An exploratory visualization of expert chat development in a *World of Warcraft* player group

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Abstract: This paper describes the visualization of chat log data in the massively multiplayer online game *World of Warcraft*. Charts were created to get a general sense of chat trends in a specific player group engaged in "high-end raiding," a 40-person collaborative activity. These charts helped identify patterns in the frequency of chat over time during two specific gaming sessions. The sessions represented significant moments in the raid group's history: the first time a particular monster, Ragnaros, was fought and one of the first times he was defeated. The visualization process, while useful, is only one analysis tool in a fuller ethnographic account of expertise development in *World of Warcraft*.

Keywords: Visualization, Chat, Expertise, MMOG, *World of Warcraft*

Imagine 40 people grouped together in a dark, hot, volcanic cavern deep beneath the earth. Some of them appear to have been human at one point, but the flesh rotting off their frames clearly point to some supernatural force. Others are muscular, green-skinned brutes or wiry, purple-skinned figures sporting Mohawks and tusks. Finally, some of them tower above the others with their massive cow-like forms. Some in this exotic group are dancing, some are

jumping up and down, others are sitting and drinking water and various other liquids, but the majority of them are just standing around, waiting or watching the large, spiky snake-man creature in the middle of the chamber. The humanoids are wearing an assortment of leather or metal armor and/or cloth or silk robes, and they are equipped with glowing swords, maces, and staves. A few of them are discussing the upcoming fight. One of them in particular is talking about the specific positions and roles for the others during the fight. Many of the others are talking privately with each other at the same time, sharing pleasantries or chatting about more mundane events, as if oblivious to their locale and the upcoming fight.

The apparent leader, the one who was summarizing roles and positions, yells, "Get in positions!" and everyone spreads out, running to various parts of the large cavern. A sizeable group of them bunches up near a lava flow, directly across from the snake-man.

"Talk to Domo!" yells the raid leader, and one of the green orcs, decked out in full metal armor, rushes to the snake-man, Majordomo Executus.

Domo, seeing the orc approach, yells, "Impudent whelps! You've rushed headlong to your own deaths! See now, the master stirs!" He then summons his boss, the overlord of this intricate cavern system known as Molten Core.

His name is Ragnaros, and he emerges from the center of the chamber, adding to the sweltering heat, his fiery, semi-liquid form towering and massive like no other monster in this harsh land known as Azeroth.

"Behold Ragnaros - the Firelord! He who was ancient when this world was young! Bow before him, mortals! Bow before your ending!"

Surprisingly, Ragnaros bellows, "TOO SOON! YOU HAVE AWAKENED ME TOO SOON, EXECUTUS! WHAT IS THE MEANING OF THIS INTRUSION???"

"These mortal infidels, my lord! They have invaded your sanctum and seek to steal your secrets!"

"FOOL! YOU ALLOWED THESE INSECTS TO RUN RAMPANT THROUGH THE HALLOWED CORE? AND NOW YOU LEAD THEM TO MY VERY LAIR? YOU HAVE FAILED ME, EXECUTUS! JUSTICE SHALL BE MET, INDEED!"

With that, Ragnaros slays Majordomo Executus with a flaming ball of fire.

"NOW FOR YOU, INSECTS! BOLDLY, YOU SOUGHT THE POWER OF RAGNAROS. NOW YOU SHALL SEE IT FIRSTHAND!"

The raid leader, unfazed, yells, "ATTACK!" and a flurry of activity commences.

Within moments, the raiders are all dead.

This event was experienced repeatedly by a group of players in the massively multiplayer online game (MMOG) *World of Warcraft* (*WoW*) who delved into Molten Core (MC) weekly for a period of about ten months. My research is an ethnography of this group as a fellow group member, and I attempt to document the collaborative learning and expertise development found within the group.

Expertise and change in expert practice

Expertise development may occur in all the domains of activity in which people participate. Looking at expertise development in these various settings is important for "understanding consequential learning across settings" (Bell et al. 2006). Additionally, expertise development is a sociocultural process situated within specific contexts, and acquiring expertise is, as Collins and Evans (2007) note, "a matter of socialization into the practices of an expert group…"

The practices of an expert group, however, also change over time, especially with a newly formed group that has to learn effective methods to succeed, or with an established group encountering new challenges. The players of *World of Warcraft* whom I studied and played with are one of these expert groups that had to learn and develop new forms of expert practice. Studying this group and other informal learning groups may help us understand the necessary elements of group dynamics for success in all the various ways it may be defined.

By participating with the group (also known as a "raid"), I got a sense of the kinds of in-game talk and practice happening, how they change over time, and how this change could paint a portrait of expertise development with the group. Additionally, by being in the trenches, I began to question whether all players of the raid could and did participate equally.

This paper documents an attempt to confirm my initial thoughts about the ways in which this particular raid's practice evolved and whether certain categories of players participated (that is, used in-game chat) less than others did. I do this by visualizing [1] and comparing the chat logs from two different nights in the in-game dungeon Molten Core. My visualizations show patterns in the main form of communication in our shared activity that I could not readily see before and thus allow me to theorize further about the nature of chat while raiding. Of particular note is that the first example represents the first time we encountered Ragnaros, the last monster in MC, while the second example, occurring after weekly attempts for three months, documents one of the first times we were able to defeat Ragnaros. The difference in how chat was used gives evidence to how our actions and practices as raiders changed to enable us to succeed.

Many educational researchers have written about methodological issues surrounding the use of visuals to help analyze and illustrate qualitative data (e.g., Goodwin, 1994, and Stevens, 2000). Additionally, many quantitative studies necessarily use charts and other visualization

tools to present data (e.g., Yee, 2008). Literature regarding the specific use of visualization tools for qualitative studies, such as that of Horney (1994), and Ruberg and Moore (1995), however, are few. Therefore, I mean to describe exactly the method and reasoning behind the creation of the charts in this paper in an attempt to address this lack of transparency. I also hope that the inclusion of my methods will be useful for people attempting the same kind of analysis.

Setting

World of Warcraft follows a tradition of "role-playing" games loosely based on *Dungeons & Dragons* (TSR, 1974, and Wizards of the Coast, 2008) set in a Tolkienesque fantasy world full of exotic locales, aggressive monsters, and glory to be had. Players create a character to play by choosing its class (warrior, rogue, etc.), race (human, orc, etc.), and sex (see figure 1). Character class and race determine his or her initial attribute values (strength, agility, etc.) and the available abilities or actions he or she can perform. The abilities from one class complement those from a different class, encouraging players to team-up and cooperate. As a player journeys through the land with his or her character, completing quests and defeating monsters, the character gains "experience points" or "XP." After a certain amount of XP, the character advances an "experience level" and becomes more powerful through a rise in his or her attribute values and access to new abilities. Additionally, the corpses of defeated monsters can be searched for valuable items (known as "loot") which may help characters outfit themselves and be better prepared for future encounters. Some loot, for example, were enchanted and gave additional bonuses to a character's attributes.

Figure 1: Character creation showing the different races and classes players can choose to play.

During the time of my data collection, *WoW* had a level cap of 60, which means that characters started out at level one and could only advance to level 60, at which point no more XP could be gained [2]. Once reaching level 60, the only way to improve a character was to join a raid that went to "endgame" dungeons to kill the monsters within for the loot they "dropped." Once formed, these expert groups needed to learn how to work collectively and coordinate with each other on team based activities. I joined a 40-person raid group that met up each week to delve into the dungeon known as Molten Core for a period of about ten months (October 2005, when it first formed, through July 2006).

Figure 2: The Molten Core dungeon and some of the monsters found within.

Molten Core was a volcanic cave located in a fiery, barren landscape. The sounds of lava flows and rushing hot air provided steady background noise as we delved and fought the monsters inside. These monsters included several big "boss" monsters with names like Majordomo Executus and Ragnaros and many more generic monsters like rocky Molten Giants and two headed Core Hounds (see figure 2). Like all *World of Warcraft* monsters, each monster in MC had a set of abilities it used when fighting. For example, Molten Giants had a Stomp ability that damaged everyone around them. Part of successfully raiding a dungeon meant learning effective approaches to each encounter. We met twice a week for about seven months and then just once a week for three months as we became more efficient in our monster killing. Each session lasted about five hours, and each week we would attempt to kill as many of the boss monsters as possible before the dungeon reset every Tuesday. That is to say, every week we

would start anew because Molten Core would be set back to its initial state and all of the bosses would reappear. This was deliberately designed into the game to allow groups to achieve progress through iterative attempts to clear the dungeon. Some of the regular monsters, however, reappeared (known as "repopping" or "respawning") after a few hours making backtracking difficult. Only after delving for seven or eight months, were we able to clear the dungeon completely before it reset the following week.

Figure 3: Ragnaros, the last boss monster in Molten Core. Our skeletal remains littering the floor around him are good indicators of how massive and tall Ragnaros is.

The last three months of this seven or eight month period were spent achieving the ultimate goal of raiding MC, defeating the last boss monster, Ragnaros (see figure 3), and collecting the epic loot he dropped. In other words, it took us five months or so of visiting MC to learn how to kill efficiently the monsters before Ragnaros. Then it took another three months to learn how to execute successfully the Ragnaros fight. Like all the boss monsters, when he died, Ragnaros only dropped three or four items. This meant that we continued to visit the dungeon to defeat Ragnaros many more times in the following months in order for every raid member to receive a loot reward. [3]

Visualizations

Multiple changes to our practice and talk needed to occur for us to defeat Ragnaros. What follows are six pairs of stacked bar charts showing patterns in the text chat that was happening on two different nights in Molten Core, focusing on the Ragnaros fight. The two nights represent our first serious attempt at fighting Ragnaros on February 24, 2006, and the second time we were able to defeat him on May 19, 2006. Each session has been cropped to include only the time spent preparing for, fighting, and then debriefing our encounters with Ragnaros. On the first night, we attempted to defeat him four times before we gave up. After each defeat, we had to spend time to resurrect ourselves, regroup, and try again. On the second night, we finally killed Ragnaros on our third attempt.

The six pairs of charts show a timeline view of different ways in which the chat was broken down by (see Appendix A): chat channel (chart pair 1), character class (pair 2), strategy talk (pair 3), whether the utterance was made by a raid leader (pair 4), and gender (pairs 5 and 6). On the first night, we started preparing for the fight with Ragnaros at 9:15 PM and ended the

night at 10:51 PM. The second night's Ragnaros section was longer, starting at 7:37 PM and ending at 9:32 PM. Common to each chart are areas marked with red bands showing the actual Ragnaros fights. Also, for most of our sessions, voice chat chatter was relatively constant, but the gray bands show specifically moments when the majority of voice chat focused on strategy or on-task talk about the Ragnaros fight. Unfortunately, for these two gaming sessions, I did not record our voice chat data and only have my field notes to go by. The partial captures of the two nights under study show two significant milestones in Molten Core, however, and they serve by their contrast rather than their individual full capture of data.

These charts helped me more clearly see how our talk changed, reflecting changes in our practice over time. One question under scrutiny was if the later night had more participation turns, something that Iacono & Weisband (1997) suggest can show evidence of trust within the group. It is clear that the second night did indeed have more talk happening, so it is possible that this is evidence of trust and that it reflects the behavior of a more confident group.

The charts also brought up further questions that I can now attempt to answer. Overall, for example, on the second night, it is clear that the time between our second and third attempts to defeat Ragnaros is longer than other in-between sections. Going back to the chat logs, I remembered that this particular night was one in which we were not able to revive ourselves after the second fight. This was normally done by someone known as a "safe rezzer," usually a character who could resurrect ("rez") others from the dead who had a Soulstone (an item created by Warlocks) that he or she could use first to self-rez. Soulstones had a time limit before they ceased to exist whether used or not, and Warlocks could only make one every 30 minutes.

After our first attempt to kill Ragnaros, while the raid was being revived, someone accidentally attracted Ragnaros's attention. He then proceeded to kill everyone again, marked by

the green band, forcing another of our safe rezzers to use his or her Soulstone. By the time we failed to kill Ragnaros a second time, we had run out of safe rezzers. This meant that we would all have to "release" our souls and appear as ghosts at the nearest graveyard to run back and claim our bodies upon entering the dungeon. This was a huge set-back, however, since some of the regular monsters in MC had "repopped" already, meaning we would have to spend valuable time killing them again to get back to Ragnaros's location. Eventually, we decided to have a couple of rogues (a character class that could sneak around undetected by monsters unless it got too close) attempt to stealth their way to Ragnaros's chamber and use an item called a Goblin Jumper Cable to bring a priest back to life. The area of the chart where the rogues decided to try "stealthing" through Molten Core has been marked with the blue/purple band. One of the rogues died on the way, but the other succeeded, and the raid was able to revive itself in Ragnaros's chamber and attempt (successfully!) to kill him one last time.

Successfully sneaking to Ragnaros caused a little more chatter than would normally have happened, since some of what was said in the last part of the night consisted of thanking the rogue (me, as it happens) who succeeded in making the run. This may explain some of why the last part of the session has relatively high chat frequencies. Immediately after we defeated Ragnaros, of course, the chat erupted with cheers and congratulations.

This kind of analysis was spurred by looking at pattern changes in the visualization of the data, since I was more quickly able to identify moments worth investigating. Breaking the chat down by various different kinds of categories or coding schemes also shows different kinds of patterns.

Chart pair 1: Chat channel

The first pair of charts (see chart pair 1) show the timeline view of the number of utterances per chat channel (marked by color) used while raiding. These charts clearly show that most of the talk occurred in the [Raid] channel (orange), the common channel that all raid members could see. Areas where there were high frequencies of [Yell] (light gray) utterances coincide with actual fights with Ragnaros because most of the yells that occurred during our sessions were our raid leader yelling commands such as "ATTACK!" during the fights. Ragnaros also yelled during the fights (such as "DIE, INSECT!" any time one of the raiders died) but yells from non-human actors were not included in the charts.

Another part that stands out is the activity in the [madrogues] channel (yellow), a specialized, private channel that all the rogues subscribed to so we could talk about rogue specific strategies. Each role within the raid had a specialized channel, but, as a rogue, I was only subscribed to the one in which I belonged. [4] Clearly, the rogues used their private channel, but what is not captured in these charts is how much talk on different channels is task-specific talk or just general chatter. I'll write more about this in the discussion for chart 3.

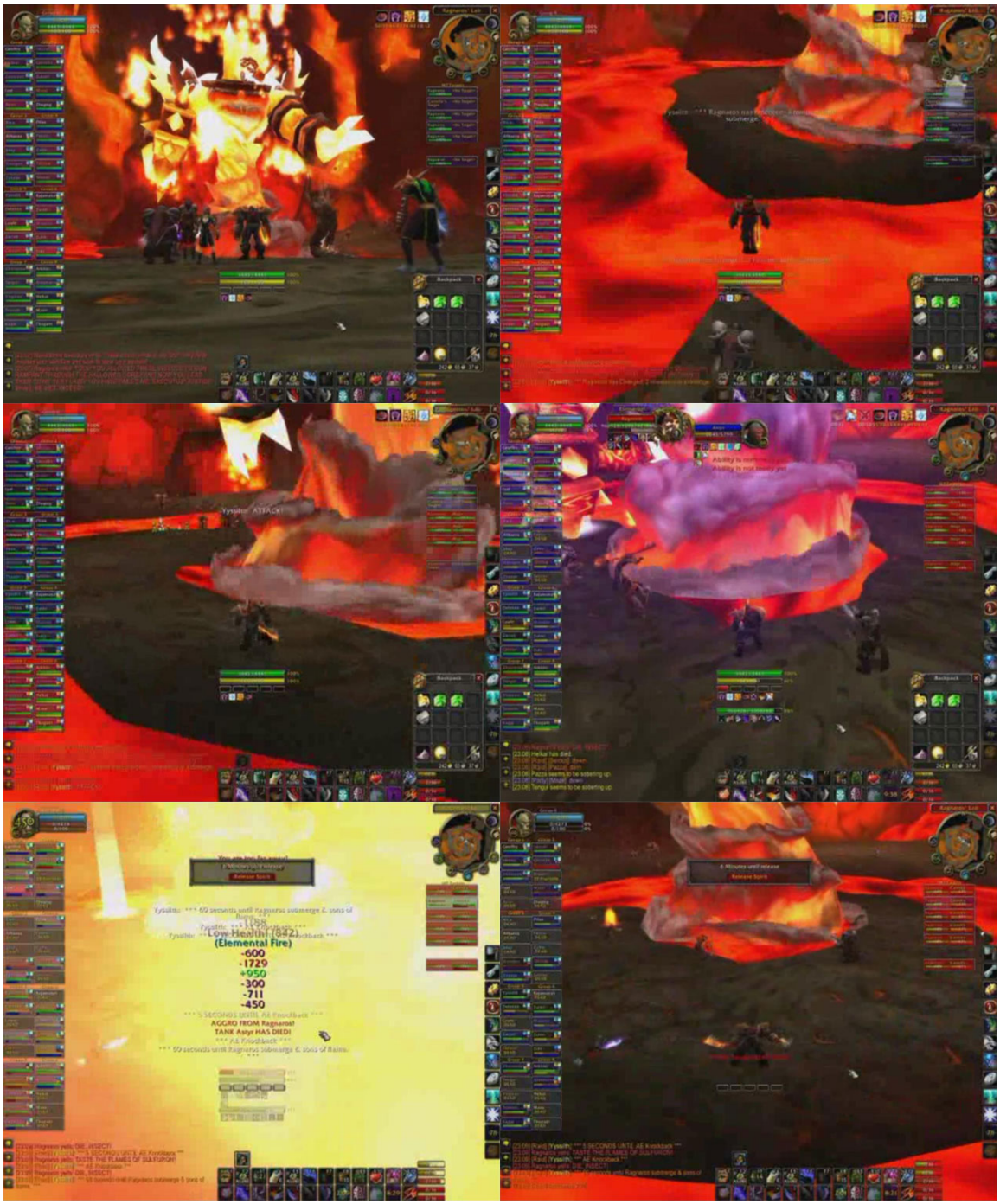

Figure 4: The rogues starting position and movement to final positions for the Ragnaros fight. It is clear that we are spread out and not in an optimal location, which lead to our early deaths.

Figure 5: By this time, the rogues have learned exactly where to stand during the fight, evident through our bunching up and standing on top of each other.

Finally, the brown areas generally show moments of people "emoting" with their characters, such as hugging another character or making a roar. These appear in-game as non-verbal lines of chat (e.g. "Thoguht flexes his muscles."). They also include players "rolling" (using an in-game mechanism to generate a random number) for loot that dropped from Ragnaros after the final, successful fight with him, which is why there are large brown areas in that part of the timeline.

Seeing the [Whisper] channel (pink) caused me to go back into the chat logs and look up what was happening. Whispers are private chat between two players. Only these two players can see the chat, therefore all the whispers that I captured are either to me or from me to another player. On the first night at 22:00 (10 PM), I exchanged some whispers with the raid leader clarifying where the rogues were supposed to be positioned during the Ragnaros fight. Further looking at the logs, in the [madrogues] channel before the first fight with Ragnaros, there were questions about our location, and it was clear after the fight that we were not in optimal places (see figure 4). By the time we took down Ragnaros three months later, we had learned where to position ourselves (see figure 5). This is not evident solely through the chat visualizations, but, through them, I was able to pinpoint moments of clarification.

Chart pair 2: Character class

Dividing the number of utterances by the character class of the speaker shows us different information. For example, it is clear that druids (orange) were not talking much in text chat on the first night. My sample size (40 players each night) is small enough that this change could be simply because one druid was missing on the first night. For future analysis, I need to run queries on the database to divide further the chat by individual participant.

Mages (blue), on the other hand, seem to have been participating very frequently. This can be explained readily when one realizes that the raid leader, the one person who talked much more than others, was a mage. Rogues (yellow) seem to have talked a disproportionate amount, too, but that can be explained by comparing these charts with the previous charts divided by channel. Since I captured the [madrogues] channel, I captured more data on rogues than any other class.

Chart pair 3: Frequency of strategy talk

Coding the different chat utterances based on on-task and off-task talk uncovers that more strategy talk happened during our successful night than our first night. The pink areas show strategy related talk such as argumentation on different approaches to an upcoming fight or notifications of events during a fight. Purple indicates any chat line that consisted of talk about "buffing" or emotes of characters actually performing "buffs." A buff is a temporary bonus to a character's abilities, usually given by certain characters as spells or enchantments on others. Buffing tended to happen between fights, and, in the case of these two nights, they happened after all raid members had been revived after a failed attempt at killing Ragnaros. This was because buffs went away upon character death, so our buffers needed to recast them after each time we failed.

A look back at the actual chat makes clear why much more strategy talk was happening during the fights themselves on our successful night. The fight happened in phases that were time-dependent, and, by the time of the second night, we had learned the timing of the fight. A new practice for us was to designate one of our raid members to be a timekeeper and call out in the [Raid] channel how much time was left before the next phase every 30 seconds or so. Upon

entering a new phase and for other moments of significance, our raid leader also called out these moments so the rest of the raiders knew what to do at any given time.

A future area for inquiry would be to do a micro examination of the timekeeper and his change in practice over time. I also want to combine the differentiation of strategy talk with the differentiation of chat channels and character class to see if certain ones have more strategy talk than other ones do.

Chart pair 4: Talk made by raid leaders

Seeing how much of the strategy talk was affected by our raid leader, I ran another query dividing the chat into leader and non-leader talk. We had one main raid leader, a mage as stated earlier, but also three other players, two warriors and one warlock, who were semi-leaders in their own right. Coding each of their chat lines shows how much talk was made by them (dark blue), especially during the fight moments. Most of this, as stated in the discussion for the strategy charts, was the raid leader calling out specific events.

Chart pair 5: Talk by gender and Chart pair 6: Talk by gender without leaders

The green areas show talk by women players, while the purple areas show talk by men. I should note that I did not collect offscreen demographic information from these players, so their gender designation is my best guess from what their voice sounded like. It is possible that I confused a man for a woman and vice versa based on his or her voice, but there were no cases where I thought there was doubt.

One of the main reasons why I initially decided to do these data visualizations was to confirm a feeling I had about the disproportionate gender talk in these raids. I thought that women were participating with lower frequency than men were, and seeing the charts confirm this phenomenon, at least for these two nights, flags another topic for me to study. For the first

night, we had 11 women and 31 men in the raid (a couple of people had to leave early and we filled their vacated spots with two new people, for a total of 42 participants), yet they only made up about 16.7% of the talk. The second night had a bigger imbalance: 9 women and 32 men with the women making about 7.5% of the participation. Full details can be seen in table 1.

Since the raid leader, who spoke more than anyone else, was a man, I decided to exclude his and the other three raid leaders' talk in the last chart. Two of the raid sub-leaders were women, explaining why on the first night, the percentage of talk does not change. On the second night, however, because the raid leader was talking much more during our fight sections, removing leader talk changes the percent of women talk (7.5% v. 9.4%).

		Women	Men	% women
Feb 24	**Players**	11	31	26.2%
	Chat utterances	125	623	16.7%
	Chat utterances w/o leader data	91	455	16.7%
May 19	**Players**	9	32	22.0%
	Chat utterances	108	1323	7.5%
	Chat utterances w/o leader data	88	851	9.4%

Table 1: Percent of players who were women and percent of chat made by women.

Considering raid leadership helps unearth questions about the coding scheme I used and if it affected the outcome of gender differences. Are there informal leaders within the raid, for example, who may or may not be women who talk more than others do, and if so, does that skew my data in ways that make excluding designated leaders (other than the main leader) meaningless? The truth is that spontaneous leadership and mentoring happened whenever we had a new raid member for the evening or when a raid member noticed an aspect of the activity that no one else seemed to be mentioning. Painting broad strokes with these charts, therefore, can

only show us broad pictures of patterns of participation, not the specific details that are needed for a full account of raiding activity.

It is also possible that women used private channels more than men did, or perhaps women tended to play certain character classes and all people playing these character classes tended to talk less. All of these considerations require further narrowing down of the criteria for information to report. In future analyses, I will do these reports and charts once I've also entered more sessions into the database.

Details for visualization process

While playing *World of Warcraft*, I used a third-party addon or extension to the game that let me dump the text chat from the sessions into external text files. They included the date, time, and chat utterance. These log files were reformatted and saved with a text editor that supported regular expressions: a way of matching patterns of text using various syntactically meaningful symbols (Wikipedia, 2008). The new files included explicit channel and actor information as separate columns (see figure 6). For example, this expression was used to change all lines with "<character name> whispers" such that they appeared in the [Whisper] category within a channels field:

Search for: ([0-9])\t([A-Z][a-z]{1,}) whispers:

Replace with: \t[Whisper]\t\2\t

The result is that "Bob whispers: how are you?" turns into "[Whisper] Bob How are you?"

```
5/19 20:44:13.343  : [Raid] Thoguht: let me die if I pull aggro
5/19 20:44:32.921  : Rory has died.
5/19 20:44:42.437  : [Raid] Roger: uh oh?
5/19 20:44:44.218  : [1. madrogues] Rory: yep I died...
5/19 20:44:48.437  : [Raid] Roger: ahh
5/19 20:45:08.968  : [Raid] Mandy: *sigh*
5/19 20:45:20.031  : [Raid] Rory: Thoguht is stealthing pretty good
5/19 20:46:06.656  : [Raid] Mandy: Nice job Thogut.
5/19 20:46:11.125  : [Raid] Derek: everyone cross your fingers
5/19 20:46:17.468  : [Raid] Wallace: Help us, Thoggie, you're our only hope. *end transmission*
5/19 20:46:18.687  : [Raid] Rory: Go Go Thoguht!
5/19 20:46:19.781  : Wei whispers: im your biggest fan

2006/05/19      20:44:13.343    20:44   [Raid]  Thoguht let me die if I pull aggro
2006/05/19      20:44:32.921    20:44   [Emote] Rory    Rory has died.
2006/05/19      20:44:42.437    20:44   [Raid]  Roger   uh oh?
2006/05/19      20:44:44.218    20:44   [1. madrogues]  Rory    yep I died...
2006/05/19      20:44:48.437    20:44   [Raid]  Roger   ahh
2006/05/19      20:45:08.968    20:45   [Raid]  Mandy   *sigh*
2006/05/19      20:45:20.031    20:45   [Raid]  Rory    Thoguht is stealthing pretty good
2006/05/19      20:46:06.656    20:46   [Raid]  Mandy   Nice job Thogut.
2006/05/19      20:46:11.125    20:46   [Raid]  Derek   everyone cross your fingers
2006/05/19      20:46:17.468    20:46   [Raid]  Wallace Help us, Thoggie, you're our only hope. *end transmission*
2006/05/19      20:46:18.687    20:46   [Raid]  Rory    Go Go Thoguht!
2006/05/19      20:46:19.781    20:4    [Whisper]       Wei     im your biggest fan
```

Figure 6: Raw chat log on top, edited file below with pieces of info separated into columns.

After these files were saved with these separate columns, they were imported into Microsoft Excel, which was used to create initial pivot tables and charts to get a sense of what was possible (E. Speckman, personal communication, November 2008). It was clear that visualizing the data might prove useful, but I did not have an easy way of coding each line with participant information such as alias, gender, and character class. To resolve this, the files were imported into a MySQL database, and an additional table ("aliases") was created that just had participant metadata. By creating this relational database, linking information from one table to another was possible using the SQL "JOIN" command. Here's the code I used for outputting a new file that included all of the data in the chat logs plus information about the actor on each chat line (see figure 7):

```
SELECT `20060519`.Time, `20060519`.Channel, aliases.Alias, aliases.Class,
aliases.SexReal, aliases.Leader, `20060519`.Chat
FROM `20060519` JOIN aliases ON (`20060519`.Name = aliases.Name)
```

Time	Channel	Alias	Class	SexReal	Leader	Chat
20:44:00	[Raid]	Thoguht	Rogue	M		let me die if I pull aggro
20:44:00	[Emote]	Rory	Rogue	M		[redacted] has died.
20:44:00	[Raid]	Roger	Rogue	M		uh oh?
20:44:00	[1. madrogues]	Rory	Rogue	M		yep I died...
20:44:00	[Raid]	Roger	Rogue	M		ahh
20:45:00	[Raid]	Mandy	Mage	M		*sigh*
20:45:00	[Raid]	Rory	Rogue	M		Thoguht is stealthing pretty good
20:46:00	[Raid]	Mandy	Mage	M		Nice job Thogut.
20:46:00	[Raid]	Derek	Druid	M		everyone cross your fingers
20:46:00	[Raid]	Wallace	Warrior	M		Help us, Thoggie, you're our only hope. *end trans...
20:46:00	[Raid]	Rory	Rogue	M		Go Go Thoguht!
20:04:00	[Whisper]	Wei	Warrior	M		im your biggest fan

Figure 7: SQL output of the joined tables ("20060519" and "aliases").

Queries were run on the database counting the number of times something occurred per minute and saved as comma delimited values (CSV) text files. Each query counted something different, such as a specific chat channel or the number of times a woman spoke. For example, the query used to count the number of times a rogue spoke was:

```
SELECT `20060519`.Time, Count(`20060519`.Time)
FROM `20060519` JOIN aliases ON (`20060519`.Name = aliases.Name)
WHERE `20060519`.Channel NOT LIKE "[Guild]" AND aliases.Class LIKE "Rogue"
GROUP BY `20060519`.Time
```

This produced rows formatted with just two columns: the minute and the number of times a rogue spoke in that minute.

These files were aggregated and manipulated in Excel so that, for example, the one for character class included columns for each class. The resulting table (see figure 8) was then saved as a flat CSV files and then read by a Flash-based web application, amCharts (Marcelionis, 2008), to make the timeline charts. This meant editing and saving HTML and settings files with a text editor for each chart pair. I then took screenshots of the charts and edited them with Adobe Photoshop, adding the hanging color bands and notes.

```
# Time,Druid,Hunter,Lock,Mage,Priest,Rogue,Shaman,Warrior
19:37,0,0,0,3,0,2,2,1
19:38,1,0,0,2,1,2,0,2
19:39,0,2,0,0,2,3,4,3
19:40,0,1,3,0,0,6,3,0
19:41,0,0,0,2,3,2,0,1
19:42,0,0,1,3,0,3,0,1
19:43,0,0,6,6,5,2,0,5
19:44,0,1,4,0,0,5,1,1
19:45,0,1,3,4,0,1,2,5
19:46,0,3,2,2,2,1,1,3
```

Figure 8: The first few rows of the class text file read by amCharts.

After creating several charts in this fashion, it was clear that some of the talk patterns were confounded by whether the talk was on-task, so I had to go back into the original log files and code each line, flagging strategy talk, talk about buffs, etc. In truth, the whole process was very cyclical, where I would go through the steps to generate a pair of charts and realize I had forgotten to exclude or include certain things in the query. For example, I had originally only excluded leaders from the second gender chart pair, but I realized that my own whispers potentially biased the charts towards men. One thing to note is that excluding leaders from the results might counter-bias the talk towards women since it excludes talk coming from players designated as leaders that might not be motivated by their role as leaders. I hope that the description of my methods makes them transparent enough for dissection and critique.

Conclusion

There are technical limitations to the charts for data analysis of my chat logs. For these two raid nights, I did not capture voice chat, owing to hardware limitations at the time, whereas I do have this data for other nights. It would seem I may have an incomplete picture of all chat activity, but, again, I was interested in the comparison of the data that I had for these two critical times in the raid's history.

There are several methodological limitations to using charts, too. The most glaring problem is that the visualizations only show general patterns without going into the intricate details of raiding practice. They generalize the activity without explaining it. It is possible, for example, to see talk in the various channels, but we have no clear sense of how each line of talk relates to previous lines, whether a conversation or argumentation is happening, etc. For these kinds of conclusions, it is necessary to go back into the chat logs and manually follow threads, code individual lines, inspect specific players or categories of players, etc. When this is done, it is clear that the charts do a poor job of documenting the distributed yet collective nature of the raid group and the overall joviality and tone of the raid sessions (Chen, 2009).

Much more goes into describing how this raid group learned to work together. With time, we adopted and used third-party addons to the game to lessen cognitive load (Sweller, 1988), keep track of relational data during fights (compare figure 4 with figure 5, for example, to see a new addon that helped us identify who Ragnaros would hit), and alert us of specific events during the fights. We assigned specialized roles to certain players such as the timekeeper. We drew upon many outside material resources such as reading and referring to web strategy guides for boss fights and discussing ideas to maximize efficiency in raiding (known as "theorycrafting") in online discussion forums.

I hope to write a fuller account of expertise development and practice in *World of Warcraft* raiding for my dissertation work. The creation of the charts in this paper was instrumental for me to see general patterns that I could investigate further. One of the meta-goals for my work is to open access to my data through a web interface, and the visualization process helped me to work through, on a smaller scale, exactly what that would look like and how the data should be formatted. Feedback and critique would be most welcome, and, hopefully, by

documenting the process through which I created these charts, other researchers can have a leg-up on doing similar work.

Notes

[1] For a good overview of visualization techniques and their use as inquiry tools, see Tufte's book series: *The Visual Display of Quantitative Information* (1983), *Envisioning Information* (1990), and *Visual Explanations* (1997).

[2] The level cap at the time of this writing was 80.

[3] Various incentives were used by different groups to make sure raid members didn't just leave the group once they get the loot they are after. One way was by awarding points for participation that were then spent in loot "auctions." The most famous of this system was called DKP, described in detail by Malone (2007). Another way, found in my particular group, was by emphasizing friendship and belongingness, reflected by a more "laid back" loot system (Chen, 2009).

[4] At the time, I felt that it would be too invasive or out of the ordinary to subscribe to channels that were not for my specific role. I did, however, subscribe to all of the specialized chat channels for a one-month period, and details about them can be found in *Communication, coordination, and camaraderie in World of Warcraft* (Chen, 2009).

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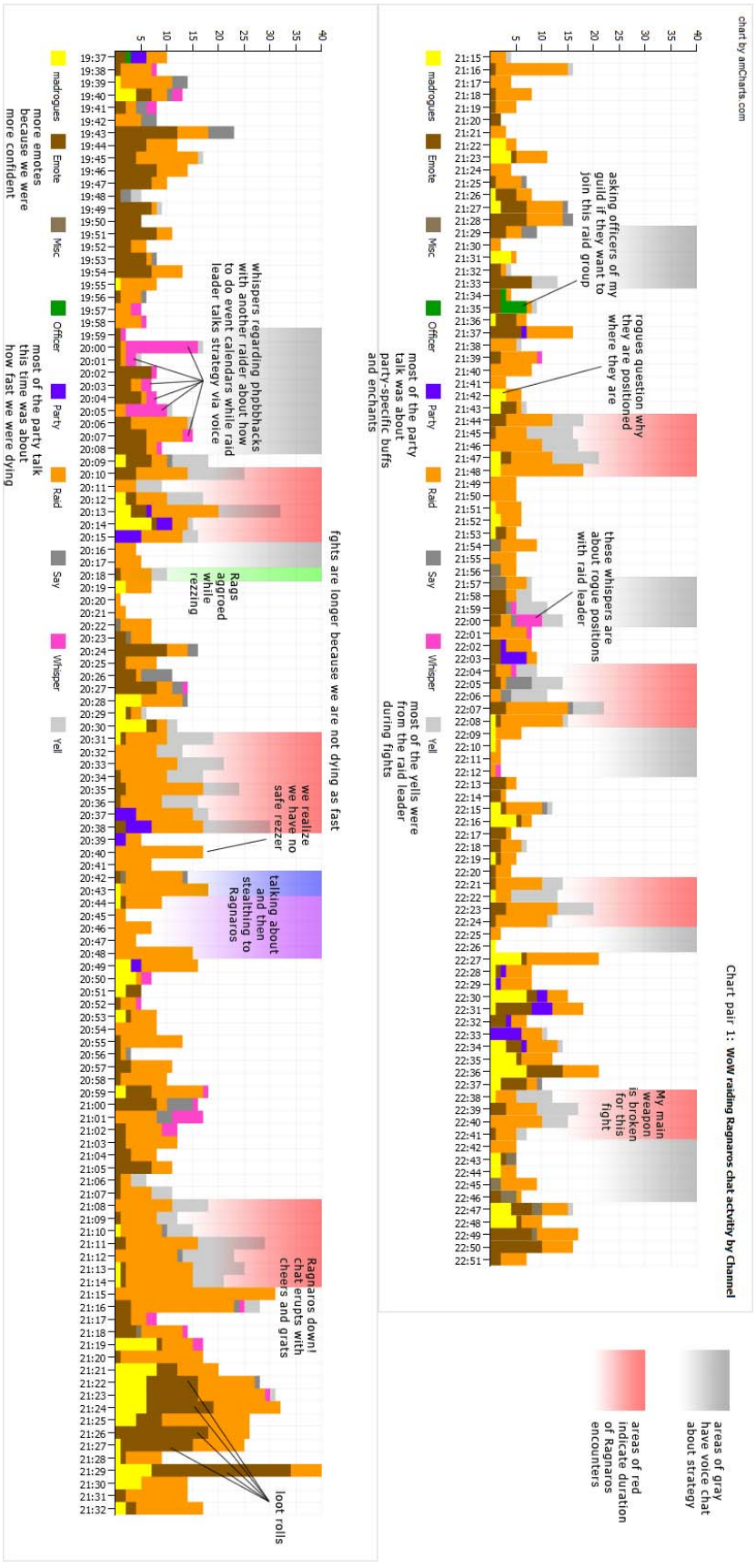
chart by amCharts.com
Chart pair 1: WoW raiding Ragnaros chat activity by Channel
madrogues
Emote
Misc
Officer
Party
Raid
Say
Whisper
Yell
asking officers of my guild if they want to join this raid group
rogues question why they are positioned where they are
most of the party talk was about party-specific buffs and enchants
these whispers are about rogue positions with raid leader
most of the yells were from the raid leader during fights
My main weapon is broken for this fight
areas of gray have voice chat about strategy
areas of red indicate duration of Ragnaros encounters
fights are longer because we are not dying as fast
whispers regarding phpbbhacks with another raider about how to do event calendars while raid leader talks strategy via voice
Rags aggroed while rezzing
we realize we have no safe rezzer
talking about and then stealthing to Ragnaros
Ragnaros down! chat erupts with cheers and grats
loot rolls
more emotes because we were more confident
most of the party talk this time was about how fast we were dying

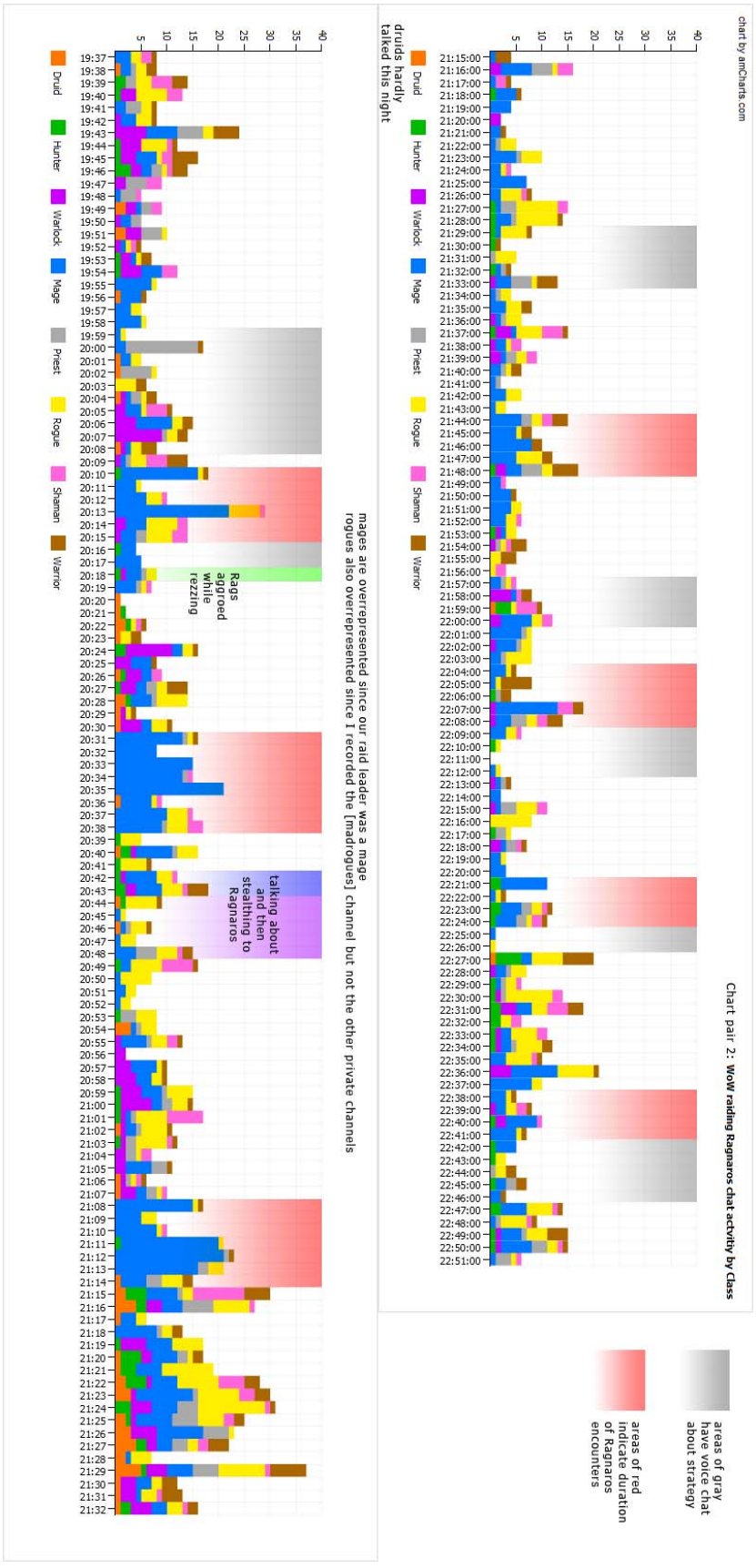
chart by amCharts.com
Chart pair 2: WoW raiding Ragnaros chat activity by Class
druids hardly talked this night
Druid
Hunter
Warlock
Mage
Priest
Rogue
Shaman
Warrior
areas of gray have voice chat about strategy
areas of red indicate duration of Ragnaros encounters
mages are overrepresented since our raid leader was a mage
rogues also overrepresented since I recorded the [madrogues] channel but not the other private channels
Rags aggroed while rezzing
talking about and then stealthing to Ragnaros

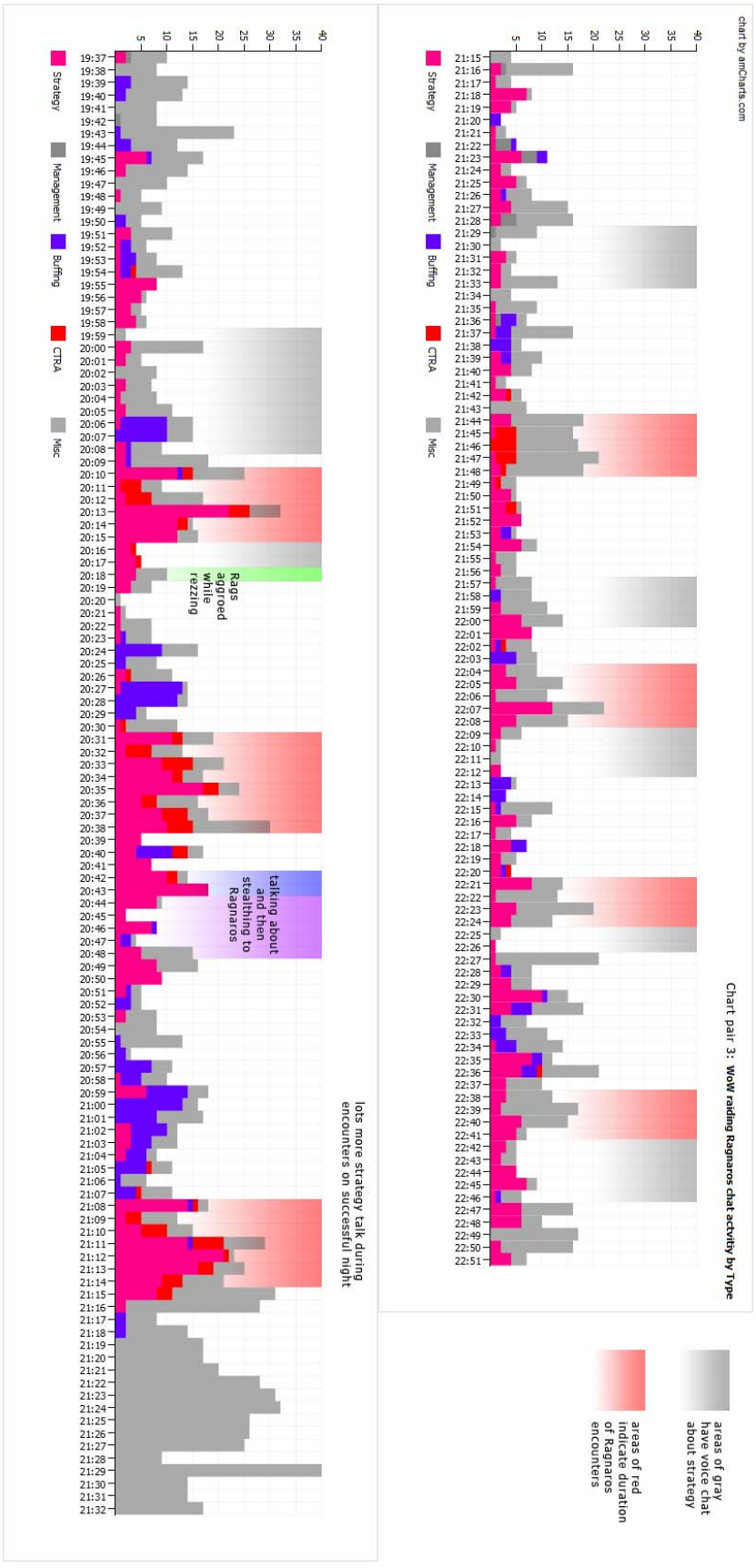
chart by amCharts.com
Chart pair 3: WoW raiding Ragnaros chat activity by Type
Strategy
Management
Buffing
CTRA
Misc
areas of gray have voice chat about strategy
areas of red indicate duration of Ragnaros encounters
Rags aggroed while rezzing
talking about and then stealthing to Ragnaros
lots more strategy talk during encounters on successful night

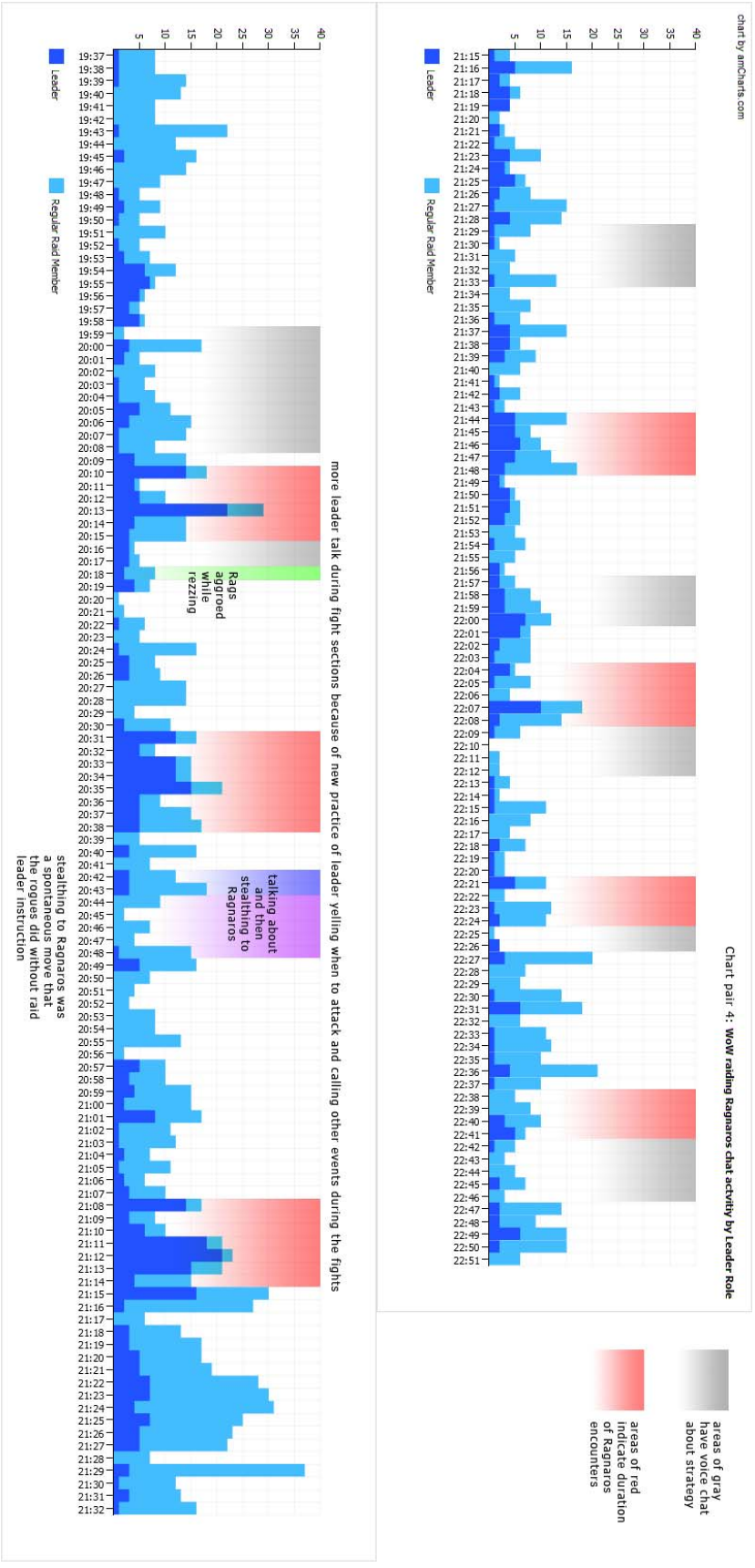
chart by amCharts.com
Chart pair 4: WoW raiding Ragnaros chat activity by Leader Role
Leader
Regular Raid Member
areas of gray have voice chat about strategy
areas of red indicate duration of Ragnaros encounters
more leader talk during fight sections because of new practice of leader yelling when to attack and calling other events during the fights
Rags aggroed while rezzing
talking about and then stealthing to Ragnaros
stealthing to Ragnaros was a spontaneous move that the rogues did without raid leader instruction

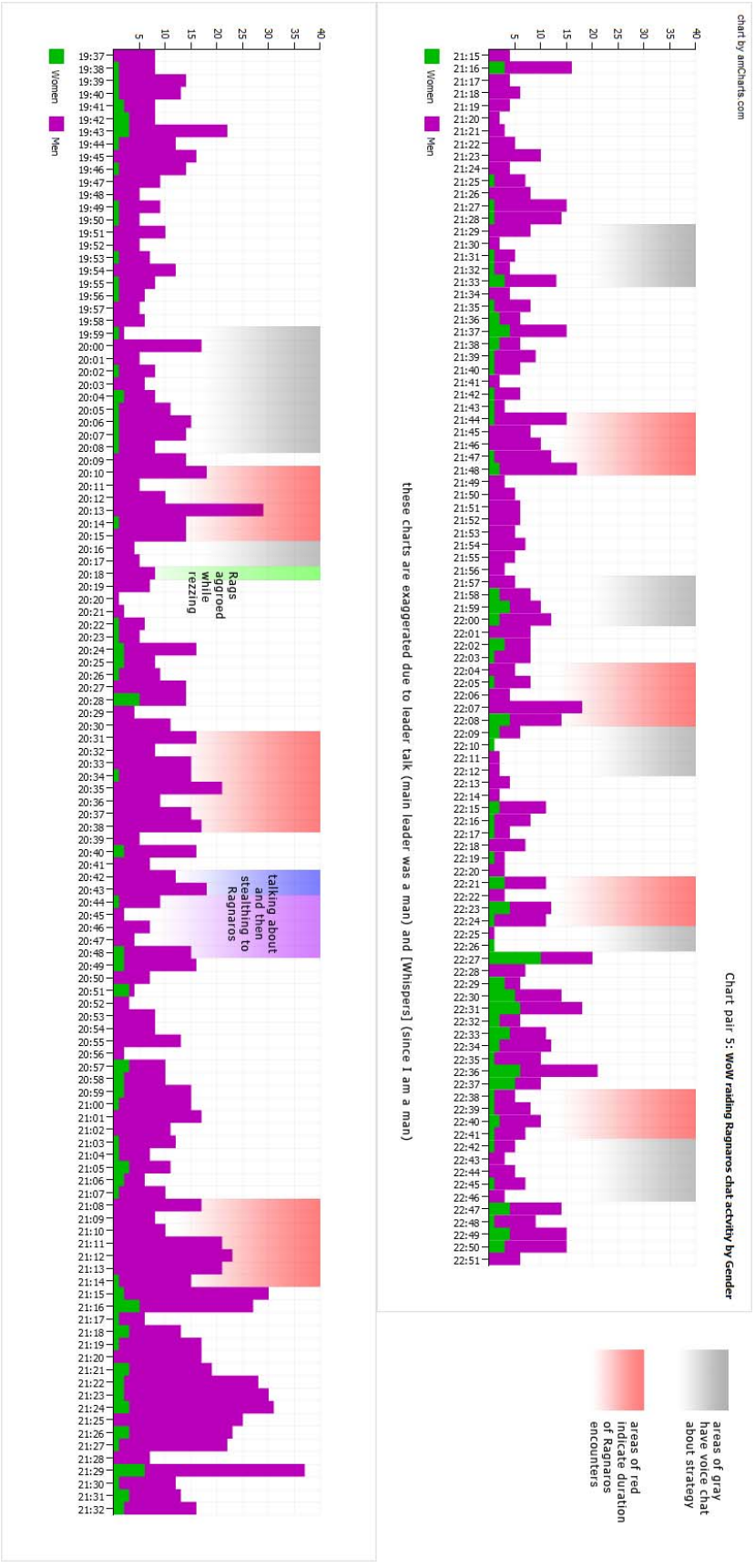
chart by amCharts.com
Chart pair 5: WoW raiding Ragnaros chat activity by Gender
Women
Men
these charts are exaggerated due to leader talk (main leader was a man) and [Whispers] (since I am a man)
areas of gray have voice chat about strategy
areas of red indicate duration of Ragnaros encounters
Rags aggroed while rezzing
talking about and then stealthing to Ragnaros

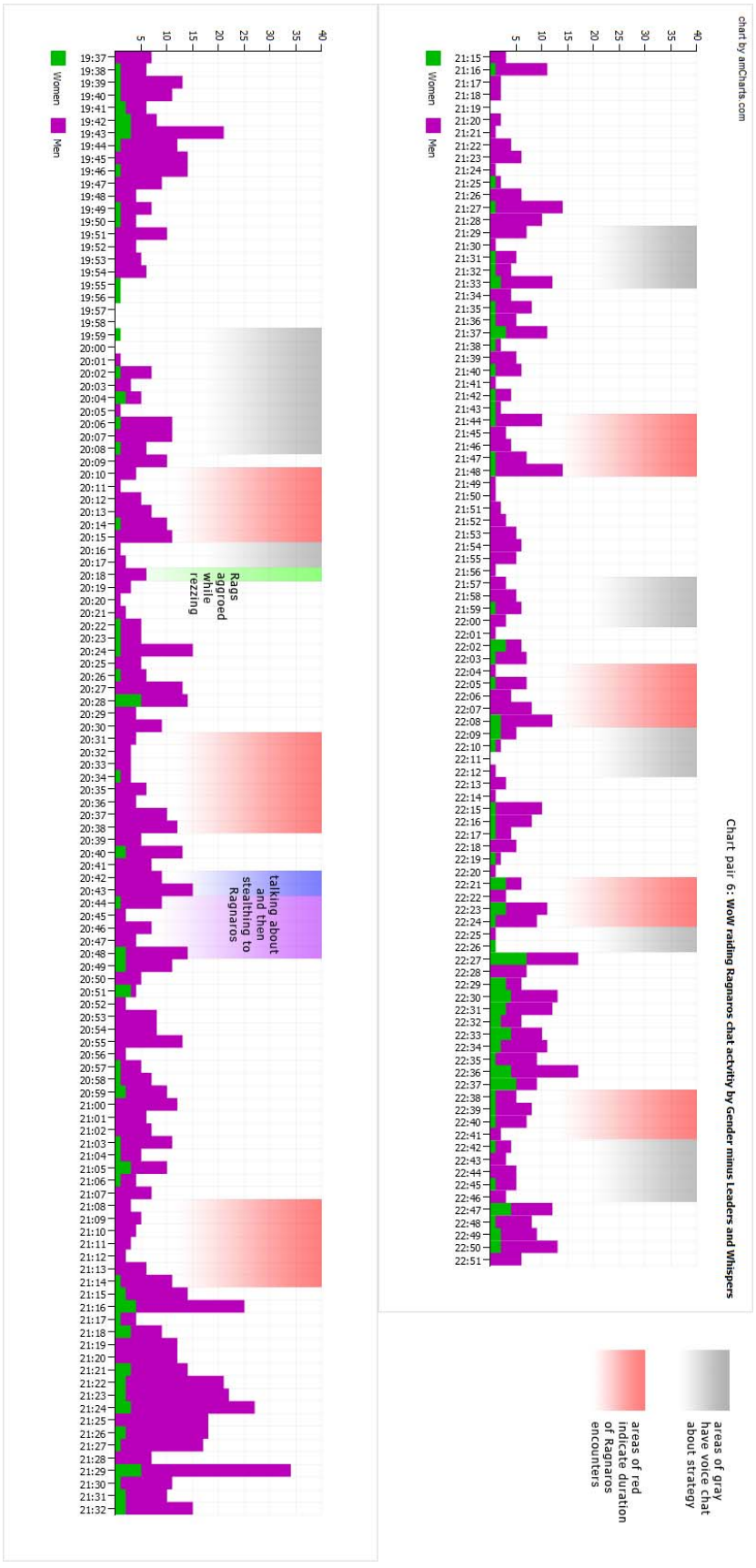
chart by amCharts.com
Chart pair 6: WoW raiding Ragnaros chat activity by Gender minus Leaders and Whispers
Women
Men
areas of gray have voice chat about strategy
areas of red indicate duration of Ragnaros encounters
Rags aggroed while rezzing
talking about and then stealthing to Ragnaros