"Site-Seeing" in Disaster:
An Examination of On-Line
Social Convergence

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ABSTRACT

On-line websites and applications are increasingly playing a role in disaster response and recovery. Yet with the wide variety of on-line grassroots activities that occur in such situations, it can be difficult to make sense of them. In this paper, we describe on-line behavior as socially convergent activity, interpreting it within existing sociological understandings of behavior in disaster events. We discuss seven types of convergent behavior and give examples of on-line activities for each type. By seeing these activities as an essential part of the disaster social arena, we can begin to think about how to support socially convergent phenomena in new and creative ways.

Keywords

Crisis informatics, disaster, convergence, computer-mediated communication, social media (websites)

INTRODUCTION

An important social phenomenon that occurs in nearly every disaster is the convergence of people, information, and materials into the geographical region of disaster (Fritz and Mathewson, 1957). The sheer vastness of convergent activity brings this observation from one of obviousness to one of wonder. The coordination of such activity, as well as the sudden large-scale change in social behavior are remarkable, and are bases for understanding and designing information and communication technology (ICT) for disaster situations.

Our interest here pertains to social convergence—the arrival of people to physical geographical sites in the aftermath of disasters. Social convergence describes not only the people associated with the official response, but the many members of the public who also converge. Sociologists have documented the nature of convergence onto the physical sites of disasters (Fritz and Mathewson, 1957; Kendra and Wachtendorf, 2003), and now, increasingly, parallels of such behavior can be seen on-line. In recent disasters, the Internet has supported the interests of disaster survivors, curious onlookers, and compassionate helpers wishing to aid those directly affected by crisis. New roles and functions are emerging as people, including those in the geographical space of disaster and those outside it, go on-line to seek and provide information.

While convergence to on-line sites mirrors convergence activities that take place in physical sites of disasters, there are important differences. The Internet has brought changes to the speed with which people and information can converge—or attempt to converge—around disaster events, as well as the distance from which people can participate. The number of people who can converge around a disaster is nearly without limit, and is really only bounded by technology access and technical ability. These changes mean that public participation in disaster activities is on the rise, and, we believe, is usually benign and often advantageous. This is in contrast to conventional notions of public activity as something to police and control (Tierney, Lindell, and Perry, 2001; Palen and Liu, 2007). Empirical research shows that large-scale distributed problem-solving can and does occur to support information-seeking activities in disaster situations, and can do so accurately (Palen, Vieweg, Sutton, Liu, and Hughes, 2007).

With each new disaster, on-line activity increases by both members of the public and the formal organizations of disaster response. We are seeing new synergies across organizations and activities, though all this activity is still fledgling. The fact that this on-line activity is happening is just as fascinating as the help such activities hope to offer. However, the array of on-line sites following a disaster event is just as confusing as it is exciting, from both the lay person's point of view, the practitioner's point of view, and the researcher's point of view. The objective of

the analysis presented in this paper is to impose a 'sense' onto a seemingly sprawling arena of human interaction that, especially in the hectic days following a disaster, seems boundless.

TYPES OF SOCIAL CONVERGENCE: EXTENDING THE THEORY TO A DIGITAL WORLD

In this paper we rely on Kendra and Wachtendorf's (2003) examination of convergence in the 2001 World Trade Center Disaster as a basis for our analysis. In this work, Kendra and Wachtendorf discuss seven types of social convergence: the *anxious*, the *returnees*, the *curious*, the *helpers*, the *exploiters*, the *mourners*, and the *supporters*. The first five of these types were originally defined by Fritz and Mathewson (1957), while the last two—the *mourners* and the *supporters*—were newly identified by Kendra and Wachtendorf (2003).

Here we re-interpret these categories to consider the nature of convergence on-line during times of disaster. Previous work on this topic was based on physical disaster sites, regarding people whose actions and behaviors could be watched and observed. In classic research on this topic, then, the focus was on roles that people played in disaster. For on-line activity, however, so often what we witness are small bits of activity without the context that physical settings afford, making it sometimes difficult to frame characteristics of convergent activity as role-based behavior.

Therefore, thinking about convergence phenomena in virtual settings with constructs like "the helpers" or "the anxious" implies more attribution of roles to people than we can empirically or even practically apply. In physical settings, people who are "helping" or "mourning" might be acting in a sustained-enough fashion that makes those actions visible, but in digital settings, only traces of actions are observable. Our work shifts the analytical lens from the *role* to the *interaction* (or the results of that interaction), which are empirically observable. We therefore discuss convergence activities as displays of *helping*, *being anxious*, *returning*, *supporting*, *mourning*, *exploiting*, and *being curious*.

APPROACH & BACKGROUND

The motivation for this paper arose out of our own difficulty in wrestling with the vastness and heterogeneity of the social arena we were studying. Our analytical frame is guided by existing sociological theory about collective behavior in disaster—as described above—with selected illustrations of on-line activity that we have been investigating in our broader research program. To that end, in addition to our own first-hand data, we also cite other instances of on-line convergence using secondary sources, specifically the empirical research on the September 11, 2001 attacks conducted by Kendra and Wachtendorf (2003), and instances of on-line activity from the August 2005 Hurricane Katrina catastrophe in the US Gulf Coast in an initial investigation we conducted at that time (see Palen and Liu, 2007).

From our own recent research, we draw from descriptions of on-line activities we studied that took place during the April 16, 2007 Virginia Tech School Shooting and the October 2007 Southern California Wildfires, which were part of a larger programmatic effort on an area of research we call *Crisis Informatics* (Palen et al., 2007). Our program on crisis informatics is overarchingly guided by questions about technology use for information dissemination between officials, from officials to the public, and peer-to-peer. To that end, we use a mixed methods approach, which to date includes ethnographic on-site field work, on-line (or "virtual") ethnography, and web-based questionnaires. In both study cases, field work conducted in the aftermath of the events served as a basis for strategizing data collection of on-line investigation of many web sites. For the Southern California Wildfires event, our field- and on-line investigations informed the development of a widely distributed web-based questionnaire. The data collection and analytic methods are reported at greater length elsewhere (Palen et al, 2007; Liu, Palen, Sutton, Hughes and Vieweg, 2008; Sutton, Palen and Shklovski, 2008; Vieweg, Palen, Liu, Hughes and Sutton, 2008).

We are sensitive to the ethical demands and implications of social research in this particular sphere and are aware that our activity could be perceived as exploitive (in the same way that other post-disaster activity is considered exploitative). We are committed to vigilance on this matter, and are guided by the experience of those sociologists who have long-engaged with these sometimes thorny data collection, analysis, and reporting concerns (Stallings, 2003).

Disaster	Description
World Trade Center Disaster	On September 11, 2001 Al-Queda hijacked four commercial passenger airplanes, crashing two into the two World Trade Center towers in New York City, one into the Pentagon in Washington, DC, and one into a field in Somerset County, Pennsylvania. 2,974 people were killed.
Hurricane Katrina	In August 2005, Hurricane Katrina made landfall on the north-central US Gulf Coast, devastating much of the region. In New Orleans, breached levees flooded 80% of the city and many neighboring areas for weeks. At least 1,836 people where killed during the hurricane and the resulting New Orleans flooding alone.
Virginia Tech Shooting	On April 16, 2007, on the Virginia Tech college campus, a single shooter killed 32 people over the course of two-and-a-half hours.
Southern California Wildfires of 2007	In October 2007, multiple wildfires, fueled by extreme drought conditions and unusually strong Santa Ana winds, destroyed at least 1,500 homes and burned over 500,000 acres of land in Southern California. Nine people were killed as a direct result of the fires, and an additional eighty-five people were injured. 500,000+ people were under mandatory evacuation orders.

Table 1. Brief Disaster Descriptions

SOCIALLY CONVERGENT ON-LINE BEHAVIOR

In times of disaster, people seek information for themselves while also finding ways to provide information and assistance to others. By foregrounding these behaviors analytically, and relying on sociological theory to help explain what we see, we might be better able to understand the role on-line sites, services, and interactions have in the larger socio-technical arena of disaster situations.

Helping

> *Helpers converge in order to assist victims or responders* (Kendra and Wachtendorf, 2003, p. 107).

Disasters foster altruism, where people aid those who are in trouble or suffering from the disaster. The most common types of on-line help during a disaster comes in the form of information about personal and property safety and information about sources of relief. During the California wildfire disaster, several local citizens and news organizations provided updates about the fire through the on-line Twitter service. Users of the Twitter service could subscribe to receive these updates on their mobile phone or computer; this information was often judged to be more frequent and timely than official reports (Sutton et al., 2008).

One local resident, Nate Ritter, was primarily responsible for maintaining a Twitter feed that could be tracked by anyone using the hashtag "#sandiegofire." He documented his experience in an October 23, 2007 entry, entitled *Helping People Everywhere through the San Diego Fires*, on his personal blog (*www.blog.perfectspace.com*):

> *Yesterday and this morning this blog's contact form and comments along with my twitter feed turned into a help center. I had news information and help requests coming in from every method of communication I had available; tv, radio, phone, SMS, twitter, instant messenger, email, twitter direct messages, my contact form on this blog, and face to face. I helped people as far away as Vermont to get information about their families homes and ranches because cell phone lines went down.*

Another activity that now takes place within hours following disaster events is the formation of Wikipedia pages detailing the unfolding event. Wikipedia pages are encyclopedic entries that are collaboratively written, edited, and archived. The Virginia Tech Shooting page, for instance, was created less than ninety minutes after the shooting, though during a phase when authorities were unsure if the campus was still at risk (Palen et al., 2007). Drawing upon traditional media, eyewitness reports and other firsthand content, as well as by making deductions by voluntary "I'm OK" reports, people rapidly contributed and edited content, self-policing to check for inaccuracies and information framing. Participation is completely voluntary, though there is recognition and social capital to be had for heavy contributors (Bryant, Forte and Bruckman, 2005).

In the immediate aftermath of the Virginia Tech crisis, Facebook was also used as a location of highly distributed problem-solving activity. A particularly illustrative example occurred in the *Prayers for VT* group, where the members of the group worked together to compile a list of the fatality victims. Shortly after the shootings, Virginia Tech released news of 33 deaths, including the shooter, though it was nearly 39 hours later before they could release the full set of names. During that interval, many members of this group (as well as several other Facebook groups) worked to put names to that number, culling information from a variety of sources (Vieweg et al., 2008). The

activity here is best described as an attempt to help in some way when there were few other ways to do so; an attempt to "remedy" the situation, to use sociological framings of such behavior (Powell, 1954).

Additional support for on-line helping behavior is provided by *Google Maps*— a web application that produces annotatable maps. For example, during the Southern California fires, there were several instances of people in both official and unofficial capacities creating and annotating maps with fire-related information (see Figure 1). Markers indicated burn areas, evacuation areas, shelters, school and business closings. One of the most popular Maps was created and maintained by KPBS news, which received more than 1.7 million views over the course of the firestorm (Sutton et al., 2008).
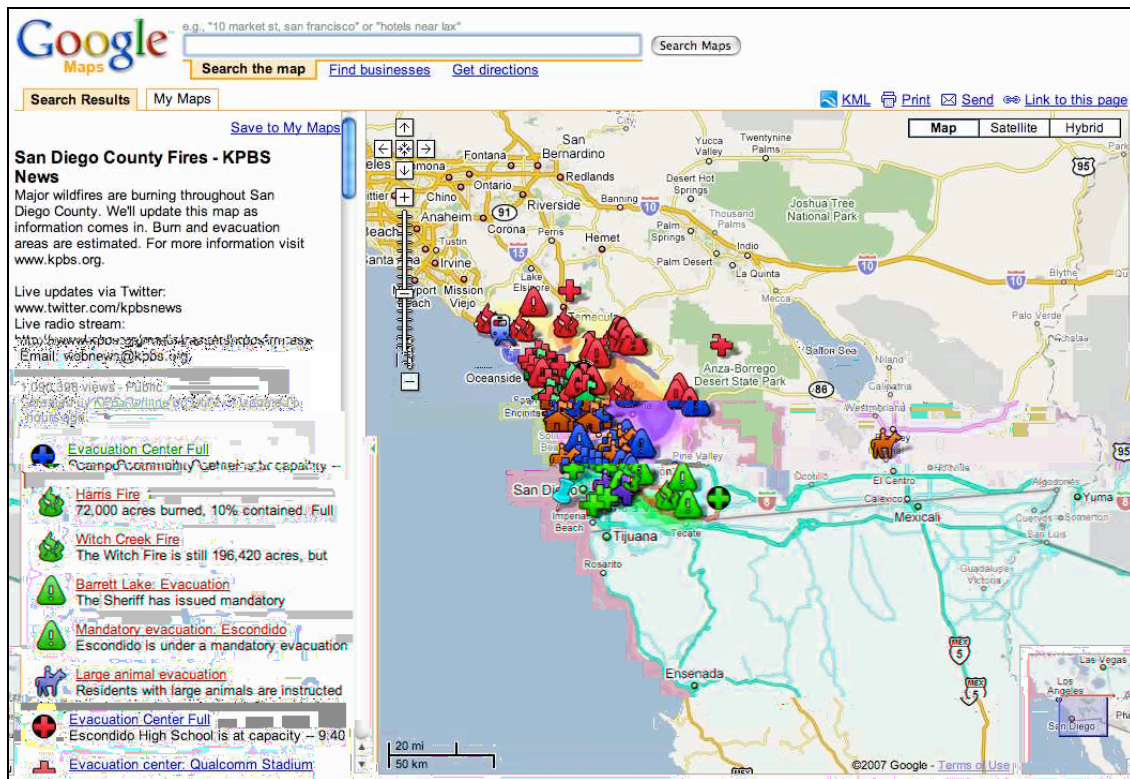

Figure 1. Google Map Mashup of the Southern California Wildfires

Several on-line sites and forums during Hurricane Katrina and the Southern California Wildfires attempted to coordinate housing arrangements and provision relief goods. During Hurricane Katrina, Craigslist provided a public forum organized around topical needs, where users posted offers of housing, material necessities, and employment from all over the country. Additional notable efforts included two university research groups that moved into this sphere of social action by providing web-based services to aggregate housing offers and make connections between providers and those in need: University of Michigan's *www.katrinahousing.net* and University of California, Irvine's *www.calfirehelp.com.* Though it is unclear how effective these sites were—a professor at the University of Michigan reflected that the reality didn't match hopes (Resnick, 2005)—these kind of organized grassroots activities are in keeping with historical, pre-ICT collective behavior during times of disaster (Mileti, 1999), and are indications of how people will use ICT to self-organize in disasters to come.

Being Anxious

> *The anxious are people from outside the impacted area who attempt to obtain information about family and friends* (Kendra and Wachtendorf, 2003, p. 105).

Anxiety causes people outside of the immediate impact zone of crisis to converge on disaster sites to learn the fate of friends, family, and co-workers. Increasingly, people are turning to *on-line mechanisms*—features of web-based and other group support software—that support these goals. In our research, Virginia Tech students reported using e-mail, Instant Messaging (IM), and Facebook to determine whether those in their extended social circles were safe. What is of interest here is not just the technologies they used, but rather *why* they used them. Using IM and Facebook, students could passively monitor the on-line behavior of others to determine whether they were safe or not. IM, for example, shows activity status for users (Is the user signed on?; Are they typing a message?; Are they away from their keyboard?; and so on). Likewise, Facebook sends messages to one's Facebook-designated friends about one's Facebook activity. Using these *passive indicators of presence*, students could deduce that their friends were okay by interpreting signs of activity, inferring for example, that "She must be ok, because she just posted a message on her Facebook site" (Palen et al., 2007).

On-line sites are increasingly becoming a means for finding missing people and for communicating personal safety to others. Following Katrina and, more recently, Virginia Tech, several important grassroots efforts around such activities emerged. A Facebook group called *I'm ok at VT,* created less than two hours after the shootings at Virginia Tech, was designed to be a location where students could report that they were safe. In that case, simply the act of joining was enough, because joining served as yet another passive indicator of presence and therefore well-being.

This on-line coordination of safety and welfare information is finding a place in formal response activities as well. The American Red Cross, which is mandated by the US federal government to perform relief services (sheltering and feeding) in times of disaster, recently created a site called the *Safe and Well List* in March of 2007 to centralize welfare-based information-seeking activities. At the time of this writing, only 4,092 records have been entered over the span of 9 months (and across three significant US crises), but it suggests, along with disaster-specific grassroots efforts, a form of on-line coordination that we will see much more of in the future.

Returning

> *Returnees in New York City [during the World Trade Center Attacks] included residents, employees, business owners, and "substitute" returnees (Fritz and Mathewson, 1957) who are the relatives and friends of disaster victims who enter the area to assess the victims' losses and salvage their property* (Kendra and Wachtendorf, 2003, p. 104).

People return to disaster areas as soon as possible to see the destruction of their towns and cities, to look for belongings and loved ones, and to begin to make sense of how the events have personally affected them. On-line resources in recent disasters created additional ways for people to return—albeit virtually— to the space of disaster to take initial stock of the destruction.

Due to the regional scale of the California wildfires and the large number of evacuations, thousands of temporarily homeless people worried about the safety of their homes. To support community members looking for information about their properties, one web site, *www.therimoftheworld.net*, provided users with information about affected neighborhoods, including lists detailing home addresses and status reports. Residents of one neighborhood in San Bernardino County distributed URLs for webcams that the community had previously installed for security purposes. During the wildfires, residents adapted the use of the webcams to see local fire conditions. One resident expressed frustration at being able to see his community, but not being able to physically return:

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From: ResidentA
Sent: Sunday, October 28, 2007 07:06 PM

Nice to see the webcam back up and running.

Town looks sad and pathetic. Looks like the lights are on in the
park behind the post office.

Can we go home yet? Grrrrrrrrrrr!!!!
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Google Maps have offered another way to virtually return to the disaster site. Residents of the Baton Rouge shelter following Hurricane Katrina reported using Google Maps' aerial/satellite imagery to see the status of their homes

and neighborhoods when they couldn't otherwise return; this represented the first time using a computer for many (Palen and Liu, 2007).

Supporting

> *The convergers are either individuals or groups who gathered to encourage and express gratitude to emergency workers* (Kendra and Wachtendorf, 2003, p. 115).

Supporting behavior is demonstrated when people converge with the primary purpose of expressing thanks to disaster respondents and lending moral support to disaster victims. Support may be expressed in many ways, including the display of banners and thank-you notes, and cheering as emergency vehicles drive by. These same expressions of support can be found on-line.

A common type of Facebook group that appeared during the Virginia Tech shootings showed support for the Virginia Tech community in the group title, including, for example, *Praying for Virginia Tech*, *Supporting Virginia Tech*, or *Protect the dignity of the Virginia Tech victims!*. Simple membership to these groups was the primary means of involvement. For the largest group, *A Tribute to those who passed at the Virginia Tech Shooting*, the way to show support to the Virigina Tech community was through achieving a high membership count:

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Richard A. (Tampa Bay, FL) wrote
at 14:32 on 4/19

300,000!
100 x's more than when I joined!
It's incredible.
We all support you, VT!
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In Facebook, people changed their user picture to an iconic representation of Virginia Tech, including what became the standardized VT memorial ribbon (see Figure 2). Other members created images with their own collegiate mascot or symbol juxtaposed with a VT memorial ribbon. The phrase "Today, we are all Hokies!" was also used in many of these images to signal support.
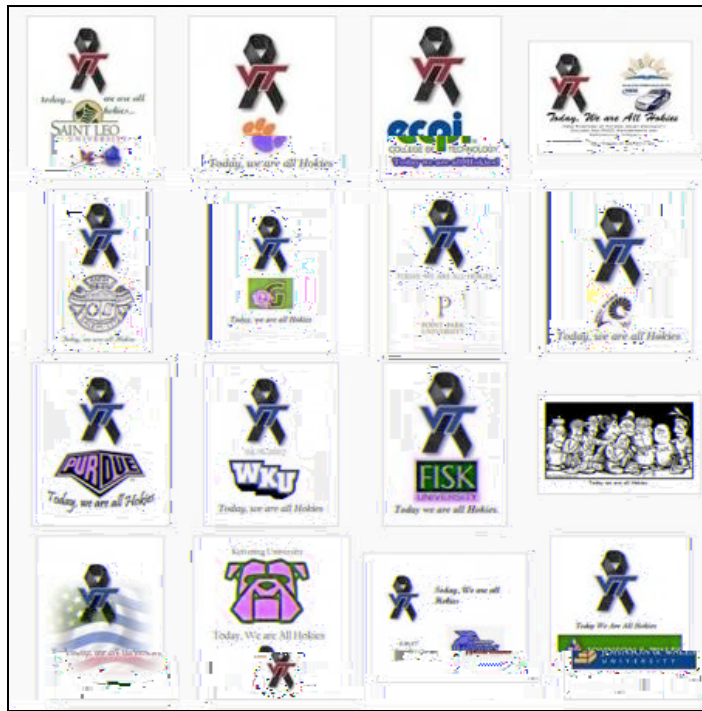
There were also shows of support for official response personnel during the Virginia Tech crises. An on-line petition, *www.wesupportvt.com*, was established to support the Virginia Tech President and Police Chief, who were strongly criticized by the media in the aftermath of the event.

Figure 2. Symbols of support seen in Facebook.

Mourning

These were people who went to locations such as firehouses, Union Square, and Ground Zero to lay flowers, light candles, create memorials, and mourn the dead (Kendra and Wachtendorf, 2003, p. 117).

After nearly any disaster, people converge on the site to mourn the victims (and the destruction), and show respect by holding vigils, or by creating physical memorial sites. We see parallels of this behavior in on-line social forums as well, as people virtually converge to grieve with those who have been affected by the disaster. Following the Virginia Tech school shootings, SecondLife memorializers imitated physical life in virtual space. One user created a virtual graveyard

with gravestones for each of the fatality victims with names, photos, and short biographies for each one (see Figure 3). Other users created virtual memorials that included candles, poetry, music, and flowers, all simulations of the same kind of objects placed at the physical memorial sites on the Virginia Tech campus (see Figure 4).

Figure 3. SecondLife virtual graveyard for the victims of the Virginia Tech tragedy

Figure 4. SecondLife virtual memorial for the victims of the Virginia Tech tragedy

Exploiting

> *Exploiters are convergers who use the disaster for personal gain or profit* (Kendra and Wachtendorf, 2003, p. 113).

The on-line arena is place for personal gain in disaster situations. During the VT shootings, Facebook members felt that their privacy had been violated when news organizations contacted them through Facebook for interviews and information. Students told us that they felt hurt and exploited that a site they used for communication between friends could be co-opted by others. One post on the *Prayers for VT* group shows protectiveness around the activities going on there[1]:

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Mike T. (Virginia Tech) wrote
at 15:54 on 4/17

As many of you know many news reports are now reporting on
facebook about the lists we have created. Note that these lists
are not officially confirmed or released entirely by Virginia
Tech, The State of Virginia, or the Press.  This information is
simply to keep the outsiders informed and the insiders united.
Thank you
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Kendra and Wachtendorf (2003) discuss exploitive incidents that occurred through misleading websites after the 2001 World Trade Center Attacks, where websites falsely stated that people who were reported missing had been found. "While little financial profit could be gained from these websites containing false information, the pain and anxiousness of family members were exploited, presumably for the amusement of those publishing the information" (Kendra and Wachtendorf, 2003, p. 114).

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[1] As this category of concern describes, we ourselves are not ignorant of the dilemmas our own research pose. No matter how ethically we behave and how well-intentioned the larger aims of the research are, there is always a concern about how what we do—how we collect data and report it— affects those affected by disaster.

Others take advantage of disaster as an opportunity to profit by selling products and services. For example, vendors in SecondLife sold t-shirts that commemorated the victims of the Virginia Tech Shooting (see Figure 5). In cases like this one, vendors often claim that proceeds go to help the victims, but it is often unclear how much really goes to the victims or relief activities.

Figure 5. SecondLife T-Shirt Being Sold to Benefit the Victims of the Virginia Tech Tragedy.

Being Curious

Curious convergers come to the impacted site primarily to view the destruction left in the wake of the disaster and the activities surrounding the response (Kendra and Wachtendorf, 2003, p. 111).

Disaster breeds curiosity for those who want to learn more about the disaster and see the destruction and response activities first-hand. This behavior, though natural, has been called "disaster tourism" by some (de Waal, 1997), and can cause problems if it hinders rescue, relief, and recovery operations. However, we note that curiosity itself breeds opportunity: many people who converge to a disaster scene without, perhaps, clear goals for involvement, are among those who become helpers when the need arises.

On-line resources can support curiosity in a way that has not been possible before. Through the Internet, people from anywhere in the world can view and share photos from sites like Flickr, as well as read eyewitness accounts from blogs (Liu et al., 2008). In the recent California fires, Yahoo! News posted Flickr photos on their news site as a means to supplement their news coverage. Owners of these posted photos reported huge spikes in the number of views their photos received, presumably from those browsing Yahoo! News coverage of the fires. One user reported receiving 50,000 views within a two-day period.

Curiosity-based activity is difficult to observe, because the very existence of all these disaster-based interactions on the Internet are now also observable by "lurking," a term used to describe those who observe public discussions in public forums, but never contribute themselves. The Internet provides another window into the disaster arena, similar to television, but different, too, because the observer can witness first-hand interactions by and between those affected by the disaster, making the experience all the more palpable.

CONCLUSION

The public plays a critical role in the disaster lifecycle, not only in today's tech-savvy world, but also throughout human history (Stallings and Quarantelli, 1985). The kinds of activities and communications that happen in the public sphere are not incidental to disaster response—in many cases, they are essential. As we describe here, the on-line arena has become another place of such civic activity.

Using existing social science theory on collective behavior in disaster, we make an initial contribution by framing this large and unwieldy frontier for disaster activity as a matter of social convergence that parallels geographical on-site behavior. The output of this socially convergent activity, while varied and far-flung, is made understandable by interpreting it within existing sociological understandings of behaviors that are typical and predictable consequences in disaster events. When examining activities and behavior on-line, the means and nature of "observation" changes, and attributing the socially convergent roles set forth by Fritz and Mathewson (1957), and Kendra and Wachtendorf (2003) becomes a challenge. The work presented here translates these roles to better address social convergence on-line during times of disaster.

Examples discussed in this paper demonstrate adaptations of existing social media to enable virtual convergence in disaster. A next step would be to create on-line environments, tools, and features tailored to and designed around specific kinds of convergent activity. For example, we might support mourning activity with digital environments that allow users to easily create, customize, and maintain their own memorials; this could have important long-term benefit as well given the Herculean efforts made toward the historical preservation of the numerous physical memorials following the World Trade Center disaster. One might even imagine how on-site memorials and on-line

activity could creatively blend to indicate and capture both kinds of simultaneous activity. Volunteerism and desire to help might be loosely coordinated and intersect with existing organizations associated with the National Voluntary Organizations in Disaster (NVOAD), such as the American Red Cross, that help coordinate on-site volunteer activities. Likewise, society could benefit from additional, distributed, lightweight but still coordinated efforts that take stock and communicate personal safety and welfare (I'm OK/Are You OK accountings).

In this paper we outline several examples of each type of on-line social convergence behavior during times of crisis: *helping*, *being anxious*, *returning*, *supporting*, *mourning*, *exploiting*, and *being curious*. By seeing these on-line convergence activities as elements in the disaster social arena, we might begin to think not only about implications for the design and deployment of features and sites, but also about how collections of people and information might support this socially convergent phenomena in new and creative ways to benefit both public and official disaster response.

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