Reading Ben Shneiderman's Email: Identifying Narrative Elements in Email Archives

Jason Zalinger[a], Nathan G. Freier[a], Manuel Freire[bc], Ben Shneiderman[c]

[a]Rensselaer Polytechnic Institute, Troy, NY 12180
[b]Universidad Autónoma de Madrid 28049 Madrid, Spain
[c]University of Maryland College Park, MD 20742

Abstract

This paper describes techniques for finding narrative elements in the archived email of a scholar. The goal is to test a narrative approach to searching using a 15-year email archive containing nearly 45,000 messages belonging to University of Maryland Professor Ben Shneiderman and ranging from 1984-1998. The goal is not to find complete narratives (although, many do exist) but to search for narrative elements, the building blocks that make up a narrative. Thus, narrative search is defined as both a set of search techniques and a way of thinking like a storyteller that allows designers and users to uncover narrative elements. We argue that narrative search is a promising strategy that can be productively applied to other email archives. This paper makes a contribution to HCI by showing that a narrative approach to search can be productive and compelling. By encouraging designers (and users) to think like storytellers, we can create robust interfaces that help users make narrative sense out of overwhelming amounts of messages.

Keywords: Email archives, narrative, discovery methods, interface design, exploratory search.

1 Introduction

When you don't know what you are looking for, how do you find it? This question drove the initial motivation for this paper. Specifically, the goal of this paper is to test a narrative approach to searching through an email archive of 44,971 messages containing over 4,000 relationships belonging to Professor Ben Shneiderman from 1984-1998. It should also be noted that Shneiderman—like any careful professional—was "always aware that my emails could become public or fall into some unexpected recipients hands, so I was fairly careful in self censoring, or at least cautious in sending notes that could be problematic" (Personal communication, 2009). Regardless, the archive contained fascinating, and often highly personal and emotional exchanges. This paper tries to focus on the professional when possible, but often it is the personal which seemed to yield the "best" results using narrative search techniques.

We define narrative search as both a set of search techniques and a way of thinking like a writer or storyteller. The goal is not to find complete narratives (although, many do exist) but to search for the critical narrative clues, like the right jigsaw puzzle piece, that will lead a user to find rich, rewarding information about someone else's life-in-email—especially when they do not know much about that person's life. We argue that searching for these narrative elements is a promising search technique that can be productively applied to other email archives. Narrative search is not just a technique, but a way of approaching or thinking about what to search for and why.

Personal digital archives have become significant enough in breadth and depth to stand as a reflection of a lifetime's worth of work and lived experience. By some accounts, worldwide email traffic in 2009 will average around 247 billion messages per day (Radicati Group, 2009). This

does not include instant messages, text messages or Facebook email, Twitter updates and so on. In short, the historical record has never been more complete, offering historians and others a rich record of a person's life. However, the question that remains to be answered is how best to make some kind of narrative sense out of all this "data?" Specifically, how should we design effective archival systems to help users explore a vast email archive of, in this case, the life of a scholar? In April 2009, at the CHI conference in Boston, one of the authors (Zalinger), was in a workshop with Professor Ben Shneiderman, who has been an influential and prolific academic for thirty years. At the lunch break, Shneiderman approached Zalinger. He pointed his finger at him and said "You!" He then told Zalinger, who studies narrative and personal digital archives, that he had a substantial email archive of nearly 45,000 messages and that he would give that archive to him. "You are going to let me read 15 years of your email?" Zalinger asked.

"Yes."

"Ok."

A few weeks later, Zalinger received a DVD containing the email archive and a handy search system designed by Tamer M. Elsayed. Shneiderman's archive was well-curated, in that he saved only key emails, no junk mail, and very little of the daily traffic of announcements. In addition, he saved them in folders organized by name and year from 1984-1998. Thus, this paper is the story of trying to find and piece together the narrative elements about an academic's life. Shneiderman was interested to see what an outsider thought about his archive. Thus, after spending roughly 80 hours and reading or searching through well over 1000 emails, how would Zalinger interpret 15 years of professional and even some very personal material? What would he find interesting? Would it be interesting to others? Would Shneiderman find the same things interesting? Would he regret letting Zalinger read his email? To address these questions, this paper is organized around Zalinger's descriptions of what he searched for and why he searched for it. Along the way, we offer a variety of design suggestions for creating an interface to help users (from professional historian to interested novice) make narrative sense out of an overwhelming quantity of emails. Finally, this paper is written in a narrative style that reflects the underlying search methodology, and as such, some readers may find the reading experience contrasts significantly with a more traditional, technically-oriented paper. We believe, however, that the narrative style facilitates a deeper understanding of the methodological approach that we have utilized.

2 Related Work

Ironically, we have to search hard to discover new ways to think about exploratory search tools to help people make sense of large email archives. These new tools and techniques for exploratory search will require novel research and collaboration (White et al., 2006). The narrative search strategies we describe here seem closely related to Gary Marchionini's (2006) notion of interactive information retrieval, which looks at the search problem from the perspective of "an active human with information needs," and "information skills." To characterize our exploratory narrative searching, we would simply change the word "information" to "narrative." Of course, the perfect interface would not require narrative skills from the user, but would help them to think like a storyteller. Although we believe our approach is unique, there has been some work done that relates to our main themes of narrative discovery in email archives. For example, Leuski (2004) argued that it is possible to detect someone's role by analyzing "speech acts" in email. Carvalho and Cohen (2005) showed how to improve on the classification of "email acts."

Kleinberg (2002) explored how to model "bursts" of email activity in order to more efficiently identify and organize the underlying content of the messages. A recent, successful "meme-tracking approach" followed short, "distinctive phrases" as they traveled through the internet, revealing a "coherent representation" of the temporal patterns in the news cycle (Leskovec et al., 2009).

Others have taken a more visual approach to gaining insight from email archives. For example, the first attempt to analyze and understand Shneiderman's archive was documented in (Perer et al., 2006). Those authors—including Shneiderman—argued that to understand email conversations in an archive, context is needed. They provided methods for "constructing meaningful rhythms from the e-mail headers by identifying relationships and interpreting their attributes" (Perer et al., 2006). Their visualizations of these rhythms showed that important relationships became evident, and they discovered insights "that may have been otherwise hidden" (Perer et al., 2006).

Viégas et al. (2006) created *Themail*, a "visualization that portrays relationships using the inter-action histories preserved in email archives." *Themail* was built "with the working hypothesis that a visualization of email content constituted meaningful portraits of people's relationships." *Posthistory* and *Social Network Fragments* are visualization tools that allowed users to see the "higher-level" patterns of their email habits (Viegas et al., 2004). *PostHistory* focused on dyadic email relationships whereas *Social Network Fragments* explored the social groups that emerge within email exchanges. Another project is *Crystalchat*, which used a 3D representational model of personal instant messenger history to "reveal the patterns and to support self-exploration of one's personal chat history" (Tat and Carpendale, 2006).

Lifelogging technology is also related to our work. Arguably the best known example of a lifelogging project is the Microsoft funded MyLifeBits, which its creators call "a lifetime store of everything. It is the fulfillment of Vannevar Bush's 1945 Memex vision including full-text search, text & audio annotations, and hyperlinks" (MyLifeBits, n.d.). The creators describe themselves as on a "quest to digitally chronicle every aspect of a person's life" (Bell and Gemmell, 2007). Of course, it is an open research question as to whether or not this is even a good idea. Other lifelog researchers have argued, "Given the volume of content contained within a lifelog collection, we cannot expect a user to manually locate and construct individual stories from its contents. As such we must make the process of constructing a narrative retelling as automatic as possible" (Byrne and Jones, 2008). There have also been attempts to design narrative interfaces. For example, Gonçalves and Jorge (2008) showed that "narratives can be successfully used as a way to help users recall important autobiographic information about their documents and convey that information to the computer." Another study investigated what people tend to remember when looking for their old email messages. They showed that people tend to remember quite a lot regarding their emails, but there are situations where they remember less (Elsweiler, 2008). Bottom line: we need better tools to help us search through email. However, these last two approaches were autobiographic: Our perspective is outsider-looking-in, whereas they took an insider-looking-in perspective: OLI v. ILI.

These approaches are all potential answers to the vexing problem of finding meaning in vast amounts of personal data—especially email. However, none have yet focused on finding narra-

tive elements. Our approach is narrative, and we believe a well-designed interface can help users find the narrative clues that lead to stories. And all those stories can add up to a robust characterization of a person's life. In this case, an academic's life.

3 Why Narrative?

In his book, *On Stories*, Richard Kearney explores some of the reasons why telling and sharing stories are such critical elements of human behavior. The fundamental question he asks is this: Why are stories important? He offers some trenchant insights. For example, he writes that it is "only when haphazard happenings are transformed into story, and thus made memorable over time, that we become full agents of our history" (Kearney, 2001). Stories are not just some stuff that happened. It is a transformation of events placed into a particular sequence using particular words that renders them into art, into something that we want to tell and retell. Kearney also writes that:

> When someone asks you who you are, you tell your story. That is, you recount your present condition in the light of past memories and future anticipations. You interpret where you are now in terms of where you have come from and where you are going to. And so doing you give a sense of yourself as a narrative identity that perdures and coheres over a lifetime. Storytelling may be said to humanize time by transforming it from an impersonal passing of fragmented moments into a pattern, a plot, a mythos. (Kearney, 2001)

This interpretation of the transformative power of storytelling endows it with the ability to control time. Humans need to organize, classify, understand—control. We search for order amid chaos. We crave logical patterns, yet we also crave emotional patterns. This is what stories seem to do. Stories organize emotions, moments and life into meaningful patterns that we can then share with each other. We need stories. How else can we make sense of such bizarre things as love and death and birth? Logic resonates with one part of the human mind because it is an organizing agent. Stories are just as powerful as logic. They are the other organizing agent in our lives. Logic cannot make sense of love lost, but a story might be able to. A story about love lost is something we can understand and share.

If Kearney is right then it is only when the seemingly haphazard happenings of an email archive are transformed into story that they will be made memorable over time. Our approach does not look for complete stories but the narrative elements that make up stories. The question is: How do we find these elements in someone else's archive?

4 Where To Begin?

What is interesting as a story if you don't know much about the life of Shneiderman or the people surrounding his life? In what narrative systematic ways might an outsider explore someone's email archive? One possibility was to use a timeline to try and visualize the messages more clearly. Timelines are an excellent technique for locating events in time and giving users an overview of results. Zalinger asked co-author Freire to build a timeline into the existing interface. Once built, this made it much easier to see conversations. Unfortunately Zalinger found it difficult to gain insight or find narrative elements using a timeline (See Figure 1). In this particular case, a timeline was not as useful as we had hoped, however, more work needs to be done

merging timelines with a narrative search. Shneiderman suggested other possibilities including identifying influential people with whom he had been in touch with over the years, doing Google searches on all his correspondents to see which had the top ten highest number of hits, or searching for people at key companies (i.e. Apple or Microsoft), in other countries or at major universities. Other ideas included locating co-authors from Shneiderman's list of publications, or finding his most frequent correspondents and then spending a while reading through the history of a single relationship.
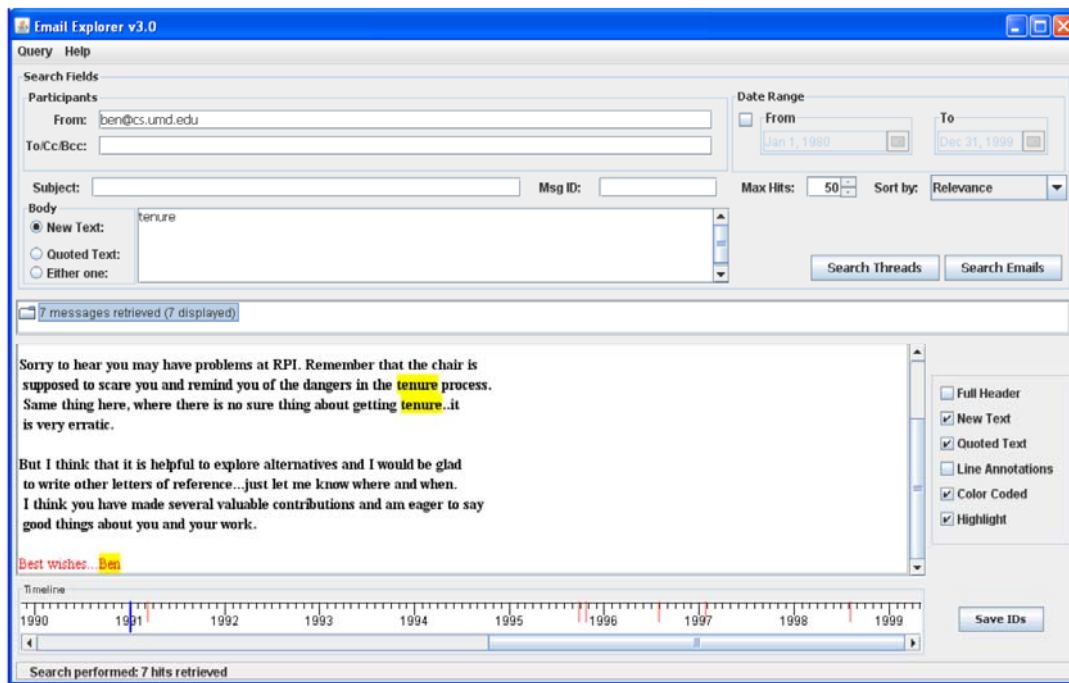

Figure 1. A search for "tenure" in Shneiderman's archive using Elsayed's EmailExplorer interface with Freire's timeline. Short ticks on the timeline indicate retrieved messages; a long tick marks the currently selected one.

These were all interesting starting points, yet, feeling overwhelmed, Zalinger decided to search the archive for mentions of Shneiderman's book *Leonardo's Laptop* (2002) to see what came up. As a PhD student who hopes to write a book someday, Zalinger was curious to know what sort of messages surrounded the creation of this book. Searching for "Leonardo's Laptop" returned 15 messages. But the first thing Zalinger realized is that the book was likely not referred to exactly that way when Shneiderman began work on it. In fact, maybe the last thing Shneiderman did was give it a name. So, without asking Shneiderman, how could Zalinger locate the beginnings of a book project in all of these messages? What are similar keywords? Should Zalinger have tried "book project," "Ben's book," "Leonardo?" Surely, a book project for which Shneiderman, or anyone for that matter, is the sole author must have more email messages than fifteen.

The design of the current interface is somewhat limited because it was not designed for finding narrative elements. It is not the interface designer's fault. The interface simply was not designed to answer the potential range of questions that a historian or biographer or writer might have; it was not designed to answer narrative questions. The same questions you were asked in high

school English class have only become more important as we continue to accumulate decades of life "data." Who is the protagonist? Who is the antagonist? What is the plot? What is the dramatic want of the character? What is the obstacle the protagonist faces? Maybe these questions are wrong, or maybe there is no interface that can answer them. However, a good interface, like a flashlight in a dark room, might allow us to explore and see interesting things for ourselves. We do not want a computer to tell us what the complete story of Shneiderman's life has been. We want a program to help us find and put together the narrative pieces of the jigsaw puzzle in a way that makes sense. Humans will write the final story.

4.1 The Mysterious Bill[1]

The first message Zalinger looked at was from January 22nd, 1998. Zalinger knew that Leonardo's Laptop was published in 2003, so the first thing that came to his mind was that he was reading the seeds of what would eventually become an influential book. The email is from someone named Bill who appears to be from the University of Victoria, according to the FROM address. Bill tells Shneiderman that they met at "ACM MM'97." Wondering who Bill is (or was?), Zalinger's first reaction was to google "ACM MM'97." Of course, Zalinger was now presented with two options. Searching in quotes gave Zalinger 33 results, without gave him 1,050,000. Without quotes, the first link Google offers suggests that Shneiderman and Bill most likely met at the Fifth ACM International Conference on Multimedia held on November 9-13, 1997. The conference does not seem to have a permanent web presence. It exists as proceedings published by the ACM. Bill goes on to say that "you impressed all of us with the Leonardo's Laptop." Obviously, whatever presentation Shneiderman gave left a very positive impression. How did this make Shneiderman feel? Was this public confirmation that his "Leonardo" project was on the right path, or did he still have many doubts? As an "outsider," Zalinger could not know. However, there was a clue in the next sentence. Bill writes "Since you wanted to see your pictures. I have posted two of them in the web." This is interesting because first, Shneiderman clearly asked to see pictures. Lots of people want to see pictures of themselves and their experiences. However, Zalinger also happened to know that Shneiderman has a serious interest in photography, and he wondered if he downloaded those pictures and added them to his archive, which is exactly why we are able to look through these emails in the first place: Because Shneiderman is an archiver and always has been. Obviously, Zalinger went to the URL for the pictures, and they were long, long gone. So, from this email we have learned some things about Shneiderman the person and scholar, yet we are left with many questions, too: Who is the mysterious Bill? How would we find him?

Zalinger put Bill's name into the email database, and the only return was the email already in question. Can we use a program to seek him out based on the little data we have, or would we have to simply do the old school detective work of calling up the University of Victoria and find out where he might be? However, luckily, another option exists: We can ask Shneiderman. Thus, can we create an accessible archive that would allow Shneiderman to go through and comment on his own email archive? Would that be remarkable bias, or would it shed light on these little moments of a man's life that were stepping stones on the way towards a larger accomplishment: *Leonardo's Laptop*? Not all historians have the ability to simply ask the person who created the

---

[1] Bill is a fake name. Due to privacy concerns, at certain points we quote directly from Shneiderman's archive without identifying any information about the sender or date.

archive what they think, but the bottom line is that we must use all available resources, and Shneiderman is the best resource on his own life. Finally, would Shneiderman, or any scholar with a vast archive, even want to do this? We know that Shneiderman actually seems to enjoy tagging his photos, but would it be tedious to go through 44,971 messages and add notes? There is yet another option here, too, which is technically easy to do but ethically a bit tricky. What if we could find Bill and ask him to comment upon the email? In fact, what if we were to send an email to everyone in Shneiderman's address book and ask them if they would be willing to comment upon any thread of which they were a part? This would turn Shneiderman's email archive into a closed wiki in which only those who had access to the original emails could add their notes. In this case, Bill could only comment on his one email. There was nothing in that message that was sensitive, but what if there was something personal?

Where are the pictures that Bill posted? Are they gone forever, or did Shneiderman happen to grab and tag them years ago? Clearly, what is needed is for any mention of pictures to be linked to Shneiderman's other substantial archive of roughly 12,000 well-curated photographs (Ben Shneiderman's Photo History, n.d.).

Was ACM MM'97 a significant moment in the history of HCI? Shneiderman's email archive may not tell us the whole story, but it is, most likely, the largest, most significant piece of the puzzle. Furthermore, how could we provide context for the user? The most obvious design solution is to link or somehow provide data from the conference: How many people attended? How many papers were published in the proceedings? Critically, what did Shneiderman publish, if anything, and how many times has that paper been published? Is there any documentation of Shneiderman's presentation? All of these elements, all of this context should be provided to the user in a way that helps them make some kind of narrative sense.

Finally, speaking of narrative, it is always important to remember that narratives contain action. People do things in a narrative. In this particular email Bill wrote "you wanted" the pictures. Perhaps this is a semantic computation problem, but it seems like we could somewhat easily find narrative elements by defining them and then searching for them. We could define narrative action as "Ben + verb." For example, I typed "Ben decided" into the email archive, but it returned only five results. Still, we imagine that Shneiderman and the word decision or some variant of that word came up a lot more in this archive. However, the point here is to look for moments when Shneiderman takes some kind of action. (In addition, the interface could use a "Google Suggest" feature and suggest words as they are typed, thus helping the user narrow down their search before they even begin).

4.3 The Big However
The first time Zalinger explored Shneiderman's archive he came across what he considered to be a very interesting email exchange between Shneiderman and a long-time collaborator. However, after a few weeks had gone by, although he could still search and find the thread, he had forgotten what keyword he had used in his original query. What word or phrase did he use to find this message? The program clearly needed a way to save searches so that a user could go back and follow their tracks, much like browsers save a session and restore it once you reopen the program. Regardless, as a PhD student, Zalinger found this particular email very revealing. The message is dated Monday August, 26th, 1996. Shneiderman begins by describing to his col-

league a recent trip, "traveling in Israel with my daughters, mostly relaxing, beaching, dealing with the needs of my parents..." Shneiderman goes on to write, in an almost literary style, of the "nice hiking days in the Golan Heights—hot days, but the narrow gorges were filled with cool streams, waterfalls, and some places to swim—and the always inspiring walks through old Jerusalem." The "cool streams" and "waterfalls" sound soothing and calm and function as a strong setup for the next two paragraphs, in which Shneiderman characterizes his message as a "sensitive issue so I think we should discuss this carefully." After the "cool streams" and almost whispery, gentle way he begins the message, in the third paragraph, we get the big however. This paragraph, again, begins positively and cordially, "I think it's great that you wrote the history (of HCI) and put forward the university role. I also like the positive tone and attention to universal access, however after reflection, I am troubled by the thin mention of my role in this history. My two main points in my note to you were about direct manipulation and hypertext" (emphasis added). Shneiderman continues, "I was pleased that you referred to my direct manipulation article, but you gave it such a shallow treatment that it was uncomfortable for me. This paper is probably the most referenced paper in HCI." Shneiderman continues this paragraph and the next four in the same polite, professional yet focused and unwavering tone. He finishes the email by writing, "We've been colleagues and professional friends for a long time, so I hope I can ask directly for better treatment of my role. Sincerely...Ben." Shneiderman then helpfully includes a list of eight of his publications.

This email is revealing for a number of reasons. First, for aspiring academics, it is fascinating and instructive to see how another scholar handled a difficult, even awkward, situation with a long-time colleague. There is a real benefit to exploring email archives. Likewise, this email tells us a lot about Shneiderman and how he was able to have such a successful career. In short, he had confidence in his work and was not afraid to speak up for his accomplishments when he felt it was necessary. This email reveals a lot about what it takes to be a successful scholar: You cannot be afraid to politely, professionally tell a colleague or "professional friend," as Shneiderman puts it, that you are unhappy with their description of your role in a particular history of a discipline. Finally, this email is filled with narrative and contextual data. In narrative, the big however is a key transitional phrase. In this particular email, the word however plays a major role in the narrative arc of the main "character's" dramatic want (Shneiderman's desire to have his historical role more prominently detailed), conflict (his colleagues "thin" mention of Shneiderman and the trickiness of politely standing one's ground) and the resolution of this "scene," which is not clear to the reader because Shneiderman's colleague only responded by saying he would consider his comments and put the project aside for awhile. The point here is that we can search for these kinds of transitional phrases, but we need a database of common transitional phrases from which to pull. Would it be possible to create or pull from an existing database to help explorers find key moments like this one, where an academic stands up for his work? By creating a transition phrase search, we might be able to locate revealing scenes such as this one. Finally, this email is full of contextual data that could help explorers get a better sense of the world that Shneiderman worked within, professionally and personally during the year 1996. For example, here is a short list of some of the places, people and literature mentioned: Golan Heights, Jerusalem, Israel, Direct Manipulation, Hypertext, Alan Kay, (Vannevar) Bush, ZOG, Apple, Hypercard, CACM, ACM, IEEE Software, FilmFinder, SIGDOC Award as well as a number of Shneiderman's publications, all of which are clues as to what the Shneiderman world looked like at that particular historical moment. Linking to many of these things would be useful.

4.4 Bearded Professional Vision

In a fascinating story-within-a-story, on October 21st, 1993, Shneiderman wrote an email to three friends in which he tells the story of his train ride after a conference, "I wrote this to record what happened for my own memories, but thought it made for a good story." He calls his train story, "An Encounter on the Metroliner." He begins by discussing his opening keynote address at the 4th International Stein Conference. On the second day, Shneiderman writes, Ed Fitzsimmons of the President's Office of Science and Technology gave a speech that "turned off most of the people in the room." Fitzsimmons was hoping to push technology into education. But Shneiderman's complaint was that Fitzsimmons paid "barely any attention to teachers or equipment. There was barely any attention to teachers or students, and no mention of educational philosophies, encouragement of teamwork" and so on. At this point, Fitzsimmons, as a character in this story, seems to be a very stiff Washington bureaucrat who seems out of touch with what schools and teachers actually need. Shneiderman writes, "One person who didn't quite know what to do with her anger settled for pointing out how embarrassing it was that such a high federal official had several typos in his presentation." This sentence was how Zalinger actually found the entire message. He searched for the word "anger." He searched that word because he was looking for points of tension, moments when anger or disappointment or confusion or pain might have entered into Shneiderman's life. Zalinger did this not because he hoped to find such things but because, in narrative, tension is what makes for a good story. Without tension and conflict, we have no drama. We have no story. Searching for what we will call tension words helped him find an amazing story-within-a-story. Thus, narrative search interfaces should include word suggestions, for example, a list of 1000 words that might convey tension, such as, "sadness, hate," "love" and so forth. In addition, a list of interesting or unusual words such as "guitar," "ninja" or, at Shneiderman's suggestion "tibia" pulled up interesting results.

Next, Shneiderman describes sitting next to Fitzsimmons on the way home, "His six foot stature and healthy fifty-ish military style was quite foreign to me." Fitzsimmons listened "openly to my ideas about education...We tried some scenarios and I think he liked the fresh perspective that I offered." So it turns out that the Fitzsimmons character is slightly more complex than we might have thought. Next, Shneiderman invites him to discuss his military experience. Although it is a little lengthy, we believe it is worth including the rest of Shneiderman's story:

> He started talking about flying helicopters in Viet Nam. I invited his further stories by saying that he must have had some scary experiences. He responded by telling about a volunteer mission at the time of the Tet offensive in early 1968. He and another captain volunteered to fly in to rescue the remnants of an American company that had been badly "hammered" by the North Vietnamese. The first chopper took off uneventfully with many dead soldiers and his chopper was loaded with wounded plus eight survivors. As he rose slowly above the trees he saw two soldiers step out firing AK-47s. Forty-seven bullets hit all around him, ripping up the windshield and floor, cutting his microphone cord, and leaving two bullets in his chest protector, but he was untouched. (…).

> At this point the guy in the seat in front of us on the train, stood up and apologized for interrupting. He was fifty-ish, with a large white mustache and cowboy

hat. He introduced himself as Tom Carhart and said that he was one of the eight guys who was picked up from that terrible killing field on January 24, 1968. Fitzsimmons couldn't confirm the date, but the story was close enough that the two of them could not dismiss the possibility. As our visitor related that he was finishing a PhD in military history at Princeton he unbuttoned his shirt to reveal an aging dark blue t-shirt with the shield of the 101st Airborne Strike Force. The eagle with its menacing claw made an impact on me, but when Fitzsimmons pulled down his suit jacket and showed the same shield on his lapel, amazement thundered through the train. They quickly exchanged life histories (Purple Hearts, Silver Stars, etc.) and found dozens of common companions. Their easy discussion of death and war shook me, but I was grateful for the chance to witness this encounter. As an opponent to the Viet Nam War I remain troubled about that national tragedy and saddened that so many died, but I can respect what Carhart and Fitzsimmons did a quarter of a century ago. Is there any chance that Fitzsimmons could accept my bearded professorial vision about how students might collaborate?

First, as for Shneiderman, he ends the email with a brutally honest, personal and academic question: Why would a war hero listen to a scholar? This is a good question for all academics. Why would someone, anyone care about the work we do? Thus, one way to read the "Metroliner" story is as a self-reflective call to all academics to think hard about the relevance of their work as well as their ability to communicate their ideas to a wide variety of people, not just their friends and colleagues. Furthermore, this story suggests something very interesting about Shneiderman's character: He is clearly aware that his "bearded" academic life could be seen as a stereotype and dismissed by men and women who have seen war or anything horrible. Thus, he seems truly sensitive about his ideas being taken seriously by people who have been through serious things. Unlike the aforementioned exchange in which Shneiderman stands firm on his body of work and disagrees with a colleague, here we see another side of Shneiderman: The listener, in awe, quietly recording a fascinating scene on a train. This interest in people and their stories seems to be in harmony with or is a clear reflection of, his larger body of work dealing with the human side of computing. In addition, this email story reminds us of how our lives magically intersect with the lives of others. Obviously, after reading this, Zalinger immediately searched for any information on Ed Fitzsimmons and Tom Carhart. Fitzsimmons did not seem to bring up much useful data. However, a simple Google search brought up tomcarhart.net, which included a biography stating:

> Tom Carhart has been a lawyer and a historian for the Department of the Army in Washington, D.C. He is a graduate of West Point, a twice-wounded Vietnam veteran, and has earned a law degree from University of Michigan and a Ph.D. in American and military history from Princeton University. He is the author of five books of military history and adjunct professor of history at University of Mary Washington in Fredericksburg, Virginia (Tom Carhart, n.d.).

Clearly, this must be the same man. Therefore, should Shneiderman email Carhart or Fitzsimmons? Could Carhart, a military historian, verify that he was, indeed, one of the soldiers picked up by Fitzsimmons? Have the two of them been in contact since the train ride? What

would the two men think of Shneiderman's telling of this story? This email and the other two we have analyzed offered us a fertile, rich set of stories from which we can learn a lot about Shneiderman, personally and professionally.

4.5 What is Flemington?
Another exploratory option, as we mentioned above, is to use Shneiderman as a resource. In an email to Zalinger, Shneiderman suggested a range of possibilities for how to locate narrative elements in his archive. At the end of his list, he suggested that Zalinger could look for place names, "try Flemington for some personal history allusions," he wrote (Personal communication, 2009). This particular word struck Zalinger as interesting. Places are powerful in our memories. Was Flemington the narrative setting for some particularly emotional period in Shneiderman's life? Was he trying to lead Zalinger to something? Was Flemington the spot for some sort of traumatic event? Had he witnessed a murder! As it turns out, Shneiderman wrote in a subsequent email to Zalinger, "I was not quite sure what Flemington would bring up." So what was Flemington? "It was," Shneiderman wrote, "our childhood weekend chicken farm…with five families sharing a 1880 farmhouse" with 20,000 chickens and 26 acres in Flemington, New Jersey (Personal communication, 2009). At first, Zalinger struggled to find any illuminating narrative elements related to Flemington. However, after much digging, he came across one fascinating message that just happened, in passing, to mention Flemington. The message was dated January 15, 1994. Shneiderman describes a range of challenges, both emotional and professional. Having just returned from giving lectures in Florida and Georgia, he writes to an old friend that "the brochures are meant to make me look like a 'big muckamuck.'" This seems to indicate a level of modesty that has probably helped Shneiderman—or any academic—keep their balance as their career begins to take flight. Shneiderman writes that he is gratified that "within the narrow community of user interface design and human-computer interaction, people value what I have done. Of course, you also acquire strong opposition as you go along, so there are often battles to fight. Also, by my pressing forward on these human-oriented issues, I have become an outsider to many people in the broader computer science community." Here we find an academic struggling to assert his ideas and gain the respect of his peers—in fact, it seems the most challenging fight was closest to him: "My hardest struggle," Shneiderman continues, "is, of course, within my own department where I have relatively few supporters, and must fight for my students, financial support, room space, etc." In this same email, Shneiderman also discusses some very interesting personal details regarding the divorce of his wife, financial issues to iron out, scheduling time with his kids and so forth. He writes, "I am very much the kind of person who hangs on loyally to current relationships, but I think it is time for me to move on…" Again, we find another side of Shneiderman: Frustrated but self-aware enough to feel that the time has come to move on. It is not important to detail the personal nature of this message in its entirety. What is important is that Zalinger found it in the first place all because Shneiderman mentioned Flemington. And that is the lesson. Shneiderman gave Zalinger a narrative clue that led to another rich message. The lesson is to listen for narrative clues when the creator of the archive gives them to you—provided they are there to help. Zalinger keyed into Flemington because it was a setting, and setting is powerful in stories and life.

However, the owner of an archive might sometimes have a fuzzy memory about what happened and when. Shneiderman suggested that Zalinger look for Flemington, and it produced interesting results. However, the aforementioned "tibia" was actually not what Shneiderman meant for Zal-

inger to look for (Personal communication, 2009). He meant to say "talus," which brought up an interesting story of Shneiderman's daughter falling while hiking and ended up with titanium pins in her ankle—the talus bone. The lesson that Zalinger learned was that medical/anatomical words lead to moments of emergency and thus narrative tension. A list of 1000 common medical/anatomical words or phrases could produce more such results.

4.6 Do Email "Characters" Change Over Time?
Characters change over time. Think of any good story you have ever read. The main character must go through some kind of metamorphosis, either physical or psychological. Think of the classic example of Scrooge in *A Christmas Story*. Scrooge starts off as a mean and selfish man only to end up, in the end, warm and giving. Therefore, how can we discover character change in email archives? Although our keyword interface is not optimal, it does allow us to search by contact. If we define each conversation with a contact as a small scene, we can at least begin to look for what we will call change phrases—similar to how Shneiderman seemed to have come to a changed state in the previous section when he decides to move on emotionally. Possible change phrases could be: "I have changed," "he has changed," "she is different" "you are different" and so forth. However, those strings yielded few results in Zalinger's initial searches. Zalinger then chose to look for threads from the same long-time friend in the previous section on Flemington. Zalinger's hope was that this person might reference changes in Shneiderman's "character."

Zalinger's initial searches yielded few results. However, inspired by the brilliant software art project "We Feel Fine," which collects millions of human "emotions" from blogs, he searched for the phrase "I feel" (We Feel Fine, n.d.). This produced some very interesting results. Although the goal is to focus on the professional side of his archive, exploring this one contact for change phrases yielded results that can be applied, we believe, to other systems and archives more broadly. For example, In January, 1994, Shneiderman's friend wrote, "I feel hopeful." In May his friend wrote back and said, "I feel less anxious and more excited about my new status." By August 27th, his friend was now describing how "the stuff with the divorce has felt hard," yet also wrote that "I feel much less captive." In September his friend wrote, "I feel very uncommitable [sic]." The email exchanges between Shneiderman and his friend from 1994 are highly personal, inspiring and fascinating. Zalinger followed the trail of exchanges and found Shneiderman's friend writing two years later in 1996 that she was "Still with Rob[2], the man I have been with for two years almost. We are doing real well." Although she did not use the specific phrase "I feel," the initial query led Zalinger to this obvious character change. Again, although Zalinger's goal was to focus on the professional, these exchanges suggest that change phrases can be very effective in discovering how "characters" in email change emotionally over time.

4.7 Suspense
"In fact," writes H. Porter Abbott, "narrative is marked almost everywhere by its lack of closure. Commonly called suspense, this lack is one of the two things that above everything else give narrative its life" (Abbott, 2008). Email is useful, stressful and it is, we argue, suspenseful. It seems we are always waiting to hear back from someone about something of importance. Academics seem especially prone to being left with lots of email cliffhangers. Unlike the postal system, the

---

[2] Rob is a fake name.

reply, the answer—good or bad—can come any time of day or night, increasing, we argue, the sense of suspense, this lack of closure. Therefore, how in the world would one search for suspense in the email archives of an academic? The key to suspense is that the "characters" must have a dramatic want. A dramatic want is different from a normal want. A normal want is "I hope our paper is accepted." A dramatic want is "If this paper is not accepted, my career is over—I will be ruined." Characters must care deeply about something. They must have something at stake. They must want something so bad that it will either cause great harm or death or at least feel that way. What would a professor of human-computer interaction care deeply about professionally? Among the many possibilities, Zalinger decided to search for grant money. He searched for "National Science Foundation," "NSF" and "grant" in various combinations looking for scenes where Shneiderman was waiting to hear back about funding. These types of narrative searches can be called suspense phrases. On April 29, 1996, Shneiderman emailed a contact at NASA to ask if she would pitch in some grant money to bring Richard Beigel, at the time a Yale computer scientist, down to his lab for the year. Shneiderman included Beigel's biography, which stated that he studied things like "fault diagnosis" and "complexity theory." Having no idea what "complexity theory" was, Zalinger—as an outsider—was intrigued to learn more, to find out if Beigel was able to get the money and spend his sabbatical at Maryland. The NASA contact wrote back to say "Ben, this sounds very promising. I'll get back to you shortly." Did he get the money? Did Beigel spend a year in Maryland? Did he and Shneiderman work on "complexity theory" with NASA? To a former English major, it all sounded incredibly impressive and fascinating, but Zalinger was unable to find the next thread, so he had to search outside the database. Searching for the last name "Beigel" brought up enough results to suggest that he did get the grant. However, Zalinger wanted more proof, and a quick search on Google Scholar found what he needed. In a co-authored article with Egemen Tanin, Beigel and Shneiderman, a footnote reads "beigel@cs.umd.edu, partially supported by NSF grants...and by NASA grant NAG 52895, on sabbatical from Yale University until 8/1/97" (Tanin et al., 1997). Zalinger found what he wanted to know, and it also led him to think about another narrative query: What do academics do? They write articles and books. Just like grants, they submit and wait. Thus, Zalinger searched for "your submission," which seems to be a standard phrase for confirming with potential authors that their work has been received. This query found many interesting messages regarding the acceptance and sometimes rejection of various projects Shneiderman worked on. This particular query seems to get at the heart of academic life. The results returned lots of scenes of acceptance, "Our paper has been accepted. It is exciting" and rejection "The UIST '95 Program Committee regrets to inform you..." Other words that might be useful for searching through a scholar's archive include "tenure," "promotion," "failure," "success," "citation" and "keynote."

4.8 Suddenly, Shneiderman Pulled Out a Gun!

As far as we know, Shneiderman has never pulled a gun on anyone; however, the point of this final section is to illustrate the power, again, of a simple transition word. Unlike the word "however," which is a different type of transition, the word "suddenly" indicates a dramatic transition. It's a word used constantly in literature or any kind of storytelling to indicate a dramatic change. Read any compelling book, and you will almost certainly find the word "suddenly" in abundance. For example, on the first page of *Alice's Adventures in Wonderland*, Lewis Carroll writes, "suddenly a White Rabbit with pink eyes ran close by her" (Carroll, 1865).

Thus, searching for "suddenly" in Shneiderman's archives pulled up a rich variety of results, sometimes happy, and other times sad, but mostly they were very compelling, filled with suddenness of being "suddenly struck" by an idea or "suddenly discovered, to my extreme embarrassment..." or "he died suddenly," or "father died suddenly," or "Suddenly, lots of little problems make our daily living quite colorful," "Then suddenly your laughter sounds hollow as if its stemmed from your mouth and not your stomach. And the sun's rays feel hot like needles stabbing your back. You can no longer breathe, you feel choked." Sometimes the query found miscommunications: "I replied, 'so I hear,' and suddenly I'm 'issuing a critique.'" It found epiphanies: "We are actually quite excited about the data visualization ideas. When you added color to the model, suddenly it made a whole lot more sense." It found a robbery: "In the brief time we were away from the car, we had been robbed! I was blind-sided by the realization and suddenly felt very weak." It found people quitting: "...called to tell me you had quit suddenly." It found refreshing honesty: "About keynote speakers: I suddenly decided to speak my mind." There were travel stories from others: "When I still did not have the money 6 weeks later I was starting to wonder...but here suddenly Dieter stood in my office, with the money, some fruits from the island and all smiles." The search found breakthroughs: "It suddenly hit me and was clearly the right idea...we've been stuck on how to overcome this limitation for a few years and there it was." It found a powerful story from a friend describing life before and after a 6-hour, open-heart, triple-bypass operation: "Suddenly, I had no alternative; I was out of the picture." And of course, it found money problems: "Now suddenly, we are running a $25,000 'deficit' when we were told not to worry about the budget." In fact, "suddenly" seemed to suddenly turn up some of the longest, story-driven messages in the archive, and we believe that it is clearly a promising technique for finding even more interesting messages, especially in an archive that was more personal as opposed to professional.

5. Lessons Learned
For designers of archival systems, we believe this paper provides a variety of useful lessons learned:
- Think like a storyteller, and encourage your users to do the same.
- Simple timelines do not seem to work well with a narrative approach: they do not provide enough context.
- As others have noted, context is important. Find links to important events/places/people mentioned in the archive.
- Listen to the creator of the archive for narrative clues, and treat them as clues that lead you to narrative elements because they may have a fuzzy memory of what happened and when.
- Create a list of transition phrases.
- Search for tension. Searching for emotional or medical words found moments of stress or emergency, moments when people feel tense. Narrative pivots on moments of conflict and tension.
- Search for unusual words. Searching for "ninja" brought up three results. Also, an interesting story was revealed when Shneiderman encouraged Zalinger to find a thread from 1994 involving a colleague. Zalinger was unable to find the exchange using emotional words until he gave up and searched using the last name. Instantly, the exchange popped up, and he found what the colleague had said: "Why don't we stop all this crap and just

get on with the work?" Lesson learned: Design for swear words and slang like "crap." These words also help find moments of tension and conflict.

- Look for email "characters" to change over time. Common phrases such as, "I feel" produce fascinating results.
- Understand what the creator of the archive did for a living. An academic's email is surely different from the personal email of an Olympic wrestler.
- Find suspense. Challenging though it is, finding these moments led to some of the richest and most compelling messages in the archive. Words like "suddenly" indicate these dramatic transitions.

6 Implications for HCI

Marchionini wrote that "Exploratory search makes us all pioneers and adventurers in a new world of information riches awaiting discovery along with new pitfalls and costs" (Marchionini, 2006). We believe that our strategies will help users find the narrative riches awaiting discovery in email archives. We argue that this paper makes a significant contribution to HCI for archival exploration. By thinking like a maker of narratives and thinking about narrative elements, designers can create robust interfaces that help users—with or without the archive creator's help. Someday, we will find ourselves and our hard drives so packed with "data," that we will be at a loss to make any sense from it. Thus, if designers think about narrative elements now, we can build systems that help users find the often revealing exchanges such as those Zalinger found in Shneiderman's archive. We argue that narrative elements exist in all email archives: we just need to help users find them. We hope that this paper helps to lay the groundwork for narrative system designers. The challenge is finding the narrative elements in digital archives. The tragedy would be if we did nothing. Designers have a responsibility not just to capture personal data but to help users find the illuminating narratives in email archives.

7 References

Abbott, H. P., 2008. The Cambridge Introduction to Narrative, 2nd ed. Cambridge University Press.

Bell, G., & Gemmell, J., 2007. A digital life. Scientific American. http://www.sciam.com/article.cfm?id=a-digital-life.

Ben Shneiderman's Photo History. n.d. URL available upon request to ben@cs.umd.edu.

Byrne, D., & Jones, G. J., 2008. Towards computational autobiographical narratives through human digital memories. In: Proceedings of the 2nd ACM International Workshop on Story Representation, Mechanism and Context, pp. 9-12.

Carroll, L., 1865. Alice's Adventures in Wonderland. Retrieved from Project Gutenberg: http://www.gutenberg.org/files/11/11-h/11-h.htm.

Carvalho, V. R., & Cohen, W. W., 2005. On the collective classification of email "speech acts." In: Proceedings of the 28th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval. ACM Press, NY, pp. 345-352.

Elsweiler, D., Baillie, M., & Ruthven, I., 2008. Exploring memory in email refinding. ACM Transactions on Information Systems 26 (4), 1-36.

Gonçalves, D., & Jorge, J. A., 2008. In search of personal information: Narrative-based interfaces. In: Proceedings of the 13th International Conference on Intelligent User Interfaces, pp. 179-188.

Kearney, R., 2001. On Stories. Routledge, New York.

Kleinberg, J., 2002. Bursty and hierarchical structure in streams. In: Proceedings of the Eighth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. ACM Press, NY, pp. 91-101.

Leskovec, J., Backstrom, L., & Kleinberg, J., 2009. Meme-tracking and the dynamics of the news cycle. In: Proceedings of the 15th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. ACM Press, NY, pp. 497-506.

Leuski, A., 2004. Email is a stage: discovering people roles from email archives. In: Proceedings of the 27th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval, pp. 502-503.

Marchionini, G., 2006. Exploratory search: From finding to understanding. Communications of the ACM, 49 (4), 41-46.

MyLifeBits. n.d. http://research.microsoft.com/en-us/projects/mylifebits/default.aspx.

Perer, A., Shneiderman, B., & Oard, D. W., 2006. Using rhythms of relationships to understand e-mail archives. Journal of the American Society for Information Science and Technology, 57 (14), 1936-1948.

Shneiderman, B., 2002. Leonardo's Laptop: Human Needs and the New Computing Technologies. MIT Press, Cambridge, MA.

Tanin, E., Beigel, R., & Shneiderman, B., 1997. Design and evaluation of incremental data structures and algorithms for dynamic query interfaces. In: Proceedings of the IEEE Symposium on Information Visualization. ACM Press, NY, pp. 81-86.

Tat, A., & Carpendale, S., 2006., CrystalChat: Visualizing personal chat history. In: Proceedings of the 39th Annual Hawaii International Conference on System Sciences.

The Radicati Group. 2009. Email statistics report 2009-2013. http://www.radicati.com/?p=3237.

Tom Carhart. n.d. http://tomcarhart.net/.

Viegas, F., boyd, D., Nguyen, D., Potter, J., & Donath, J., 2004. Digital artifacts for remembering and storytelling: Posthistory and social network fragments. In: Proceedings of the 37th Annual Hawaii International Conference on System Sciences.

Viegas, F. B., Golder, S., & Donath, J., 2006. Visualizing email content: Portraying relationships from conversational histories. In: Proceedings of SIGCHI Conference on Human Factors in Computing Systems. ACM Press, NY, pp. 979-988.

White, R. W., Kules, B., Drucker, S. M., & schraefel, m., 2006. Introduction. Communications of the ACM 49 (4), 36-39.

We Feel Fine. n.d. http://wefeelfine.org/mission.html.

Jason Zalinger[a] (corresponding author, zalinj@rpi.edu tel. 001 203-260-1778 fax. 001 518 276-4092) **Bio**: Jason Zalinger is a PhD Candidate in Communication and Rhetoric at Rensselaer Polytechnic Institute in Troy, NY.

Nathan G. Freier[a] (freien@rpi.edu) **Bio**: Nathan G. Freier is an Assistant Professor of Human-Computer Interaction in the Department of Language, Literature, and Communication at Rensselaer Polytechnic Institute. He received his Ph.D. in Information Science from the Information School at the University of Washington in 2007. His publications have appeared in such journals as the *International Journal of Human-Computer Studies*, *Journal of Environmental Psychology*, *Interaction Studies*, and *Networks and Spatial Economics*. His research investigates the human relationship to technology with a particular focus on both adults' and children's social and moral conceptions of technology.

Manuel Freire[bc] (manuel.freire@uam.es) **Bio**: Manuel Freire obtained his PhD in Computer Science at the Universidad Autónoma de Madrid, Spain, and is currently enjoying a Fulbright post-doctoral research stay at the University of Maryland. His research interests are human-computer interaction, graph visualization, user adaptation, collaborative learning and academic plagiarism detection.

Ben Shneiderman[c] (ben@cs.umd.edu) **Bio**: Ben Shneiderman is a Professor in the Department of Computer Science, Founding Director (1983-2000) of the Human-Computer Interaction Laboratory, and Member of the Institute for Advanced Computer Studies at the University of Maryland at College Park (http://www.cs.umd.edu/~ben). He is the author of *Leonardo's Laptop: Human Needs and the New Computing Technologies* (MIT Press, 2002) and *Designing the User Interface: Strategies for Effective Human-Computer Interaction: Fifth Edition* Addison-Wesley, 2009).

[a]Rensselaer Polytechnic Institute, Troy, NY 12180
[b]Universidad Autónoma de Madrid 28049 Madrid, Spain
[c]University of Maryland College Park, MD 20742