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Comprehending comics and Graphic Novels: Watchmen as a Case for Cognition

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Comprehending Comics and Graphic Novels: *Watchmen* as a Case for Cognition

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Reading *Watchmen*: A cognitive perspective

In the opening sequence of *Watchmen*, by Alan Moore and Dave Gibbons (1986-1987), a disheveled man wanders the streets of New York, carrying a sign warning of the end of the world. He steps through puddles on the sidewalk, while a blood-stained smiley face pin lies in the street. Through panel narration we are introduced to Rorschach's journal, and although we do not yet know it, we see Rorschach himself. The mystery of who murdered the Comedian begins, and over the course of the comic book's twelve issues we become familiar with dozens of characters through flashbacks, text sequences, action scenes, setting shifts, and text supplements. The characters and events that are depicted in the maxi-series are so carefully crafted, memorable, and multi-layered that many readers and critics consider *Watchmen* to be the greatest comic story ever written. As evidence of this respect, it is often described as one of the best-selling graphic novels of all time[1].

One thing that makes *Watchmen* so compelling is that it can be read on a number of levels—as a traditional comic book story, as a murder mystery, as allegory of the comics industry, as political polemic, as alternate history, as a thesis on what the world might be like if superheroes actually existed, and as an ode to tropes and icons of the comics medium. For all of these reasons *Watchmen* offers a fine example of the comic book form, providing characters and narratives that can be enjoyed over and over again. Moreover, its complexity lends the book to critical analysis, and, for the purposes of the current essay, provides a wealth of examples, techniques, and characters idiomatic to the comic book form.

But when people read *Watchmen*, perusing or even studying the comic panels, what are *they* doing? We are not referring here to any sort of metaphysical question or to queries about motivation or engagement, although these certainly are interesting issues; rather, what cognitive processes and textual features guide readers' attempts at comprehending the story?

The approach we offer in this essay in considering how people experience and comprehend *Watchmen* relies on insights from cognitive psychology. Cognitive psychology is a

[1] Of course, *Watchmen* was not initially published as a graphic novel, but rather as twelve serialized comic books. It has since been published continuously in a single collected volume, and in this trade paperback form is sometimes referred to as a graphic novel. Because Moore and Gibbons wrote it as a singly unified, complex story, it can easily be considered as such. The topics to which we relate *Watchmen* in this essay, however, can be readily applied to comics in all of their forms, including but not limited to comic strips, comic books, webcomics, and graphic novels.

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sub-field of the psychological sciences that investigates how people think, reason, learn, and remember, with the goal of both describing what happens when we make sense of our everyday experiences, as well as explaining how we accomplish these activities. Research questions in the field include: How is information encoded into and retrieved from memory? How do we solve problems and make decisions? Under what conditions do people rely on or update prior knowledge? How do these processes influence behavioral performance? And what kinds of errors do people make with respect to these activities? Cognitive psychologists have derived some answers for these questions, grounded in empirical evidence obtained through experimental studies, computational simulations of cognitive processing, and descriptive analyses of human behavior. (Some suggested introductory readings may be found in the Appendix.) The types of theoretical explanations that have emerged from this work have proven crucial to understanding the processes that underlie successful reading.

Consider this: To comprehend what we read, we must decode symbols into letters and words, integrate those words into larger segments of meaning, attempt to relate those segments across sections of discourse, and recruit background knowledge to fill in the parts of the texts that are left out as well as to resolve ambiguities in the material. These processes—of decoding, establishing coherence, building inferences, and constructing mental representations of texts—have been the subject of countless research projects. The result is a broad understanding of the particular textual features, reader variables, and comprehension activities that define our reading experiences. Contemporary models of text processing have sufficient explanatory power along these lines to make valid predictions about what readers do during reading, what they remember after reading, and potential methods of remediating reading difficulties (see Graesser, Gernsbacher, & Goldman, 2003, for discussions on these topics).

Yet the bulk of this work, to date, has focused on reading experiences that involve materials containing only words on a page (like this essay). Unfortunately, while cognitive psychologists have carefully examined text processing, they have tended to avoid considerations of written materials that combine words, pictures, color, and other types of visual cues. And when these projects *have* included images in their accounts, they have tended to focus on procedural depictions (e.g., step-by-step guides, such as instructions on how to put together furniture manuals) or expository figures (e.g., graphs from textbooks or figures from science textbooks) (e.g., Brunyé, Rapp, & Taylor, 2008; Mayer, 2001). Barring a handful of cognitive studies that have implemented children's picture books (e.g., Corrigan & Surber, 2010; Gernsbacher, Varner, & Faust, 1990), the extant literature has not included analyses of how people process written narratives as conveyed through both text *and* images.

The comics medium, then, offers an excellent test bed for the analysis of comprehension which requires the integration of text and images. As with the reading of purely textual narratives, reading comics involves deciphering the meanings of the words on a page, connecting events to meaningful segments of plot, and so on. But arguably, in comics there are different sorts of symbols (e.g., thought balloons as compared to speech balloons), different types of story grammars (e.g., the varied organization of panel sequences), and a variety of inferential activities

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(e.g., guessing what has happened between panels) that guide comprehension, in addition to the standard influences from text-only contents.

In comics, pictures and text support each other; these supports emerge through complementary depictions and descriptions rather than by presenting redundant information. For example, in chapter 6, page 15, of *Watchmen* [2] an unmasked Rorschach describes his origins as a crime fighter to his prison psychiatrist. In that discussion Rorschach talks about the Comedian understanding more than his contemporaries, while the illustrated narrative shows the Comedian behaving in an obnoxious and confrontational manner. This juxtaposition helps to exemplify the traits of the character. The pictures and words provide complementary details that, when integrated, encourage the construction of a more complex model of the story characters and narratives. In most cases, these combined presentations provide richer examples containing more information, and in less space, than would be available in traditional text-only narratives.

In this essay we use *Watchmen* as a case study to illustrate some of the processing influences and consequences that can affect peoples' reading and understanding of comics. This affords the opportunity to outline how comic book comprehension necessitates building off of, rather than relying wholesale upon, contemporary cognitive accounts of text processing. We believe strongly that many of the cognitive processes involved in reading traditional pure-text materials are analogously involved in reading comics; moreover, we offer the possibility that many of these processes are adapted to specific storytelling techniques in comic books. Our goal is to begin to integrate existing research on reading into discussions of how people experience comics, as well as to begin identifying the kinds of insights that comics might provide in the study of naturalistic reading activity. To address these goals we focus here on work that connects with our own research interests, discussing the textual features, reader factors, and cognitive processes that seem crucial in the service of comprehension. This includes discussions of cues, which can guide attention and the types of activities readers engage in during reading; of background knowledge, which readers rely on and may update as they learn from texts; and of inferences about texts, which readers derive from integrating information from both textual cues and background knowledge. Our hope is that this discussion will further motivate interest in and analysis of the ways in which people process comics, and the potential for using comics to identify the cognitive processes that are involved in reading and enjoying them. Unlike previous work, we focus here more directly on an explanation of the cognitive mechanisms involved in reading comics, in an attempt to advance beyond existing epistemological approaches towards describing comics (which, we note, have proved to be quite informative, e.g., McCloud 1993). We begin with a focus on textual cues.

Cues

Linguistic devices can be used to direct attention in a text. For example titles, headings, and warnings can encourage readers to focus on or discount information (e.g., Lorch, Lorch, Ritchey, McGovern, & Coleman, 2001; McCrudden & Schraw, 2007). These cues serve as a type of processing instruction that helps readers determine what to encode in a text stimulus (Givón, 1992) and can provide guidance to facilitate (or when used inappropriately, hinder)

[2] Throughout this essay we will refer to issues of the comic series which were originally published independently as "chapters," to facilitate consultation of either the original twelve comic books or the collected trade paperback.

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readers' comprehension (Peshkam, Mensink, Putnam, & Rapp, 2011; Zwaan & Rapp, 2006). In comics, the types of cues[3] that guide where readers will look, what they will read and reread, the information they will carefully evaluate, and so on, involves more than just words. These cues can include icons, illustrations, and boundary markers, offered on the scale of a panel, page, and/or book. We begin here with an example of a linguistic cue before identifying 'comic-centric' types.

In general, linguistic cues serve to help readers integrate incoming information. Consider the iconic opening words of *Watchmen*: "Rorschach's Journal. October 12th, 1985." (chapter 1, p. 1). These words serve as a cue in several ways. For one, the description orients the reader to a particular setting, which has important implications for comprehension, especially given the story's reliance on Cold War motifs. This helps place the narrative in a particular place and time, potentially allowing the reader to generate cultural and historical associations that might prove relevant to thinking about the story. We also learn from this cue that the narrator, for the time being, is a character named Rorschach who is recording, or has already recorded, his observations and thoughts. But unlike text-only descriptions, these words are represented in a type of "thought balloon" (specifically, a page from Rorschach's journal) which indicates that the information is not being spoken directly to another person. The background color for the information is yellow, in a particular kind of font, which distinguishes it from other instances of text in the book. That color and font pattern quickly becomes associated with Rorschach's thoughts on unfolding events. Clearly this type of cue is a simple one, but it serves an important role in helping readers understand what is happening in the story.

Balloons and narration boxes like these are mainstays of the comics medium, and are critical components of the comics reading experience. They provide a highlighted setting for words, phrases, and sentences, situated in a panel to supplement an illustrated scene (usually) without covering it over. They can vary in size, style, and content. And they can represent a variety of types of verbal and non-verbal utterances; for example, when Rorschach utters "Hurm," we can understand it as a sigh-like sound, or consider it as indicating he is reflecting upon some information. Alternatively, balloons can depict icons to convey thoughts, such as a light bulb signifying an "*Aha*! Moment."

We now identify three iconic types of balloons, which exemplify an important category of cues, illustrate how cues might serve multiple purposes, and indicate more generally how different cues might influence reading:

Speech balloons are often rounded, depicted with solid lines, and refer to spoken language.

Thought balloons are often rounded with cloud-like edges, and refer to private thoughts.

Narration balloons are marginal and rectangular, and provide exposition, often from a specific character's perspective, although occasionally from a third-person perspective.

[3] We use the general term *cues* as an analog to similar cues described in the psycholinguistics and reading comprehension literatures. Many of these, however, are what Scott McCloud (1993) refers to as "clues."

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Figure 1. Example speech, thought, and narration balloons, respectively.

These balloons may all be considered cues as they orient readers' attention and direct specifically *how* their contents might be interpreted—a speech balloon will be read with a different set of expectations than one might have when reading a thought balloon. This goes beyond the actual information contained within the balloons. Word balloons also indicate to readers who or what they should be focusing on (e.g., a main character or a plot point being referred to) *along* with what is being described. After all, speech balloons often employ tails that, when present, orient the reader directly to the character who is "speaking." For example, in chapter 7, page 9, readers need not guess whether Silk Spectre or Nite Owl is speaking; the tails of the balloons direct us to who is talking and in what order the speech was produced. This is an important but potentially overlooked example, precisely because balloons are so ubiquitous; they provide information not just about content, but also about the passage of time, the order in which people are speaking, and more often than not, causal story events.

These balloons' iconic forms are commonly found in almost all comic books, and their utility relies directly upon readers' prior familiarity with their form to ensure they are understood. New readers can become familiar with the basic role of these balloons after viewing only a few of them, employing that understanding when they read future comics by other authors and artists, and even in other media (e.g., newspaper comic strips). Expert readers can additionally impose more innovative meanings on these modulated balloons that the novice might fail to recognize or react to. These expert-novice differences help exemplify the important processing effects that cues can exert on readers. Consider cases from *Watchmen*, but also to be found in other comics, in which word balloons are subtly changed to refer to different types of communication, such as a superhero's telepathic communication, their different voice patterns or moods (e.g., the balloons associated with Doctor Manhattan and Rorschach as compared to Nite Owl and Silk Spectre), and the volume and quality of the speech production (e.g., the more angular balloons associated with voices coming through the Owlship's loudspeaker system).

We have discussed balloons here specifically, but other types of cues include sound effects (which, interestingly, are not used in *Watchmen*), arrows, and panel borders. These might all be identified as categories of micro-level cues, as they focus readers on panel-internal and page-specific instances and information. Classic comics from the 1950's occasionally even included an arrow explicitly directing the reader as to which panel to move to next when the events were arranged in a novel organization. It is also important to note that the cues we describe here are not necessarily mutually exclusive; words, arrows, balloons, and thought bubbles can be combined to great artistic and narrative effect. And more macro-level cues are also a crucial part of a comic readers' experience. Macro-level cues emerge both within a single issue as well as across several issues in a series or comics run. These types of cues include

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features such as the letters page or the publisher's soapbox pages, which usually appear near the end of an issue, cueing the reader that the end of a story or chapter is near. Similarly, when a reader holds the final issue of a twelve issue series in their hands, they likely have expectations of a narrative resolution; knowledge that this is the last part of a story provides a cue for such resolution.

Other macro-level cues can specifically direct readers' attention around a page. Panel structures help guide the reader through a story, conveying meaning through their consistency, irregularities, and ordering. A hallmark of *Watchmen* is that many pages follow a highly-regularized panel structure with 9 panels per page. However, when the story changes this format, for example, when it presents full page panels in chapter 12 to depict the murder of thousands of people in New York City, the change is striking and obvious. The panels serve as cues that this is a momentous event occurring on a much grander scale in comparison to the minor everyday dealings of the characters that has been the focus in the other parts of the story. In other words, full page splashes can cue the importance of a scene in tandem with their contents.

There are other types of cues to be found in *Watchmen* which represent many of the techniques that writers and artists can use to guide reader attention and comprehension. The cover of issue number one (or chapter 1 if you are reading the trade paperback) foreshadows the opening event, the Comedian's murder, with an extreme close-up of the blood-stained smiley face lying in the gutter. Each issue/chapter, like this one, represents a micro-view of a particular important event that will occur within that section of the story. More broadly speaking, although covers are often used to sell single comic books, they can also foreshadow major plot points in the story, and *Watchmen* employs this technique.

Notably, the cover images also provide an indication of the events that will be revealed in the beginning and the end of each chapter, making the cover both an intriguing foreshadowing of events as well as a callback to those events after they have occurred. Other visual cues allow the reader to make inferences about the characters and events in the story. Doctor Manhattan's blue hue is a persistent reminder throughout the story to the reader, the other characters, and arguably Doctor Manhattan himself, that he is different from the other characters. He is the only character who possesses superhuman abilities in the story, and as such, his striking appearance serves to enhance how out of place he is from the events and people in the story. Rorschach's mask plays with iconic representations of character and emotion, with the inkblots conveying specific forms but also remaining open, like Rorschach inkblot themselves, to interpretation. The ever-changing clock motif that recurs through each issue, on the covers, and in critical positions within the narrative (e.g., in Doctor Manhattan's origin story in chapter 4) reinforce the teleological phenomenology of nearing the last few pages of the novel by indicating that time is running out, that something important will happen soon, and that we are almost there. These examples all exploit both text and images to direct reader attention to particular aspects of the novel, while also fostering expectations and understanding for the causal events in the narrative. And as we mentioned, analogous cues and similar cue-based themes can easily be found in other comics.

Background knowledge

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Reading involves identifying the information provided on a printed page or computer screen. However, simply identifying words and pictures proves insufficient for comprehension. Readers must rely on their prior knowledge to guide their understanding of what the letters and lines are attempting to convey. The construction of meaning involves integrating what we already know with what information is being provided to us. Thus, any account of how we experience and comprehend comics must consider not just the ink impressions printed in the book, or the pixels presented on the screen (in the case of digital comics), but also the ways in which readers unpack meaning from those impressions.

Obviously background knowledge matters; but the ways in which background knowledge is activated, and the consequences of those activations for comprehension, are open issues for investigation. For example, in chapter 1, page 5, when we watch Rorschach shoot a grappling hook at the building, we can activate our prior knowledge of what happens, or perhaps more specifically *has* happened when other characters have done the same thing, if we are familiar with characters who exploit grappling hooks[4]. This activation of prior knowledge supports an understanding of the information, such that we can even guess how Rorschach will scale the building and enter the Comedian's apartment before how he uses the hook is properly depicted.

Previous research has demonstrated that these activations do not just enhance comprehension, but also foster memory for what has been read. In a classic series of studies, Bransford and Johnson (1972, 1973) asked participants to read a text, and afterwards, to recall its contents. The text on its own was an inchoate series of details with deliberately ambiguous phrases, such that it proved difficult to understand the theme or point of the text. Consider the opening sentences of that text here:

> The procedure is actually quite simple. First you arrange things into different groups. Of course, one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities that is the next step, otherwise you are pretty well set.

Participants in a *No Topic* group simply read the text in its ambiguous form. They had no idea that the text was intended to describe the procedure associated with doing laundry. In contrast, participants in a *Topic Before* group received the title "Doing Laundry" before reading the text, and participants in a *Topic After* group were provided the title after reading the text. Participants in the *Topic Before* group rated the text as much more comprehensible than participants in both the *No Topic* or *Topic After* groups. Additionally, participants in the *Topic Before* group remembered about twice as many details from the text as participants in the other groups did. These findings suggest that background knowledge (in this case, knowledge of the topic) helped readers make sense of the text, so much so that they had little difficulty remembering the text's contents after reading. But the findings also indicate that background knowledge needs to be activated *prior to* or *during* any presentation of information in order to help scaffold existing expectations to the incoming information; offering disambiguating information about the topic

[4] This sequence, of course, exploits the background knowledge of readers familiar with Batman from comics, television, movies, and video games.

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after a text has been read is no more useful than if the extra information is completely held back from the reader.

Background knowledge in the above experiment was crucial for comprehension. In the case of *Watchmen*, background knowledge proves similarly important for a reader's experience of the story. The graphic novel contains explicit linguistic and pictorial references to Richard Nixon, the Cold War, and the USSR. While a reader could comprehend the story without recognizing and understanding these concepts, there are instances in which these are critical plot points, and their invocation can enhance enjoyment and engagement in the material. For example, Ozymandias' wall of television screens depicts events replete with references to Nixon, the military, the threat of nuclear Armageddon, and the like. (Also see the first few pages of Chapter 10 for extended sequences with Nixon.) When *Watchmen* was published in the mid-1980s, many of these issues were foregrounded in readers' minds, making it easy to activate relevant information during reading. Today, such activations might not as easily come 'for free,' in that the necessary experiences and knowledge with respect to the Cold War will be less prevalent or available from memory. In fact, these differences suggest interesting studies with respect to how context and plot, and the knowledge sources they recruit, might make different demands of readers due to socio-historical events and the changing demographics of comics readers. (See Carter (2009) for a discussion of these issues in terms of didactic engagement with *Watchmen*.)

Beyond activating facts about history, readers can build more elaborate associations between what they know and what graphic novels tell them; these associations can change the experience of reading the material. Contrast an avid comics fan with a more casual fan, the latter well-versed with icons such as Batman or Superman, and the former unfamiliar with superheroes in general. When reading *Watchmen*, how would these readers differentially think about Nite Owl? In many ways Nite Owl bears striking similarities to other icons such as Batman, and to lesser icons such as the Blue Beetle[5]. If readers notice those similarities, based on their existing knowledge and familiarity with comic characters, they might be primed to notice more allusions among the characters than might someone who is less familiar. These allusions are not explicitly identified or explained in the story; readers can only become aware of them based on their existing knowledge.

Thus, the enjoyment a reader derives from their reading of *Watchmen* may be a function of the type of analysis they apply to the text, aspects of which come out of the connections and associations they make with other ideas and concepts in their background knowledge. Readers might even generate expectations for how characters will behave based on prior knowledge (e.g., that Nite Owl will have similar behaviors and beliefs as Batman or Blue Beetle, fighting crime to the bitter end but refusing to use deadly tactics to defeat his foes). Indeed, these prospective differences in reading experience as a function of familiarity with character iconicity suggest an

[5] In fact, early versions of Moore's proposal for the story intended to use characters from Charlton comics, such as Blue Beetle, but were eventually replaced by the novel characters he created with Gibbons specifically for *Watchmen* (Jensen, 2005).

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interesting set of potential research studies with respect to how readers make allegorical links between characters, and how these derived connections influence comprehension and enjoyment.

Any work on such an issue would necessarily make reference to existing models of knowledge representation in the field of cognitive science. These models are intended to describe how background knowledge is organized in the mind. A full listing of such models is beyond the scope of the current essay, but we refer to some here that are particularly relevant to the discussion. One early such model, offered by Schank and Ableson (1977), conceptualized knowledge as clustered into meaningful groupings (see also Sharkey & Mitchell, 1985). For example, we have a mental *script* for the events that take place when we make coffee; this includes filling a coffee pot, heating the water, pouring the water over grounds, waiting, and adding cream or sugar to the freshly-brewed coffee. These activities are encoded in the script for 'making coffee,' and are activated from memory when we engage in the activity. In fact, scripts like these (e.g., going to a restaurant, registering for classes, building a house) are so well-worn that when someone tells you they just made coffee, you need not consider every single step. Rather, you can make assumptions that the steps associated with the script were taken. Scripts aid comprehension by "filling-in" details that have gone unmentioned (Zwaan & Rapp, 2006).

There are several instances in *Watchmen* for which individuals' scripts for events can be invoked by what they read. For example, in chapter 7, page 11, Silk Spectre visits Nite Owl and they begin to make coffee, which likely activates knowledge for that activity. The drawings indeed show elements of that script. This facilitates the presentation of the material, as the authors need not depict every action in the script sequence, counting on readers to infer what has been left "unsaid." Countless other such instances may be found in *Watchmen*, as they are to be in any story, movie, or scene we read about or view during narrative experiences.

So, given that prior knowledge is useful, is applied during reading, and is organized in a systematic and useful fashion in memory, an important question remains: How does that knowledge *become* activated? Currently, several models of memory have considered conditions under which information is automatically activated, outside of any conscious control by the reader, as well as conditions under which information is activated only after strategic, careful deliberation (e.g., Graesser, Singer, & Trabasso, 1994; O'Brien, Rizzella, Albrecht, & Halleran, 1998). For example, the mere mention of the term 'Manhattan' might spontaneously evoke knowledge of locations (e.g., in New York City), historical events (e.g., The Manhattan Project), and perhaps metropolitan cityscapes in general. Thus, when readers learn about the character Doctor Manhattan, related concepts and ideas might be activated that further flesh out their interpretations of him. Readers less familiar with the various concepts associated with 'Manhattan' may need to search memory and make connections more deliberately. But regardless of whether information is automatically activated or strategically retrieved, the result is a constructed understanding of the events described in the book, which reflects individual differences in readers' prior knowledge. Comic aficionados might decide that Doctor Manhattan resembles Captain Atom, academics might find purchase in comparing him with Nietzsche's notion of the übermensch, critical theorists might see him as the embodiment of nuclear annihilation, newcomers to the book might conceptualize him as a fantastic imaginary hero, and

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detractors of the story might see him a simple deus ex machina. All of these constructions are in some sense correct, and each construction contributes to a different experience of reading the character.

Inferences

Authors and illustrators often have a lot of story they wish to convey to readers. If it were solely in their hands, they would need to provide an enormous amount of information to ensure that their readership could understand everything that happens in a plot. Thankfully, some of the work can be taken out of their hands: readers exert considerable effort in the service of comprehending what they read. They generate inferences about the events in a story, as well as about events that were not shown or discussed at all. These inferences require that readers make logical or story-driven bridges between events explicitly depicted in the story, as well as connections between things that have occurred in the story and possibilities for the future. Readers add information to texts, building coherence across events in ways that, as we mentioned previously, "fill-in" missing information. They do this by connecting the cues in stories with their prior knowledge.

A large body of work has demonstrated convincingly that inferences are commonly generated as readers process text descriptions. Consider the following two sentences:

We checked the picnic supplies. The beer was warm.

Readers do not need to be explicitly told that the picnic supplies included beer. Indeed, readers appear to construct such inferences spontaneously, given their prior knowledge of the fact that picnic supplies can include beer (Haviland and Clark, 1974). Prior knowledge about such information helps readers generate the necessary connections so that every little bit of information need not be provided.

As we discussed earlier, readers make similar inferences in comic stories. Depictions of characters going to a restaurant need not show every single event. Instead, a single panel in a restaurant can convey the notion that other, likely unimportant, things happened, which were nevertheless traditional occurrences for normal circumstances associated with going to a restaurant, such as opening the restaurant's door or sitting down in a booth. Readers can fill in these sorts of details from memory. They do this in particular for actions that are described in graphic narratives, in such a way that after reading they often incorrectly report that those inferred actions actually appeared in the story, when in fact they were only implied (Kopp, Magliano, & Rapp, 2010).

But the types of inferences that readers infer are not restricted to events shown or left out of single panels. The nature of sequential graphic narratives is such that an enormous amount of stuff goes on in between the panels. Characters appear in a scene, and rather than show every moment of that scene, selected moments are made available to the reader. So inferences must be made by the reader respect to what happened between the panels. Consider the prison break sequence in chapter 8; on page 21, as the characters mark their escape, we need to infer that

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Rorschach has leapt to the Owlship, and that Nite Owl has steered them away from the jail. This complex sequence of actions is inferred from the handful of static pictures that are shown.

Another important type of inference for comprehending stories is a predictive judgment. Predictions involve the forecasting of events that have not yet occurred. Some researchers have characterized predictions as a type of mental time travel, by which readers use what they know to generate expectations for what they *think* will happen. Sometimes these predictions are fairly obvious, such as when Jon becomes trapped in the intrinsic field test chamber as Doctor Manhattan recounts his origin (in chapter 4, page 7); we know how things are going to turn out, so a prediction is relatively trivial. However, at other times the possibilities for what will occur are less unconstrained, which makes it more of a challenge to predict how events will unfold. For instance, in chapter 12, page 17, when Doctor Manhattan reappears at Ozymanidas' base, it is unclear exactly what will happen, although we might expect he will attack Ozymandias. Even more difficult is what we think will happen at the beginning of the entire story given that we have little context for who the major players are and what their motivations might be.

An important difference between predictive inferences and the types of bridging inferences we described earlier is that predictive inferences do not appear to arise obligatorily (McKoon & Ratcliff, 1992). That is, predictive inferences seem to occur only when texts make them necessary or when particular task goals encourage their construction. For example, at the end of the story, when Rorschach's notebook is left in the hands of the newspaper reporters, readers need not infer what might happen next unless they specifically work to do so. These predictive inferences are not necessary for story comprehension (after all, the story is concluded), but when they are constructed, they offer supplemental methods of enriching a reading experience. In this way, discussions of cliffhangers about what is likely to happen next in a story can be seen as an enjoyable ways to remain engaged with a narrative and its characters.

Readers can also make other types of inferences. These can include deductive inferences about how particular events or sequences are related—for example, deducing that Kovacs (the sign carrier from the first page of the story) is Rorschach before the actual "reveal" in the narrative, although this is likely a very difficult inference to make. Another kind of inference might involve authorial intent; that is, beliefs about why writers or artists might have selected particular design elements or motifs. For example, consider chapter 5 of *Watchmen* (entitled "Fearful Symmetry") which is itself a type of Rorschach: events are mirrored at the beginning and end of the issue, and this mirror-like continuity is maintained in a middle section showing the attempted attack on Ozymandias. If readers are made aware of this, they might make inferences about the goals Moore had for structuring the story, or for the decisions Gibbons made with respect to illustrating the symmetric events. More generally for the entire series, readers might come to feel as though the purpose of the story was to provide a commentary on comics icons and character types, or perhaps was offered as a criticism of Cold War policies and politics. These types of experiential outcomes represent inferences that are meta-analytic, involving the integration of textual internal cues and depictions to develop beliefs about the purposes of the text.

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All of the above types of inferences are precisely the types of extensions, complements, and consequences of reading experiences that are often taken as an indication of successful comprehension (Kintsch, 1998; Zwaan & Radvansky, 1998). In order to fully understand what a text is about, readers must go beyond the words or pictures presented in the material; they must add to, decipher, and engage in the type of deductive work necessary to construct an interpretation of the content (and perhaps its cultural and sociohistoric relevance). Inferences, then, represent readers' integration of the cues they extract from the text with the knowledge they bring to the experience.

Conclusion

The goal of this essay was to outline some of the ways in which examination of the features and activities associated with comic book comprehension might be informed by, and inform, cognitive analyses of reading. We focused here on bottom-up information like the cues that readers extract from texts, as well as top-down knowledge that readers bring to those texts. The result of the interactions between these sources can include inferences that complement and extend the material of interest. Here we used *Watchmen* as an example of such material, partially given its privileged status as a classic comic story, and partially given its reputation as a complex literary work that can be read at a variety of levels. However, we wish to make clear that any comic written for any age group on any topic would likely be amenable to the types of analyses discussed herein.

While our focus in this essay was on the cognitive processes involved in the comprehension of comics, future work might consider analogous issues with respect to the application of comics in classroom settings. Students (from K to 12 and beyond) need to learn a variety of literacy skills to support their understanding of textual sources, as well as the contexts in which those sources have developed. For instance, media literacy coursework is intended to foster students' evaluative considerations and applications of information from television, radio, internet, and other formal and informal news sources. The associated curricula require that students become familiar with a variety of media, building comprehension skills that are both specific to each source, while also acquiring more general skills that extend across literacy venues and modalities.

Comics can serve to encourage the development of critical literacy skills, such as the integration of textual and visual forms into coherent understandings. In addition, comics, both in their traditional paper versions (including floppy monthlies, trade paperbacks, and manga volumes), as well as the growing digital market, offer a popular and fun means of conveying information, including narrative stories and expository concepts. Indeed, in recent years there has been a plethora of "expository comics," intended to convey non-fiction information or historical events; these seem to rely on an assumption that students will be more engaged with comics than with traditional textbooks. Moreover, sequential art can inform the design of curricula, internet sites, and other media intended to convey educational information—understandings of the processes involved in comprehending comics could expand to other mixed media texts. A failure to consider comics in an account of reading comprehension represents an ignorance of common, useful, and engaging narrative forms, and leaves out important aspects of how people understand

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stories which venture beyond the level of the written word. We hope that this brief discussion will help to initiate discussion about these concerns, and encourage continued empirical investigation of graphic novel comprehension.

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Appendix

Readers who wish to explore cognitive psychology further may find some of the following readings useful and interesting. These vary in complexity and scope, from popular psychology books to textbooks, anthologies, and monographs.

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