maintains trails. Thus, the crew at Mann Gulch is an organization by virtue of a role structure of interlocking routines.

I want to argue that the tragedy at Mann Gulch alerts us to an unsuspected source of vulnerability in organizations. Minimal organizations, such as we find in the crew at Mann Gulch, are susceptible to sudden losses of meaning, which have been variously described as fundamental surprises (Reason, 1990) or events that are inconceivable (Lanir, 1989), hidden (Westrum, 1982), or incomprehensible (Perrow, 1984). Each of these labels points to the low probability that the event could occur, which is why it is meaningless. But these explanations say less about the astonishment of the perceiver and even less about the perceiver's inability to rebuild some sense of what is happening.

To shift the analytic focus in implausible events from probabilities to feelings and social construction, l have borrowed the term "cosmology" from philosophy and stretched it. Cosmology refers to a branch of philosophy often subsumed under metaphysics that combines rational speculation and scientific evidence to understand the universe as a totality of phenomena.

Cosmology is the ultimate macro perspective, directed at issues of time, space, change, and contingency as they relate to the origin and structure of the universe. Integrations of these issues, however, are not just the handiwork of philosophers. Others also make their peace with these issues, as reflected in what they take for granted. People, including those who are smokejumpers, act as if events cohere in time and space and that change unfolds in an orderly manner. These everyday cosmologies are subject to disruption. And when they are severely disrupted, I call this a cosmology episode (Weick, 1985: 51-52). A cosmology episode occurs when people suddenly and deeply feel that the universe is no longer a rational, orderly system. What makes such an episode so shattering is that both the sense of what is occurring and the means to rebuild that sense collapse together.

Stated more informally, a cosmology episode feels like vu jàdé-the opposite of déjà vu: I've never been here before, I have no idea where I am, and I have no idea who can help me. This is what the smokejumpers may have felt increasingly as the afternoon wore on and they lost what little organization structure they had to start with. As they lost structure they became more anxious and found it harder to make sense of what was happening, until they finally were unable to make any sense whatsoever of the one thing that would have saved their lives, an escape fire. The disaster at Mann Gulch was produced by the interrelated collapse of sensemaking and structure. If we can understand this collapse, we may be able to forestall similar disasters in other organizations.

Sensemaking in Mann Gulch

Although most organizational analyses begin and end with decision making, there is growing dissatisfaction with this orthodoxy. Reed (1991) showed how far the concept of decision making has been stretched, singling out the patching that James G. March has done in recent discussions of decision making. March (1989: 14) wrote that "decision making is a highly contextual, sacred activity, surrounded by myth and ritual, and as much concerned with the interpretive order as with the specifics of particular choices." Reed (1991: 561) summarized March this way: "decision making preferences are often inconsistent, unstable, and externally driven; the linkages between decisions and actions are loosely-coupled and interactive rather than linear; the past is notoriously unreliable as a guide to the present or the future; and…political and symbolic considerations play a central, perhaps overriding, role in decision making." Reed wondered aloud whether, if March is right in these descriptions, decision making should continue to set the agenda for organizational studies. At some point a retreat from classic principles becomes a rout.

There have been at least three distinct responses to these problems. First, there has been a shift, reminiscent of Neisser and Winograd's (1988) work on memory, toward examining naturalistic decision making (Orasanu and Connolly, 1993), with more attention to situational assessment and sensemaking (Klein, 1993). Second, people have replaced an interest in decision making with an interest in power, noting, for example, that "power is most strategically deployed in the design and implementation of paradigmatic frameworks within which the very meaning of such actions as 'making decisions' is defined" (Brown, 1978: 376). And third, people are replacing the less appropriate normative models of rationality (e.g., Hirsch, Michaels, and Friedman, 1987) based on asocial "economic man" (Beach and Lipshitz, 1993) with more appropriate models of rationality that are more sophisticated about social relations, such as the model of contextual rationality (White, 1988).

Reed (1991) described contextual rationality as action motivated to create and maintain institutions and traditions that express some conception of right behavior and a good life with others. Contextual rationality is sensitive to the fact that social actors need to create and maintain intersubjectively binding normative structures that sustain and enrich their relationships. Thus, organizations become important because they can provide meaning and order in the face of environments that impose illdefined, contradictory demands.

One way to shift the focus from decision making to meaning is to look more closely at sensemaking in organizations. The basic idea of sensemaking is that reality is an ongoing accomplishment that emerges from efforts to create order and make retrospective sense of what occurs. Recognition-primed decision making, a model based in part on command decisions made by firefighters, has features of sensemaking in its reliance on past experience, although it remains grounded in decision making (Klein, 1993). Sensemaking emphasizes that people try to make things rationally accountable to themselves and others. Thus, in the words of Morgan, Frost, and Pondy (1983: 24), "individuals are not seen as living in, and acting out their lives in relation to, a wider reality, so much as creating and sustaining images of a wider reality, in part to rationalize what they are doing. They realize their reality, by reading into their situation patterns of significant meaning."

When the smokejumpers landed at Mann Gulch, they expected to find what they had come to call a 10:00 fire. A 10:00 fire is one that can be surrounded completely and isolated by 10:00 the next morning. The spotters on the aircraft that carried the smokejumpers "figured the crew would have it under control by 10:00 the next morning" (Maclean, p. 43). People rationalized this image until it was too late. And because they did, less and less of what they saw made sense:

1. The crew expects a 10:00 fire but grows uneasy when this fire does not act like one.

2. Crewmembers wonder how this fire can be all that serious if Dodge and Harrison eat supper while they hike toward the river.

3. People are often unclear who is in charge of the crew (p. 65).

4. The flames on the south side of the gulch look intense, yet one of the smokejumpers, David Navon is taking pictures, so people conclude the fire can't be that serious, even though their senses tell them otherwise.

5. Crewmembers know they are moving toward the river where they will be safe from the fire, only to see Dodge inexplicably turn them around, away from the river, and start angling upslope, but not running straight for the top. Why? (Dodge is the only one who sees the fire jump the gulch ahead of them.)

6. As the fire gains on them, Dodge says, "Drop your tools," but if the people in the crew do that, then who are they? Firefighters? With no tools?

7. The foreman lights a fire that seems to be right in the middle of the only escape route people can see.

8. The foreman points to the fire he has started and yells, "Join me," whatever that means. But his second in command sounds like he's saying, "To hell with that, I'm getting out of here" (p. 95).

9. Each individual faces the dilemma, l must be my own boss yet follow orders unhesitatingly, but I can't comprehend what the orders mean, and I'm losing my race with the advancing fire (pp. 219-220).

As Mann Gulch loses its resemblance to a 10:00 fire, it does so in ways that make it increasingly hard to socially construct reality. When the noise created by wind, flames, and exploding trees is deafening; when people are strung out in a line and relative strangers to begin with; when they are people who, in Maclean's words, "love the universe but are not intimidated by it" (p. 28); and when the temperature is approaching a lethal 140 degrees (p. 220), people can neither validate their impressions with a trusted neighbor nor pay close attention to a boss who is also unknown and whose commands make no sense whatsoever. As if these were not obstacles enough, it is hard to make common sense when each person sees something different or nothing at all because of the smoke.

The crew's stubborn belief that it faced a 10:00 fire is a powerful reminder that positive illusions (Taylor, 1989) can kill people. But the more general point is that organizations can be good at decision making and still falter. They falter because of deficient sensemaking. The world of decision making is about strategic rationality. It is built from clear questions and clear answers that attempt to remove ignorance (Daft and Macintosh, 1981). The world of sensemaking is different. Sensemaking is about contextual rationality. It is built out of vague questions, muddy answers, and negotiated agreements that attempt to reduce confusion. People in Mann Gulch did not face questions like where should we go, when do we take a stand, or what should our strategy be? Instead, they faced the more basic, the more frightening feeling that their old labels were no longer working. They were outstripping their past experience and were not sure either what was up or who they were. Until they develop some sense of issues like this, there is nothing to decide.

Role Structure in Mann Gulch

Sensemaking was not the only problem in Mann Gulch. There were also problems of structure. It seems plausible to argue that a major contributor to this disaster was the loss of the only structure that kept these people organized, their role system. There were two key events that destroyed the organization that tied these people together. First, when Dodge told Hellman to take the crew to the north side of the gulch and have it follow a contour down toward the river, the crew got confused, the spaces between members widened appreciably, and Navon-the person taking pictures (p. 71)-made a bid to take over the leadership of the group (p. 65). Notice what this does to the role system. There is now no one at the end of the line repeating orders as a check on the accuracy with which they are understood. Furthermore, the person who is leading them, Hellman, is more familiar with implementing orders than with constructing them or plotting possible escape routes. So the crew is left for a crucial period of time with ill-structured, unacknowledged orders shouted by someone who is unaccustomed to being firm or noticing escape routes. Both routines and interlocking are beginning to come apart. The second, and in some way more unsettling threat to the role system

occurred when Dodge told the retreating crew "throw away your tools!" (p. 226). A fire crew that retreats from a fire should find its identity and morale strained. If the retreating people are then also told to discard the very things that are their reason for being there in the first place, then the moment quickly turns existential. If I am no longer a firefighter, then who am l? With the fire bearing down, the only possible answer becomes, An endangered person in a world where it is every man for himself. Thus, people who, in Maclean's words, had perpetually been almost their own boss (p. 218) suddenly became completely their own boss at the worst possible moment. As the entity of a crew dissolved, it is not surprising that the final command from the "crew" leader to jump into an escape fire was heard not as a legitimate order but as the ravings of someone who had "gone nuts" (p. 75). Dodge's command lost its basis of legitimacy when the smokejumpers threw away their organization along with their tools.

Panic In Mann Gulch

With these observations as background, we can now look more closely at the process of a cosmology episode, an interlude in which the orderliness of the universe is called into question because both understanding and procedures for sensemaking collapse together. People stop thinking and panic. What is interesting about this collapse is that it was discussed by Freud (1959: 28) in the context of panic in military groups: "A panic arises if a group of that kind [military group] becomes disintegrated. Its characteristics are that none of the orders given by superiors are any longer listened to, and that each individual is only solicitous on his own account, and without any consideration for the rest. The mutual ties have ceased to exist, and a gigantic and senseless fear is set free." Unlike earlier formulations, such as McDougall's (1920), which had argued that panic leads to group disintegration, Freud, reversing this causality, argued that group disintegration precipitates panic. By group disintegration, Freud meant "the cessation of all the feelings of consideration which the members of the group otherwise show one another" (p. 29). He described the mechanism involved this way: "If an individual in panic fear begins to be solicitous only on his own account, he bears witness in so doing to the fact that the emotional ties, which have hitherto made the danger seem small to him, have ceased to exist. Now that he is by himself in facing the danger, he may surely think it greater."

It is certainly true in Mann Gulch that there is a real, palpable danger that can be seen, felt, heard, and smelled by the smokejumpers. But this is not the first time they have confronted danger. It may, however, be the first time they have confronted danger as a member of a disintegrating organization. As the crew moved toward the river and became more spread out, individuals were isolated and left without explanations or emotional support for their reactions. As the ties weakened, the sense of danger increased, and the means to cope became more primitive. The world rapidly shifted from a cosmos to chaos as it became emptied of order and rationality.

It is intriguing that the three people who survived the disaster did so in ways that seem to forestall group disintegration. Sallee and Rumsey stuck together, their small group of two people did not disintegrate, which helped them keep their fear under control. As a result, they escaped through a crack in the ridge that the others either didn't see or thought was too small to squeeze through. Wag Dodge, as the formal leader of a group he presumed still existed, ordered his followers to join him in the escape fire. Dodge continued to see a group and to think about its well-being, which helped keep his own fear under control. The rest of the people, however, took less notice of one another.

Consequently, the group, as they knew it, disintegrated. As their group disintegrated, the smokejumpers became more frightened, stopped thinking sooner, pulled apart even more, and in doing so, lost a leader-follower relationship as well as access to the novel ideas of other people who are a lot like them. As these relationships disappeared, individuals reverted to primitive tendencies of flight. Unfortunately, this response was too simple to match the complexity of the Mann Gulch fire.

What holds organization in place may be more tenuous than we realize. The recipe for disorganization in Mann Gulch is not all that rare in everyday life. The recipe reads, Thrust people into unfamiliar roles, leave some key roles unfilled, make the task more ambiguous, discredit the role system, and make all of these changes in a context in which small events can combine into something monstrous. Faced with similar conditions, organizations that seem much sturdier may also come crashing down (Miller, 1990; Miles and Snow, 1992), much like Icarus who overreached his competence as he flew toward the sun and also perished because of fire.

From Vulnerability to Resilience

The steady erosion of sense and structure reached its climax in the refusal of the crew to escape one fire by walking into another one that was intentionally set. A closer look at that escape fire allows us to move from a discussion of what went wrong at Mann Gulch, to a discussion of what makes organizations more resilient. l want to discuss four sources of resilience: (1) improvisation and bricolage, (2) virtual role systems, (3) the attitude of wisdom, and (4) respectful interaction.

Improvisation and Bricolage

The escape fire is a good place to start in the search for sources of resilience simply because it is clear evidence that, minimal though the organization of the crew might have been, there still was a solution to the crisis inside the group. The problem was, no one but Dodge recognized this. The question then becomes, How could more people either see this escape fire as a solution or develop their own solution? This is not an easy question to answer because, from everything we know, Dodge's invention of burning a hole in a fire should not have happened. It should not have happened because there is good evidence that when people are put under pressure, they regress to their most habituated ways of responding (e.g., Barthol and Ku, 1959). This is what we see in the 15 people who reject Dodge's order to join him and who resort instead to flight, a more overlearned tendency. What we do not expect under lifethreatening pressure is creativity.

The tactic of lighting a fire to create an area where people can escape a major prairie fire is mentioned in James Fenimore Cooper's 1827 novel ***The Prairie***, but there is no evidence Dodge knew this source (Maclean, p. 104). Furthermore, most of Dodge's experience had been in timbered country where such a tactic wouldn't work. In timber, an escape fire is too slow and consumes too much oxygen (p. 105). And the fire that Dodge built did not burn long enough to clear an area in which people could move around and dodge the fire as they did in the prairie fire. There was just room enough to lie down in the ashes where the heat was less intense (p. 104).

While no one can say how or why the escape fire was created, there is a line of argument that is consistent with what we know. Bruner (1983: 183) described creativity as "figuring out how to use what you already know in order to go beyond what you currently think." With this as background, it

now becomes relevant that Dodge was an experienced woodsman, with lots of hands-on experience. He was what we now would call a bricoleur, someone able to create order out of whatever materials were at hand (e.g., Levi-Strauss, 1966; Harper, 1987). Dodge would have known at least two things about fires. He would have known the famous fire triangle- you must have oxygen, flammable material, and temperature above the point of ignition to create a fire (Maclean, p. 35). A shortage of any one of these would prevent a fire. In his case, the escape fire removed flammable material. And since Dodge had been with the Forest Service longer than anyone else on the crew, he would also have known more fully their four guidelines at that time for dealing with fire emergencies (p. 100). These included (1) start a backfire if you can, (2) get to the top of a ridge where the fuel is thinner, (3) turn into the fire and try to work through it, and (4) don't allow the fire to pick the spot where it hits you. Dodge's invention, if we stretch a bit, fits all four. It is a backfire, though not in the conventional sense of a fire built to stop a fire. The escape fire is lit near the top of a ridge, Dodge turns into the main fire and works through it by burning a hole in it, and he chooses where the fire hits him. The 15 who tried to outrun the fire moved toward the ridge but by not facing the fire, they allowed it to pick the spot where it hit them.

The collapse of role systems need not result in disaster if people develop skills in improvisation and bricolage (see Janowitz, 1959: 481). Bricoleurs remain creative under pressure, precisely because they routinely act in chaotic conditions and pull order out of them. Thus, when situations unravel, this is simply normal, natural trouble for bricoleurs, and they proceed with whatever materials are at hand. Knowing these materials intimately, they then are able, usually in the company of other similarly skilled people, to form the materials or insights into novel combinations.

While improvised fire fighting may sound improbable, in fact, Park Service firefighters like those stationed at the Grand Canyon approximate just such a style. Stephen Pyne (1989), a Park Service firefighter, observed that people like him typically have discretion to dispatch themselves, which is unfathomable to the Forest Service crews that rely on dispatchers, specialization, regimentation, rules, and a conscious preference for the strength of the whole rather than the versatility and resourcefulness of the parts. Forest Service people marvel at the freedom of movement among the Park people. Park Service people marvel at how much power the Forest Service is able to mobilize on a fire. Pyne (1989: 122) described the Park Service fire operations as a nonstandard "eclectic assembly of compromises" built of discretion and mobility. In contrast to the Forest Service, where people do everything by the book, "The Park Service has no books; it puts a premium on the individual. Its collective behavior is tribal, and it protects its permanent ranks." If improvisation were given more attention in the job description of a crew person, that person's receptiveness to and generation of role improvisations might be enhanced. As a result, when one organizational order collapses, a substitute might be invented immediately. Swift replacement of a traditional order with an improvised order would forestall the paralysis that can follow a command to "drop your tools."

Virtual Role Systems

Social construction of reality is next to impossible amidst the chaos of a fire, unless social construction takes place inside one person's head, where the role system is reconstituted and run. Even though the role system at Mann Gulch collapsed, this kind of collapse need not result in disaster if the system remains intact in the individual's mind. If each individual in the crew mentally takes all roles and therefore can then register escape routes and acknowledge commands and

facilitate coordination, then each person literally becomes a group (Schutz, 1961). And, in the manner of a holograph, each person can reconstitute the group and assume whatever role is vacated, pick up the activities, and run a credible version of the role. Furthermore, people can run the group in their head and use it for continued guidance of their own individual action.

It makes just as much sense to talk about a virtual role system as it does to talk about a virtual anything else (e.g., Bruner, 1986: 36-37). An organization can continue to function in the imagination long after it has ceased to function in tangible distributed activities. For the Mann Gulch fire, this issue has bearing on the question of escape routes. In our research on accidents in flight operations off nuclear carriers (Weick and Roberts, 1993), Karlene Roberts and I found that people who avoid accidents live by the credo, "never get into anything without making sure you have a way out." At the very last moment in the Mann Gulch tragedy, Dodge discovered a way out. The point is that if other people had been able to simulate Dodge and/or his role in their imagination, they too might have been less puzzled by his solution or better able to invent a different sensible solution for themselves.

The Attitude of Wisdom

To understand the role of wisdom (Bigelow, 1992) as a source of resilience, we need to return to the crew's belief that all fires are 10:00 fires. This belief was consistent with members' experience. As Maclean put it, if the major purpose of your group is to "put out fires so fast they don't have time to become big ones" (p. 31), then you won't learn much about fighting big fires. Nor will you learn what Maclean calls the first principle of reality: "little things suddenly and literally can become big as hell, the ordinary can suddenly become monstrous, and the upgulch breezes can suddenly turn to murder" (p. 217). To state the point more generally, what most organizations miss, and what explains why most organizations fail to learn (Scott, 1987: 282), is that "Reality backs up while it is approached by the subject who tries to understand it. Ignorance and knowledge grow together" (Meacham, 1983: 130). To put it a different way, "Each new domain of knowledge appears simple from the distance of ignorance. The more we learn about a particular domain, the greater the number of uncertainties, doubts, questions and complexities. Each bit of knowledge serves as the thesis from which additional questions or antithesis arise" (Meacham, 1983: 120).

The role system best able to accept the reality that ignorance and knowledge grow together may be one in which the organizational culture values wisdom. Meacham (1983: 187) argued that wisdom is an attitude rather than a skill or a body of information:

To be wise is not to know particular facts but to know without excessive confidence or excessive cautiousness. Wisdom is thus not a belief, a value, a set of facts, a corpus of knowledge or information in some specialized area, or a set of special abilities or skills. Wisdom is an attitude taken by persons toward the beliefs, values, knowledge, information, abilities, and skills that are held, a tendency to doubt that these are necessarily true or valid and to doubt that they are an exhaustive set of those things that could be known.

In a fluid world, wise people know that they don't fully understand what is happening right now, because they have never seen precisely this event before. Extreme confidence and extreme caution both can destroy what organizations most need in changing times, namely, curiosity, openness, and

complex sensing. The overconfident shun curiosity because they feel they know most of what there is to know. The overcautious shun curiosity for fear it will only deepen their uncertainties. Both the cautious and the confident are closed-minded, which means neither makes good judgments. It is this sense in which wisdom, which avoids extremes, improves adaptability.

A good example of wisdom in groups is the Naskapi Indians' use of caribou shoulder bones to locate game (Weick, 1979). They hold bones over a fire until they crack and then hunt in the directions to which the cracks point. This ritual is effective because the decision is not influenced by the outcomes of past hunts, which means the stock of animals is not depleted. More important, the final decision is not influenced by the inevitable patterning in human choice, which enables hunted animals to become sensitized to humans and take evasive action. The wisdom inherent in this practice derives from its ambivalence toward the past. Any attempt to hunt for caribou is both a new experience and an old experience. It is new in the sense that time has elapsed, the composition of the hunter band has changed, the caribou have learned new things, and so forth. But the hunt is also old in the sense that if you've seen one hunt, you've seen them all: There are always hunters, weapons, stealth, decoys, tracks, odors, and winds. The practice of divination incorporates the attitude of wisdom because past experience is discounted when a new set of cracks forms a crude map for the hunt. But past experience is also given some weight, because a seasoned hunter "reads" the cracks and injects some of his own past experience into an interpretation of what the cracks mean. The reader is crucial. If the reader's hunches dominate, randomization is lost. If the cracks dominate, then the experience base is discarded. The cracks are a lot like the four guidelines for fire emergencies that Dodge may have relied on when he invented the escape fire. They embody experience, but they invite doubt, reassembly, and shaping to fit novelties in the present.

Respectful Interaction

The final suggestion about how to counteract vulnerability makes explicit the preceding focus on the individual and social interaction. Respectful interaction depends on intersubjectivity (Wiley, 1988: 258), which has two defining characteristics: (1) intersubjectivity emerges from the interchange and synthesis of meanings among two or more communicating selves, and (2) the self or subject gets transformed during interaction such that a joint or merged subjectivity develops. It is possible that many role systems do not change fast enough to keep up with a rapidly changing environment. The only form that can keep up is one based on faceto- face interaction. And it is here, rather than in routines, that we are best able to see the core of organizing. This may be why interaction in airline cockpit crews, such as discussed by Foushee (1984), strikes us so often as a plausible microcosm of what happens in much larger systems. In a cockpit under crisis, the only unit that makes sense (pun intended) is face-to-face synthesis of meaning.

Intersubjectivity was lost on everyone at Mann Gulch, everyone, that is, but Sallee and Rumsey. They stuck together and lived. Dodge went his own individual way with a burst of improvisation, and he too lived. Perhaps it's more important that you have a partner than an organization when you fight fires. A partner makes social construction easier. A partner is a second source of ideas. A partner strengthens independent judgment in the face of a majority. And a partner enlarges the pool of data that are considered. Partnerships that endure are likely to be those that adhere to Campbell's three imperatives for social life, based on a reanalysis of Asch's (1952) conformity experiment: (1) Respect the reports of others and be willing to base beliefs and actions on them (trust); (2) Report

honestly so that others may use your observations in coming to valid beliefs (honesty); and, (3) Respect your own perceptions and beliefs and seek to integrate them with the reports of others without deprecating them or yourselves (self-respect) (adapted from Campbell, 1990: 45-46).

Earlier I noted a growing interest in contextual rationality, understood as actions that create and maintain institutions and traditions that express some conception of right behavior and a good life with others (Reed, 1991). Campbell's maxims operationalize this good life with others as trust, honesty, and self-respect in moment-to-moment interaction. This triangle of trust, honesty, and self-respect is conspicuously missing (e.g., King, 1989: 46-48) in several well-documented disasters in which faulty interaction processes led to increased fear, diminished communication, and death. For example, in the Tenerife air disaster (Weick, 1990), the copilot of the KLM aircraft had a strong hunch that another 747 airplane was on the takeoff runway directly in front of them when his own captain began takeoff without clearance. But the copilot said nothing about either the suspicions or the illegal departure. Transient cockpit crews, tied together by narrow definitions of formal responsibilities, and headed by captains who mistakenly assume that their decisionmaking ability is unaffected by increases in stress (Helmreich et al., 1985), have few protections against a sudden loss of meaning such as the preposterous possibility that a captain is taking off without clearance, directly into the path of another 747.

Even when people try to act with honesty, trust, and self respect, if they do so with little social support, their efforts are compromised. For example, linguists who analyzed the conversations at Tenerife and in the crash of Air Florida flight 90 in Washington concluded that the copilots in both cases used "devices of mitigation" to soften the effects of their requests and suggestions:

A mitigated instruction might be phrased as a question or hedged with qualifications such as "would" or "could." …(I)t was found that the speech of subordinate crew members was much more likely to be mitigated than the speech of captains. It was also found that topics introduced in mitigated speech were less likely to be followed-up by other crew members and less likely to be ratified by the captain. Both of these effects relate directly to the situation in which a subordinate crew member makes a correct solution that is ignored… The value of training in unmitigated speech is strongly suggested by these results. (O'Hare and Roscoe, 1990: 219)

If a role system collapses among people for whom trust, honesty, and self-respect are underdeveloped, then they are on their own. And fear often swamps their resourcefulness. If, however, a role system collapses among people where trust, honesty, and self-respect are more fully developed, then new options, such as mutual adaptation, blind imitation of creative solutions, and trusting compliance, are created. When a formal structure collapses, there is no leader, no roles, no routines, no sense. That is what we may be seeing in Mann Gulch. Dodge can't lead because the role system in which he is a leader disappears. But what is worse, Dodge can't rely on his crew members to trust him, question him, or pay attention to him, because they don't know him and there is no time to change this. The key question is, When formal structure collapses, what, if anything, is left? The answer to that question may well be one of life or death.

Structures For Resilience

While the answer to that question is not a matter of life or death for organizational theorists, they do have an interest in how it comes out. A theorist who hears Maclean's question, "what the structure of a small outfit should be when its business is to meet sudden danger and prevent disaster," might come back with a series of follow-up questions based on thinking in organizational studies. l look briefly at four such questions to link Mann Gulch with other concepts and to suggest how these linkages might guide further research.

First, there is the follow-up question, Is "small" necessarily a key dimension, since this group is also young and transient? Maclean calls the 16-person smokejumper crew "small," except that it is conventional in the group literature to treat any group of more than 10 people as large (Bass, 1990: 604). Because there is so little communication within the crew and because it operates largely through obtrusive controls like rules and supervision (Perrow, 1986), it acts more like a large formal group with mediated communication than a small informal group with direct communication.

It is striking how little communication occurred during the three and a half hours of this episode. There was little discussion during the noisy, bumpy plane ride, and even less as individuals retrieved equipment scattered on the north slope. After a quick meal together, people began hiking toward the river but quickly got separated from one another. Then they were suddenly turned around, told to run for the ridge, and quickly ran out of breath as they scaled the steep south slope. The minimal communication is potentially important because of the growing evidence (e.g., Eisenhardt, 1993: 132) that nonstop talk, both vocal and nonverbal, is a crucial source of coordination in complex systems that are susceptible to catastrophic disasters.

The lack of communication, coupled with the fact that this is a temporary group in the early stages of its history, should heighten the group's vulnerability to disruption. As Bass (1990: 637) put it, "Groups that are unable to interact easily or that do not have the formal or informal structure that enables quick reactions are likely to experience stress (Bass, 1960). Panic ensues when members of a group lack superordinate goals-goals that transcend the self-interests of each participant." While the smokejumpers have the obvious superordinate goal of containing fires, their group ties may not be sufficiently developed for this to be a group goal that overrides self-interest. Or Bass's proposition itself may be incomplete, failing to acknowledge that unless superordinate goals are overlearned, they will be discarded in situations of danger.

Second, there is the follow-up question, Is "structure" what we need to understand in Mann Gulch, or might structuring also be important? By structure, l mean "a complex medium of control which is continually produced and recreated in interaction and yet shapes that interaction: structures are constituted and constitutive…of interpersonal cognitive processes, power dependencies, and contextual constraints" (Ranson, Hinings, and Greenwood, 1980: 1, 3). Structuring, then, consists of two patterns and the relationships between them. The first pattern, which Ranson et al. variously described as informal structure, agency, or social construction, consists of interaction patterns that stabilize meaning by creating shared interpretive schemes. l refer to this pattern as shared provinces of meaning, or meaning. The second pattern, variously described as configuration, contextual constraints, or a vehicle that embodies dominant meanings, refers to a framework of roles, rules, procedures, configured activities, and authority relations that reflect and facilitate meanings. l refer to this second pattern as structural frameworks of constraint, or frameworks.

Meanings affect frameworks, which affect meaning. This is the basic point of the growing body of work on structuration (e.g., Riley, 1983; Poole, Seibold, and McPhee, 1985), understood as the mutual constitution of frameworks and meanings (Ranson, Hinings, and Greenwood, 1980) or relations and typifications (DiMaggio, 1991) or structures and structuring (Barley, 1986). Missing in this work is attention to reversals of structuration (Giddens, 1984). The use of descriptive words in structuration theory such as "continually produced," "recreated in interaction," "constituted," and "constitutive" directs attention away from losses of frameworks and losses of meaning. For example, Ranson, Hinings, and Greenwood (1980: 5) asserted that the "deep structure of schema which are taken for granted by members enables them to recognize, interpret, and negotiate even strange and unanticipated situations, and thus continuously to create and reenact the sense and meaning of structural forms during the course of interaction." The Mann Gulch disaster is a case in which people were unable to negotiate strangeness. Frameworks and meanings destroyed rather than constructed one another.

This fugitive quality of meaning and frameworks in Mann Gulch suggests that the process of structuring itself may be more unstable than we realized. Structuring, understood as constitutive relations between meaning and frameworks, may be a deviation-amplifying cause loop (Maruyama, 1963; Weick, 1979) capable of intensifying either an increase or decrease in either of the two connected elements. Typically, we see instances of increase in which more shared meanings lead to less elaborate frameworks of roles, which lead to further developments of shared meaning, etc. What we fail to realize is that, when elements are tied together in this direct manner, once one of them declines, this decline can also spread and become amplified as it does so. Fewer shared meanings lead to less elaborate frameworks, less meaning, less elaborate frameworks, and so on. Processes that mutually constitute also have the capability to mutually destroy one another.

If structuration is treated as a deviationamplifying process, then this suggests the kind of structure that could have prevented the Mann Gulch disaster. What people needed was a structure in which there was both an inverse and a direct relationship between role systems and meaning. This is the only pattern that can maintain resilience in the face of crisis. The resilience can take one of two forms. Assume that we start with an amplifying system like the one in Mann Gulch. The role system lost its structure, which led to a loss of meaning, which led to a further loss of structure, and so on. This is the pattern associated with a deviation-amplifying feedback loop in which an initial change unfolds unchecked in the same direction. One way to prevent this amplification is to retain the direct relation between structure and meaning (less role structure leads to less meaning, more structure leads to more meaning) but create an inverse relation between meaning and structure (less meaning, more structure, and vice versa). This inverse relationship can be understood as follows: 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. These actions produce more structure, which then increases meaning, which then decreases the attention directed at structure. Puzzlement intensifies attentiveness to the social, which reduces puzzlement.

The other form of control arises when a change in structure, rather than a change in meaning, is responsible for counteracting the fluctuations in sensibleness. In this variation, less structure leads to more meaning, and more meaning then produces more structure. The inverse relationship between structure and meaning can be understood this way: When social ties deteriorate, people try harder to make their own individual sense of what is happening, both socially and in the world. These

operations increase meaning, and they increase the tendency to reshape structure consistent with heightened meaning. Alienation intensifies attentiveness to meaning, which reduces alienation.

What is common to both of these controlled forms is an alternation between attention to frameworks and attention to meanings. More attention to one leads to more ignorance of the other, followed by efforts to correct this imbalance, which then creates a new imbalance. In the first scenario, when meaning declines, people pay more attention to frameworks, they ignore meaning temporarily, and as social relations become clearer, their attention shifts back to meanings. In the second scenario, when social relations decline, people pay more attention to meaning, they ignore frameworks temporarily, and as meanings become clearer, attention shifts back to frameworks. Both scenarios illustrate operations of wisdom: In Meacham's words, ignorance and knowledge grow together. Either of these two controlled patterns should reduce the likelihood of disaster in Mann Gulch. As the smokejumpers begin to lose structure they either also lose meaning, which alerts them to be more attentive to the structure they are losing, or they gain individual meaning, which leads them to realign structure. The second alternative may be visible in the actions taken by Dodge and Rumsey and Sallee.

This may seem like a great deal of fretting about one single word in Maclean's question, "structure." What I have tried to show is that when we transform this word from a static image into a process, we spot what looks like a potential for collapse in any process of social sensemaking that is tied together by constitutive relations. And we find that social sensemaking may be most stable when it is simultaneously constitutive and destructive, when it is capable of increasing both ignorance and knowledge at the same time. That seems like a fair return for reflecting on a single word.

Third, there is the follow-up question, Is "outfit" the best way to describe the smokejumpers? An outfit is normally defined as "a group associated in an undertaking requiring close cooperation, as a military unit" (Random House, 1987: 1374). The smokejumpers are tied together largely by pooled interdependence, since the job of each one is to clear adjacent portions of a perimeter area around a blaze so that the fire stops for lack of fuel. Individual efforts to clear away debris are pooled and form a fire line. What is significant about pooled interdependence is that it can function without much cohesion (Bass, 1990: 622). And this is what may have trapped the crew. Given the constantly changing composition of the smokejumping crews, the task largely structured their relations. Simply acting in concert was enough, and there was no need to know each other well in addition. This social form resembles what Eisenberg (1990: 160) called nondisclosive intimacy, by which he meant relationships rooted in collective action that stress "coordination of action over the alignment of cognitions, mutual respect over agreement, trust over empathy, diversity over homogeneity, loose over tight coupling, and strategic communication over unrestricted candor." Nondisclosive intimacy is a sufficient ground for relating as long as the task stays constant and the environment remains stable.

What the Mann Gulch disaster suggests is that nondisclosive intimacy may limit the development of emotional ties that keep panic under control in the face of obstacles. Closer ties permit clearer thinking, which enables people to find paths around obstacles. For example, when Rumsey squeezed through a crevice in the ridge just ahead of the fire, he collapsed "half hysterically" into a juniper bush, where he would have soon burned to death. His partner Sallee stopped next to him, looked at him coldly, never said a word, and just stood there until Rumsey roused himself, and the two then

ran together over the ridge and down to a rock slide where they were better able to move around and duck the worst flames (Maclean, p. 107). Sallee's surprisingly nuanced prodding of his partner suggests the power of close ties to moderate panic.

One might expect that the less threatening the environment, the less important are relational issues in transient groups, but as Perrow (1984) emphasized in his normal accident theory, there are few safe environments. If events are increasingly interdependent, then small unrelated flaws can interact to produce something monstrous. Maclean saw this clearly at Mann Gulch: The colossal fire blowup in Mann Gulch was "shaped by little screwups that fitted together tighter and tighter until all became one and the same thing-the fateful blowup. Such is much of tragedy in modern times and probably always has been except that past tragedy refrained from speaking of its association with screwups and blowups" (Maclean, 1992: 92).

Nondisclosive intimacy is not the only alternative to "outfit" as a way to describe the smokejumpers. Smith (1983) argued that individual behaviors, perceptions of reality, identities, and acts of leadership are influenced by intergroup processes. Of special relevance to Mann Gulch is Smith's reanalysis of the many groups that formed among the 16 members of the Uruguayan soccer team who survived for 10 weeks in an inaccessible region of the Chilean Andes mountains after their aircraft, carrying 43 people, crashed (see Read, 1974 for the original account of this event). Aside from the eerie coincidence that both disasters involved 16 young males, Smith's analysis makes the important point that 16 people are not just an outfit, they are a social system within which multiple groups emerge and relate to one another. It is these intergroup relationships that determine what will be seen as acts of leadership and which people may be capable of supplying those acts. In the Andes crash, demands shifted from caring for the wounded, in which two medical students took the lead, to acquiring food and water, where the team captain became leader, to articulating that the group would not be rescued and could sustain life only if people consumed the flesh of the dead, to executing and resymbolizing this survival tactic, to selecting and equipping an expeditionary group to hike out and look for help, and finally to finding someone able to explain and rationalize their decisions to the world once they had been rescued.

What Smith shows is that this group of 16 forms and reforms in many different directions during its history, each time with a different coherent structure of people at the top, middle, and bottom, each with different roles. What also becomes clear is that any attempt to pinpoint the leader or to explain survival by looking at a single set of actions is doomed to failure because it does not reflect how needs change as a crisis unfolds, nor does it reflect how different coherent groupings form to meet the new needs.

The team in the Andes had 10 weeks and changing threats of bleeding, hygiene, starvation, avalanche, expedition, rescue, and accounting, whereas the team in Mann Gulch had more like 10 minutes and the increasingly singular threat of being engulfed in fire. Part of the problem in Mann Gulch is the very inability for intergroup structures to form. The inability to form subgroups within the system may be due to such things as time pressure, the relative unfamiliarity of the smokejumpers with one another compared with the interdependent members of a visible sports team, the inability to communicate, the articulation of a common threat very late in the smokejumpers' exposure to Mann Gulch, and ambiguity about means that would clearly remove the threat,

compared with the relative clarity of the means needed by the soccer players to deal with each of their threats.

The point is, whatever chance the smokejumpers might have had to survive Mann Gulch is not seen as clearly if we view them as a single group rather than as a social system capable of differentiating into many different sets of subgroups. The earlier discussion of virtual role systems suggested that an intergroup perspective could be simulated in the head and that this should heighten resilience. Smith makes it clear that, virtual or not, intergroup dynamics affect survival, even if we overlook them in our efforts to understand the group or the "outfit."

As a fourth and final follow-up question, If there is a structure that enables people to meet sudden danger, who builds and maintains it? A partial answer is Ken Smith's intergroup analysis, suggesting that the needed structure consists of many structures, built and maintained by a shifting configuration of the same people. As I said, this perspective makes sense when time is extended, demands change, and there is no formal leader at the beginning of the episode. But there is a leader in Mann Gulch, the foreman. There is also a second in command and the remaining crew, which means there is a top (foreman), middle (second in command), and bottom (remaining crew). If we take this a priori structure seriously, then the Mann Gulch disaster can be understood as a dramatic failure of leadership, reminiscent of those lapses in leadership increasingly well documented by people who study cockpit/crew resource management in aircraft accidents (e.g., Wiener, Kanki, and Helmreich, 1993).

The captain of an aircrew, who is analogous to a player-coach on a basketball team (Hackman, 1993: 55) can often have his or her greatest impact on team functioning before people get into a tight, time-critical situation. Ginnett (1993) has shown that aircraft captains identified by check airmen as excellent team leaders spent more time team building when the team first formed than did leaders judged as less expert. Leaders of highly effective teams briefed their crewmembers on four issues: the task, crew boundaries, standards and expected behaviors (norms), and authority dynamics. Captains spent most time on those of the four that were not predefined by the organizational context within which the crew worked. Typically, this meant that excellent captains did not spend much time on routine tasks, but less-excellent captains did. Crew boundaries were enlarged and made more permeable by excellent captains when, for example, they regarded the flight attendants, gate personnel, and air traffic controllers as members of the total flight crew. This contrasts with less-excellent captains, who drew a boundary around the people in the cockpit and separated them from everyone else.

Excellent captains modeled norms that made it clear that safety, effective communication, and cooperation were expected from everyone. Of special interest, because so little communication occurred at Mann Gulch, is how the norm, "communication is important," was expressed. Excellent crews expect one another to enact any of these four exchanges: "(1) I need to talk to you; (2) l listen to you; (3) I need you to talk to me; or even (4) I expect you to talk to me" (Ginnett, 1993: 88). These four complement and operationalize the spirit of Campbell's social imperatives of trust, honesty, and self-respect. But they also show the importance of inquiry, advocacy, and assertion when people do not understand the reasons why other people are doing something or ignoring something (Helmreich and Foushee, 1993: 21).

Issues of authority are handled differently by excellent captains. They shift their behaviors between complete democracy and complete autocracy during the briefing and thereafter, which makes it clear that they are capable of a range of styles. They establish competence and their capability to assume legitimate authority by doing the briefing in a rational manner, comfortably, with appropriate technical language, all of which suggests that they have given some thought to the upcoming flight and have constructed a framework within which the crew will work.

Less autocratic than this enactment of their legitimate authority is their willingness to disavow perfection. A good example of a statement that tells crewmembers they too must take responsibility for one another is this: "I just want you guys to understand that they assign the seats in this airplane based on seniority, not on the basis of competence. So anything you can see or do that will help out, I'd sure appreciate hearing about it" (Ginnett, 1993: 90). Notice that the captain is not saying, l am not competent to be the captain. Instead, the captain is saying, we're all fallible. We all make mistakes. Let's keep an eye on one another and speak up when we think a mistake is being made.

Most democratic and participative is the captain's behavior to engage the crew. Briefings held by excellent captains last no longer than do those of the lessexcellent captains, but excellent captains talk less, listen more, and resort less to "canned presentations."

Taken together, all of these teambuilding activities increase the probability that constructive, informed interactions can still occur among relative strangers even when they get in a jam. If we compare the leadership of aircraft captains to leadership in Mann Gulch, it is clear that Wag Dodge did not build his team of smokejumpers in advance. Furthermore, members of the smokejumper crew did not keep each other informed of what they were doing or the reasons for their actions or the situational model they were using to generate these reasons. These multiple failures of leadership may be the result of inadequate training, inadequate understanding of leadership processes in the late '40s, or may be attributable to a culture emphasizing individual work rather than group work. Or these failures of leadership may reflect the fact that even the best leaders and the most team-conscious members can still suffer when structures begin to pull apart, leaving in their wake senselessness, panic, and cosmological questions. If people are lucky, and interpersonally adept, their exposure to questions of cosmology is confined to an episode. If they are not, that exposure stretches much further. Which is just about where Maclean would want us to end.

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