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Amazing Stories: Acquiring and Avoiding Inaccurate Information From Fiction

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Authors of fiction need not provide accurate accounts of the world, which might generate concern about the kinds of information people can acquire from narratives. Research has demonstrated that readers liberally encode and rely upon the information provided in fictional stories. To date, materials used to demonstrate these effects have largely included stories taking place in real-world settings. We tested whether readers might exhibit more conservative use of information from stories with unrealistic settings and characers, as in science fiction and fantasy genres. In two experiments, participants read texts containing accurate, misleading, or neutral information, embedded in realistic or unrealistic stories. They subsequently completed a general knowledge test that included probes for story information. Unrealistic stories, in comparison to realistic stories, led to reductions in the use of misinformation. Source monitoring judgments suggest explanations for these reductions. The findings offer intriguing possibilities for encouraging readers' critical evaluation of text content.

INTRODUCTION

Texts often contain inaccuracies, and readers' responses to text errors can vary with regard to whether those inaccuracies might be considered inappropriate and

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inexcusable or reasonable and allowable. On one side, news investigations and journal articles are expected to contain accurate information, so when errors work their way into text contents, public concern is followed by corrections and retractions. In the case of fiction, readers can similarly be displeased with stories that contain unintended and lazy plot errors. But some inaccuracies are more allowable in fiction as authors develop story worlds that differ from our everyday experiences. For example, fantastic events such as schoolboys flying on broomsticks and spies surviving mortal wounds are commonplace in fiction but implausible in the real world. In contrast to experiences with newspaper and journal articles, readers have little difficulty finding fiction involving implausible events to be coherent and engaging, even when the stories offer inaccurate representations of the real world. In fiction, the properties of physics, the consistency of characters, and the constraints of events are malleable based on the rules set forth by authors, story settings, and genre.

However, some inaccuracies authors use to develop their fictional plots can contradict and confuse readers about what they know to be true outside of the story world. For example, in the novel *The Plot Against America* (Roth, 2004), Charles Lindbergh defeats incumbent Franklin Delano Roosevelt to become the 33rd President of the United States. In actuality, Harry S. Truman held the position after President Roosevelt succumbed to a cerebral hemorrhage. Roth's version of Lindbergh's presidency is inaccurate based on how events unfolded in the real world, although the inaccuracy is unlikely to motivate calls to publishers for retractions given that the story is considered entertainment or commentary. In contrast to cruising on broomsticks or recovering from an assassin's killing blow, inaccuracies like the Lindbergh presidency might even seem plausible because readers *could* imagine the events having happened if history had played out differently.[1] Nevertheless, this account is inconsistent with what readers know about the real world, exemplifying how inaccurate information regularly appears in many fictional contexts.

Given that fiction can and often does present inaccuracies, there is no *a priori* reason to believe their contents should be treated as a reliable source of information. Additionally, because fictional worlds can differ in so many ways from the real world, we might expect readers to generally avoid encoding inaccurate content from fiction into memory. However, research indicates that people use the information presented in fiction to complete subsequent problem solving, judgment, and memory tasks, both when that information is accurate and informative and when it is wrong (Appel & Richter, 2007; Gilbert, Krull, & Malone, 1990; Gilbert, Tafarodi, & Malone, 1993; Prentice, Gerrig, & Bailis,

[1]It turns out Lindbergh was actually considered a contender by Republicans (Schlesinger, 2000), although unlike the events in the novel he never garnered serious political support.

1997; Wheeler, Green, & Brock, 1999). One well-replicated method for demonstrating readers' reliance on text information asks participants to read fictional stories that contain accurate, misleading, or neutral statements. The crucial test, after reading, is whether participants will use the information from those statements to complete an unrelated postreading task (Marsh, Meade, & Roediger, 2003).

For example, participants might read a fictional story in which two characters are discussing travel plans. One character might state, "Go to Heathrow airport in London and use my ticket to fly back to Kentucky." The content of this conversational statement accurately conveys the location of Heathrow airport as being in London. In contrast, participants could read a different version of the statement containing misleading information: "Go to Heathrow airport in Dublin and use my ticket to fly back to Kentucky." And a third group of participants might read a neutral statement that leaves out the crucial geographic details while discussing the same topic: "Go to Heathrow airport and use my ticket to fly back to Kentucky." After reading texts containing various statements that include accurate, misleading, and neutral information, participants are asked to complete a test of general knowledge. This test takes the form of a trivia quiz that includes critical questions related to the information presented previously in the fictional stories. From our example, the critical question would be "Heathrow airport is located in which city?" The degree to which participants provide answers that align with what they read earlier serves as a measure of knowledge acquisition from the fictional source.

Across many experiments, two critical findings have been reported (Butler, Dennis, & Marsh, 2012; Eslick, Fazio, & Marsh, 2011; Fazio, Barber, Rajaram, Ornstein, & Marsh, 2013; Fazio & Marsh, 2008; Marsh, Balota, & Roediger, 2005; Marsh & Fazio, 2006). First, participants are more likely to provide accurate responses to questions after they have read accurate as compared with neutral versions of story statements. This indicates that readers learn from what they read. Second, participants also provide incorrect responses to questions if they have read the misleading versions of the statements. This occurs both when the story statements should be easy to answer based on knowledge norms (e.g., Who was the first person to step foot on the moon?) and when the statements are difficult and unfamiliar (e.g., What is the last name of the inventor of the steamboat "Clermont"?), with even greater proportions of misinformation typically produced for difficult as compared with easy questions. This indicates that readers *liberally* learn from what they read, meaning they acquire information more readily than might be expected if they were carefully critiquing text contents.

Besides answering test questions, participants are sometimes also tasked with making judgments of where they acquired the knowledge for answering each question (i.e., from the text, general knowledge, or both). Although they often correctly identify having obtained answers from the fictional texts, participants

also report having actually known the information beforehand. This is surprising and probably wrong for cases in which participants read misleading information in the stories they were unlikely to have learned previously (e.g., that Heathrow is in Dublin). These findings suggest that reliance on fictional information involves flawed beliefs about what readers believe they already know, stemming in part from failures to identify false information as having only been provided in stories rather than also from prior knowledge.

But *why* do readers liberally use story content when they should know that fiction can vary greatly as to whether it contains useful information? One possibility is that the ease with which individuals can fluently retrieve information from memory influences the likelihood they will use that information on a subsequent task (Marsh & Fazio, 2006). When information is easily retrievable, individuals' perceptions of processing fluency serve as an indicator of the validity of the information (i.e., if it is easily recalled, then it must be true; Kelley & Lindsay, 1993; Nelson & Narens, 1990). Because recently processed text is readily available in memory, individuals may therefore rely on it to answer subsequent questions, even when it runs counter to what they already know. This explanation also connects with classic work on the mere exposure effect in which individuals, after only brief exposures to stimuli, prefer repeated over nonrepeated content (Zajonc, 1968) and misidentify nonfamous names as famous (Jacoby, Kelley, Brown, & Jasechko, 1989). The ready familiarity of recently read information can drive beliefs about the validity of content and thus subsequent use of it.

However, reliance on fictional information nevertheless seems surprising, as we might expect readers would keep the information they learn from fictional sources separate from the real-world knowledge they have acquired over years of formal and informal learning experiences. Compartmentalizing fictional information in this way seems reasonable as it would afford the opportunity to encode what was read into memory but keep that encoded information separate so it does not contaminate knowledge and influence subsequent performance (Gerrig & Prentice, 1991; Potts & Peterson, 1985; Potts, St. John, & Kirson, 1989). However, participants' liberal use of information from fiction suggests that pure compartmentalization is not the norm. On the other hand, complete integration of fiction and knowledge does not seem to occur either. Recall that participants accurately source their incorrect responses to stories that provide misleading information, which they might not do if they were integrating fictional and general knowledge into a unified representation (Marsh et al., 2003). Some accounts have advocated for a hybrid representation (Prentice & Gerrig, 1999), given that measures of misinformation use exhibit characteristics consistent with both compartmentalization (i.e., knowing when information was provided by a text source) *and* integration (i.e., using inaccurate information provided by a text source). One intriguing possibility is that although readers are adept at source

monitoring, which indicates representational compartmentalization, the effects of mere exposure and the retrieval fluency of recently read information still fosters integration and use of text content.

These explanations help motivate considerations as to the types of activities that constrain readers' reliance on fictional information. For example, encouraging readers to carefully track instances in which fiction contains misinformation should encourage compartmentalization and/or more careful tagging of text content as accurate or inaccurate. The expected result would be a decrease in the production of misinformation on subsequent tests. Alternatively, asking readers to retrieve relevant knowledge before reading might reduce any integration of inaccuracies and/or interfere with the easy retrieval of misinformation. However, neither of these methods has proven particularly effective: Tasks asking participants to adopt these strategies still reveal reader reliance on fictional information, with only modest reductions obtained, if at all (Marsh & Fazio, 2006; Rapp, 2008). Some interventions have even increased reliance. For example, slowing down the presentation of story content so participants can more carefully and critically process texts actually leads to greater use of content on subsequent tests (Fazio & Marsh, 2008). One explanation for this surprising increase relies on the previously described accounts: Slowing down the story presentation can make text content easier to encode, increasing retrieval fluency and enhancing subsequent use of the material.

In reviewing the extant literature, many studies demonstrating reliance on fictional contents have used stories describing situations familiar and similar to our own experiences. The mundane situations in these materials involve characters and events that commonly occur in the real world, which might subtly or overtly encourage integration of text contents with prior knowledge. This led us to wonder whether similar effects would be obtained with fiction taking place in unrealistic and far-fetched settings, as commonly described in popular science fiction and fantasy stories. Because these fictional settings are often strikingly different from the real world, individuals might be more likely to compartmentalize the information they read in them. Additionally, because the settings are unfamiliar and foreign, they should prove challenging to imagine and dissimilar enough from our everyday experiences to reduce any potential fluency effects. That is, the specific contents of these stories, because they are different and unfamiliar, will be more challenging to retrieve and reconstruct from memory as compared with the contents of more mundane fiction, with commensurate decreases in reliance on their contents.

In two experiments, we tested whether readers' reliance on information from fiction would decrease when stories were set in fantastic worlds with characters and situations different from those we encounter every day, compared with the patterns obtained with more routine stories. In Experiment 1, participants read stories set in science fiction and fantasy realms or fiction taking place in more contemporary and familiar settings. As described above, the stories contained

statements that conveyed accurate, misleading, or neutral information. After a subsequent distractor task, participants completed a trivia quiz that included questions associated with the manipulated statements. Participants were also asked to identify the source of their knowledge after answering each question. In Experiment 2, we attempted to replicate the obtained effects with a larger number of participants and changing the point of test for source judgments.

EXPERIMENT 1

Given the diversity of fictional settings, stories can describe characters and situations that might make the ostensible veracity of their contents more or less salient. We tested whether participants might rely less on information presented in narratives that seem less relevant for learning about the real world. To do this, we rewrote the materials from Marsh (2004) to create stories set in worlds involving unrealistic characters and events in their plots (e.g., psychic surgery to cure diseases, a journey on a flying carpet). We kept the same target statements, however, presenting them in accurate, misleading, and neutral frames within the stories.

We predicted that compartmentalization would be more likely when stories described settings substantially different from the real world. Evidence supporting this prediction would be obtained if participants reproduced less story information on a subsequent test of general knowledge after reading unrealistic fictional contexts than after reading realistic fictional contexts. Alternatively, participants might rely on the information in unrealistic texts to a greater degree than from the realistic stories given that the critical statements will be easily distinguishable from surrounding unrealistic contexts (e.g., Lizard people discussing which city is the capital of Kentucky might call attention to this fact). Text elements that are distinct from their contexts are better remembered (e.g., Garner, Gillingham, & White, 1989; Harp & Mayer, 1998; Shapiro & Fox, 2002), and thus another possibility is that the unrealistic contexts could enhance use of the critical information on the test.

Method

Participants. Thirty-two native–English-speaking undergraduates completed the experiment in exchange for $15 or partial fulfillment of a requirement for an introductory psychology course.

Materials. Nine stories from Marsh (2004) were presented in their original forms (the realistic condition) or modified to make their plots and settings more fantastic (the unrealistic condition). These modifications changed the characters,

environments, and events from commonplace occurrences to scenes associated with fantasy/science fiction stories. For example, a story involving a conversation in Paris was modified to take place on Jupiter's moon Io, between members of a race of lizard people (see Appendix). We used the same frames for the 54 target statements from Marsh et al. (2003) in both the realistic and modified unrealistic texts. The statements, based on norms (Nelson & Narens, 1980), included 27 easy and 27 hard items.

Target statements were presented in one of three frames. In *accurate frames*, the story contained correct information for answering the test questions. For example, an accurate frame informed participants that the instrument sailors used to navigate by the stars was a sextant. *Neutral frames* did not contain the critical piece of information, instead ambiguously referring to the target concept without naming it. For example, a neutral frame informed participants that sailors used instruments to navigate by the stars but never identified the instruments. In *misleading frames*, an incorrect lure was provided. For example, a misleading frame informed participants that the instrument sailors used to navigate by the stars was a compass. Frames were counterbalanced across target statements within a story, with each statement presented in each frame in one of three packets. This counterbalancing ensured there were two accurate, two neutral, and two misleading frames in each story, with one hard and one easy item for each frame type. The three packets were counterbalanced across participants, and the distribution of facts across frames and texts was identical for the realistic and unrealistic story versions.

The final test of general knowledge consisted of a booklet with 147 short answer questions (e.g., "What instrument did sailors use to navigate by the stars? _____"). Each question was accompanied by two spaces for participants to register source judgments by writing yes or no. One space was marked GK, allowing participants to indicate whether or not they knew the answer they had written before reading the stories; the other space was marked S, allowing participants to indicate whether or not the answer they had written had appeared in the stories. On the final test, 54 items were related to information appearing in the stories in one of the three frames; the remaining 93 items were filler questions whose contents were never mentioned in the stories.

Procedure. Participants completed all tasks individually. All stories were presented in booklets and all tests conducted with pencil and paper. Each participant was given up to 5 min to read each of the nine realistic or nine unrealistic stories, handing a story back to the experimenter either at the end of 5 min or when they had finished reading the story one time. Participants then answered four accompanying short answer comprehension questions after each

story. The comprehension questions were included to ensure participants had a purpose for reading, asking simple questions that did not directly relate to any of the target facts.

After reading, participants completed a 7-minute visuospatial distractor task and then the test of general knowledge. Test instructions warned against guessing and encouraged participants to skip a question if they were uncertain about the answer. Participants were also asked to identify the source of their knowledge for each response. They wrote "yes" or "no" in both the GK and S blanks to identify (1) whether their answer was known before reading or (2) whether their answer was provided in the stories. This allowed for three possible sourcing decisions for each response (i.e., from prior knowledge, from the story, or both). After completing the test, participants were asked to guess the purpose of the experiment. If participants failed to mention having read misinformation, they were informed that "some of the facts embedded in the texts were false" and asked if they were aware of any errors. We coded participants as "aware" of misinformation only if they claimed to have noticed the misinformation *and* were able to list at least one error.

Scoring. Each test response was coded for accuracy and coded for misinformation. Only responses containing the accurate information (e.g., "sextant") were considered correct, and only responses containing the misleading lure (e.g., "compass") were considered misinformation. Blank or other responses (e.g., "horoscope") were not considered as correct or misinformation.

Design. Framing (accurate, neutral, misleading) and Difficulty (easy, hard) were varied within participants. Fiction Context (realistic, unrealistic) was varied between participants.

Results

All effects were significant at an alpha level of .05 unless otherwise noted. Our analyses consider participants' misinformation and accurate responses on the test, their awareness of story misinformation, and their source monitoring identifications for misinformation responses.

Misinformation responses. Table 1 displays mean rates of misinformation responses based on Framing, Difficulty, and Fiction Context. First, we analyzed the effects of Framing and Difficulty without regard to Fiction Context. There was a main effect of Difficulty ($F(1, 30) = 5.77$, $\eta_p^2 = .16$) with participants producing more misinformation for hard ($M = .12$, $SD = .07$) than for easy items ($M = .09$, $SD = .06$). There was also a main effect of Framing ($F(2, 60) = 75.82$, $\eta_p^2 = .72$): Misleading frames led to higher misinformation rates ($M = .23$,

TABLE 1
Mean Proportion of Misinformation Responses as a Function of Framing, Difficulty, and Fiction Context (Data From Experiments 1 and 2)

	Realistic Stories			*Unrealistic Stories*			*Unrealistic Stories*		
	Exp. 1 ($n = 16$)			*Exp. 1 ($n = 16$)*			*Exp. 2 ($n = 47$)*		
	Easy	*Hard*	*Mean*	*Easy*	*Hard*	*Mean*	*Easy*	*Hard*	*Mean*
Accurate	.01 (.03)	.03 (.05)	.02 (.03)	.05 (.09)	.05 (.08)	.05 (.06)	.03 (.06)	.04 (.06)	.03 (.04)
Neutral	.04 (.06)	.05 (.07)	.05 (.04)	.03 (.05)	.04 (.07)	.04 (.03)	.04 (.08)	.04 (.07)	.05 (.05)
Misleading	.22 (.16)	.35 (.14)	.28 (.13)	.18 (.14)	.19 (.16)	.18 (.11)	.20 (.14)	.20 (.15)	.20 (.11)
Mean	.09 (.06)	.14 (.05)		.09 (.06)	.09 (.07)		.09 (.06)	.10 (.06)	

Numbers in parentheses represent standard deviations. Proportion scores are derived from a possible nine misinformation responses per cell per participant (27 easy and 27 hard items divided evenly between accurate, neutral, and misleading frames).

$SD = .13$) than did accurate ($M = .03$, $SD = .05$; $t(31) = 7.98$, $d = 2.03$) or neutral frames ($M = .04$, $SD = .03$; $t(31) = 9.29$, $d = 2.01$). The difference between accurate and neutral frames was not significant ($t < 1$). The interaction between Difficulty and Framing was also not significant ($F(2, 60) = 2.13$, $p = .13$, $\eta_p^2 = .07$).

Next, we examined whether the different story contexts were associated with differential reliance on misleading information. The main effect of Fiction Context was not significant ($F(1, 30) = 2.09$, $p = .16$, $\eta_p^2 = .07$), but Fiction Context interacted with Difficulty ($F(1, 30) = 4.13$, $\eta_p^2 = .12$) and with Framing ($F(2, 60) = 6.26$, $\eta_p^2 = .17$). The three-way interaction was not significant ($F(2, 60) = 1.96$, $p = .15$), so we explored the two interactions independently. For the interaction with Difficulty, unrealistic stories as compared with realistic stories reduced misinformation rates for hard items ($t(30) = 2.33$, $d = .82$) but not for easy items ($t(30) = .00$). For the interaction with Framing, unrealistic stories as compared with realistic stories reduced misinformation rates following misleading frames ($t(30) = 2.29$, $d = .81$) but not following neutral or accurate frames (all $t < 1.60$, all $p > .12$). In other words, the reductions observed after unrealistic story contexts were specific to the inaccuracies that had been presented in the stories, and were most notable for difficult rather than for easy information.[2]

Accurate responses. Table 2 displays mean proportions of accurate responses based on Framing, Difficulty, and Fiction Context. We first analyzed the effects of Framing and Difficulty on the production of accurate responses without regard to Fiction Context. There was a main effect of Difficulty ($F(1, 30) = 249.10$, $\eta_p^2 = .89$) with more correct responses for easy ($M = .63$, $SD = .17$) than for hard items ($M = .24$, $SD = .15$). There was also a main effect of Framing ($F(2, 60) = 49.49$, $\eta_p^2 = .62$). Accurate frames led to higher accuracy ($M = .56$, $SD = .18$) than did misleading frames ($M = .33$, $SD = .15$; $t(31) = 8.98$, $d = 1.39$) or neutral frames ($M = .41$, $SD = .17$; $t(31) = 5.37$, $d = .86$). Misleading frames led to lower accuracy than did neutral frames ($t(31) = 4.53$, $d = .50$). The interaction between Difficulty and Framing was also

[2]Participants were only allowed 5 min to read each story and thus sometimes failed to finish reading the stories in the time allotted (7 of 16 participants in the realistic story condition and 10 of 16 participants in the unrealistic story condition did not finish at least one story). Because the critical statements were distributed throughout each story, participants may not have read some of the statements presented late in the stories. We identified 7 statements (of 54) that appeared on the last 1.5 pages of the story texts and excluded test responses to the pertinent items for the participants who did not finish the stories. This resulted in the exclusion of 48 data points, 14 of which were in the misleading frame condition (a total of 2.42% of all misleading lures). Recalculating our analyses after removing these data points did not affect the pattern of results, again revealing a significant Fiction Context × Framing interaction ($F(2, 60) = 6.53$, $\eta_p^2 = .18$) and a Fiction Context × Difficulty interaction ($F(1, 30) = 4.28$, $\eta_p^2 = .13$).

TABLE 2
Mean Proportion of Accurate Responses as a Function of Framing, Difficulty, and Fiction Context (Data From Experiments 1 and 2)

	Realistic Stories			*Unrealistic Stories*			*Unrealistic Stories*		
	Exp. 1 ($n = 16$)			*Exp. 1 ($n = 16$)*			*Exp. 2 ($n = 47$)*		
	Easy	*Hard*	*Mean*	*Easy*	*Hard*	*Mean*	*Easy*	*Hard*	*Mean*
Accurate	.79 (.19)	.41 (.25)	.60 (.19)	.75 (.19)	.30 (.21)	.52 (.15)	.74 (.18)	.37 (.21)	.56 (.17)
Neutral	.63 (.23)	.18 (.18)	.41 (.17)	.65 (.24)	.17 (.15)	.41 (.17)	.61 (.21)	.21 (.20)	.41 (.18)
Misleading	.47 (.22)	.16 (.13)	.32 (.14)	.49 (.18)	.20 (.19)	.35 (.16)	.52 (.21)	.19 (.16)	.35 (.16)
Mean	.63 (.18)	.25 (.15)		.63 (.17)	.22 (.15)		.62 (.15)	.25 (.14)	

Numbers in parentheses represent standard deviations. Proportion scores are derived from a possible nine correct responses per cell per participant (27 easy and 27 hard items divided evenly between accurate, neutral, and misleading frames).

significant ($F(2, 60) = 5.45$, $\eta_p^2 = .15$). A crucial comparison for this interaction is between misleading and neutral frames for hard versus easy items. For easy items, misleading frames reduced accuracy ($M = .48$, $SD = .20$) as compared with neutral frames ($M = .64$, $SD = .23$; $t(31) = 4.78$, $d = .74$). For hard items, accuracy was similar for misleading ($M = .18$, $SD = .16$) and neutral frames ($M = .17$, $SD = .16$; $t(31) = .24$). Presumably misleading frames did not reduce accuracy for hard items because accuracy was already low for the items, as indicated by performance in the neutral frame condition.

Next, we examined whether unrealistic story contexts influenced participants' acquisition of correct information from the stories. Generally, Fiction Context had little effect on accuracy rates with no main effect, interaction with Difficulty, or three-way interaction between Fiction Context, Difficulty, and Framing (all $F < 1$). The interaction between Fiction Context and Framing also did not reach significance ($F(2, 60) = 2.79$, $p = .07$, $\eta_p^2 = .09$). We note, though, that the difference between correct and neutral frames (an indication of the degree to which participants relied on the texts for accurate information) was numerically larger with realistic texts (19% difference; $d = 1.03$) than with unrealistic texts (11% difference; $d = .69$).

Awareness of misinformation. Based on post-test questioning, participants who read unrealistic stories (12 of 16 participants) were more likely than participants who read realistic stories (6 of 16 participants) to report having noticed misinformation, $\chi^2(1, n = 32) = 4.57$, $p = .03$.

Source judgments for misinformation. With regard to source judgments on the final test, we reasoned that if participants were aware that information came from an unrealistic story and not their general knowledge, they would be more likely to avoid using the information. To test this, we calculated the joint probability of responding with misinformation while making each of the possible source judgments (general knowledge only, story only, both general knowledge and story). Table 3 displays mean joint probabilities for these source judgments exclusively for responses to misleading frames, given this was where misinformation reliance was prominent and the effects of Fiction Context were obtained. Mixed ANOVAs for each type of source judgment were used to assess the effects of Difficulty and Fiction Context. To conduct the ANOVAs, we transformed the data using arcsine transformations given the low range of proportion scores.

Participants were unlikely to respond with misinformation and attribute it only to general knowledge, regardless of Difficulty or Fiction Context (all $F < 1.62$). This reflected a general awareness that the misinformation had appeared in the stories. For story-only judgments, there was a significant interaction between Difficulty and Fiction Context ($F(1, 30) = 5.51$, $\eta_p^2 = .16$). With easy items,

TABLE 3
Joint Probability of Responding With Misinformation and Providing Different Source Judgments (Data From Experiments 1 and 2)

	Realistic Stories			*Unrealistic Stories*			*Unrealistic Stories*		
	Exp. 1 ($n = 16$)			*Exp. 1 ($n = 16$)*			*Exp. 2 ($n = 47$)*		
Source	*Easy*	*Hard*	*Mean*	*Easy*	*Hard*	*Mean*	*Easy*	*Hard*	*Mean*
GK only	.03 (.08)	.04 (.08)	.04 (.06)	.03 (.08)	.04 (.08)	.04 (.06)	.04 (.07)	.04 (.07)	.04 (.06)
Story only	.06 (.07)	.16 (.14)	.11 (.08)	.07 (.07)	.06 (.14)	.07 (.08)	.06 (.09)	.07 (.11)	.07 (.08)
Both GK and story	.13 (.11)	.15 (.12)	.14 (.10)	.08 (.11)	.08 (.12)	.08 (.10)	.10 (.12)	.09 (.11)	.10 (.10)

Data are exclusively from the misleading frame condition. Numbers in parentheses represent standard deviations. Proportion scores are derived from a possible nine misinformation responses per cell per participant (nine easy and nine hard items).

participants were unlikely to provide misinformation they had attributed only to the stories, regardless of Fiction Context ($t < 1$). With hard items, participants provided more misinformation they had attributed to the stories from realistic as compared with unrealistic contexts ($t(30) = 2.28$, $d = .81$). Misinformation responses that participants had attributed to *both* general knowledge and the stories showed no such interaction but revealed a marginal main effect of Fiction Context ($F(1, 30) = 2.86$, $p = .10$, $\eta_p^2 = .09$), reflecting a tendency to rely on misinformation from realistic but not unrealistic stories. This is consistent with the overall pattern that participants were more likely to use misinformation when it was sourced explicitly to realistic rather than unrealistic stories.

Discussion

Unrealistic contexts reduced participants' reliance on misinformation from the stories. This pattern was most readily apparent with difficult items, for which participants were less likely to have prior knowledge. Participants' knowledge about the unrealistic source presumably helped them avoid using the information. Participants who read unrealistic stories were less likely to use information they identified as coming *exclusively* from the stories, especially for hard items. When confronted with difficult questions, participants showed relatively high patterns of reliance on realistic stories for the answers ($M = 16\%$ or 1.44 of 9 possible responses per participant) but were less likely to rely on unrealistic stories for answers ($M = 6\%$ or .54 of 9 possible responses per participant). These effects help explain the interaction between Fiction Context and Difficulty: Unrealistic story contexts helped participants avoid obscure inaccuracies they might otherwise have relied on.

One potential concern is that the reduction in reliance from realistic to unrealistic contexts was relatively small ($M = 10\%$ difference between groups overall, 16% difference for hard items). We note, though, that misinformation rates observed with this paradigm have been attenuated in only a handful of experiments (Rapp, Hinze, Kohlhepp, & Ryskin, in press). Previous studies using explicit detection tasks have managed to reduce these rates between 5% and 10% (Fazio & Marsh, 2008; Marsh & Fazio, 2006). Thus, unrealistic story contexts were at least as effective as explicit detection tasks even though, as in this experiment, the obtained reductions have generally been modest.

Overall, the unrealistic contexts may have helped readers compartmentalize information to avoid using it, a pattern most obvious for the difficult items. The unrealistic contexts did not completely reduce reliance on their contents, as participants used correct information at typical rates and relied on incorrect information for easy items. This suggests a rather item-specific effect of fiction contexts (i.e., participants do not reject information from unrealistic stories as a matter of course). Such specificity is in line with findings from previous work

indicating that information about the reliability or credibility of sources can have a rather limited influence on readers' evaluations of text content (Sparks & Rapp, 2011). General cues as to the reliability of stories (e.g., they are unrealistic) are not guaranteed to affect the degree to which specific materials are processed, evaluated, or relied on.

Because only a handful of projects have reduced participants' reliance on text information, we believed it was important to replicate the critical result. In Experiment 2 we focused exclusively on test performance after unrealistic stories, increasing the number of participants to help provide additional clarity particularly for the source monitoring judgments. We also considered the possibility that source credibility may have been made especially salient to participants as they completed a source judgment immediately after answering each question on the test, so in Experiment 2 we manipulated the timing of the source judgments.

EXPERIMENT 2

Method

Participants. Forty-seven native–English-speaking undergraduates participated in this study for partial completion of credit in a General Psychology course.

Materials and procedure. The materials and procedure were identical to Experiment 1 with the following modifications. First, participants only read stories with unrealistic contexts. Second, one group of participants ($n = 26$) completed the source judgment task after answering each individual test question (simultaneous source-judgment), and another group ($n = 21$) completed the task after answering all test questions (delayed source-judgment). Finally, we did not query participants about their awareness of any misinformation.

Scoring. The scoring of final test responses was identical to Experiment 1.

Design. Fact Framing (accurate, neutral, misleading) and Difficulty (easy, hard) were both varied within participants, with Source-Judgment Timing (simultaneous, delayed) between participants.

Results and Discussion

Misinformation responses. Source-Judgment Timing contributed to no significant main effects or interactions with regard to misinformation rates (all $F < 1$). Therefore, mean misinformation rates are collapsed across this variable in Table 1 alongside the data from Experiment 1. We observed a main effect of

Fact Framing ($F(2, 92) = 92.38$, $\eta_p^2 = .67$): Participants produced more misinformation if they read misleading ($M = .20$, $SD = .11$) as compared with neutral ($M = .05$, $SD = .05$; $t(46) = 8.90$, $d = 1.76$) or accurate frames ($M = .03$, $SD = .04$; $t(46) = 11.13$, $d = 2.05$). The difference between accurate and neutral frames was also significant ($t(46) = 3.57$, $d = .44$). Neither the main effect of Difficulty nor the interaction between Difficulty and Fact Framing were significant (all $F < 1$). These null effects of Difficulty replicate the findings obtained with unrealistic stories in Experiment 1, with rates for hard items dropping to levels commensurate with easy items. We note that these relatively low rates of misinformation after unrealistic stories are again lower than those observed in previous experiments with realistic stories. For example, researchers have reported mean misinformation rates for hard items between .29 (Fazio & Marsh, 2008, Experiment 2) and .40 (Marsh & Fazio, 2006, Experiments 2 and 3). In two additional experiments in our lab, we obtained misinformation rates of .28 and .34 for hard items (Hinze, Slaten, Horton, Jenkins, & Rapp, in press). Misinformation rates in previous experiments using realistic stories are thus consistently higher than were obtained in the current experiment involving unrealistic stories, most notably for hard items.

Accurate responses. Source-Judgment Timing again contributed to no significant main effects or interactions with regard to accuracy rates (all $F < 1.10$), so mean accuracy rates are collapsed across this variable in Table 2, presented alongside the data from Experiment 1. Participants used the accurate information from the unrealistic contexts when responding to questions on the test. We observed a main effect of Fact Framing ($F(2, 92) = 32.91$, $\eta_p^2 = .42$) and a main effect of Difficulty ($F(1, 46) = 505.68$, $\eta_p^2 = .92$), with the interaction between these variables not significant ($F < 2.19$, $p > .10$). Collapsing across Difficulty, correct frames led to higher accuracy rates ($M = .56$, $SD = .17$) as compared with neutral frames ($M = .41$, $SD = .18$; $t(46) = 5.13$, $d = .86$), suggesting that participants learned the information provided in the accurate frames. Notably, the difference between accurate and neutral frames obtained here (15%; $d = .86$) fell between the differences observed in Experiment 1 with realistic (19%; $d = 1.03$) and unrealistic stories (11%; $d = .69$), providing evidence that unrealistic contexts did not substantially modify participants' reliance on accurate information. Accuracy was higher with neutral than with misleading frames ($t(46) = 2.18$, $d = .32$), suggesting a cost to accuracy as a result of reading misleading information. In sum and consistent with previous work, the likelihood of correctly responding to test questions was affected by the framing and difficulty of the information presented. Difficult as compared with easy items led to lower accuracy on the test, with accurate frames increasing accuracy and misleading frames reducing accuracy.

Source judgments for misinformation. Again, Source-Judgment Timing contributed no significant main effect or interactions with regard to joint misinformation probabilities (all $F < 2.20$), so the variable is collapsed in Table 3. In Experiment 1, participants were generally aware that misinformation was presented in the stories and were less likely to rely on story-sourced information from unrealistic than realistic stories. This pattern was most apparent for hard (likely unfamiliar) information. For Experiment 2 we again calculated joint probabilities using paired samples t-tests for each type of source judgment to test the effect of Difficulty.

The data aligned with the findings for the unrealistic stories from Experiment 1. Misinformation was rarely attributed exclusively to general knowledge (4%), with somewhat lower-than-normal rates of misinformation attributed exclusively to the stories (7%) or to both the stories and general knowledge (10%). For hard items, the rate of errors involving misinformation attributed solely to the unrealistic stories in Experiment 2 (7%) was lower than the error rate for hard items attributed to realistic stories in Experiment 1 (16%). But again we observed no effect of difficulty for misinformation attributed to general knowledge ($t(46) = .17$), the story ($t(46) = .90$), or both general knowledge and the stories ($t(46) = .49$).

The results of Experiment 2 replicated Experiment 1, again demonstrating that participants exhibit relatively low levels of reliance on information presented in stories set in unrealistic situations. This is in contrast to the findings obtained with fiction stories set in real-world contexts. The results also indicated that the timing of the source-judgment task was unlikely to have contributed to the levels of misinformation observed with unrealistic stories.

GENERAL DISCUSSION

Fictional texts can present mixtures of accuracies and inaccuracies in their contents, given the freedom that authors enjoy in crafting their narrative worlds. In addition, readers may be more or less aware as to whether the contents of these texts offer valid information about the real world. Previous work has shown that participants use accurate and inaccurate information from stories to answer related test questions. However, it has remained unclear whether these findings are generalizable: To date, work has focused on texts with events and characters in settings similar to those we encounter during our everyday dealings. This contrasts with the distinctive and fantastic locales and characters common to popular fiction (e.g., science fiction and fantasy). Fantasy settings differ strikingly from fiction involving more mundane characters and events, offering a crucial comparison for assessing the generalizability of previous findings and the opportunity to test accounts of how and why previously described effects emerge.

The current project offered just such a comparison. In Experiment 1, participants read stories taking place in unrealistic science fiction and fantasy settings or fiction stories taking place in more contemporary, realistic settings. The stories included statements conveying accurate, misleading, or neutral information. After reading the stories, participants completed a test that included questions associated with information from the manipulated story statements. Participants were also asked to identify the source of their knowledge for answering each question. In Experiment 2, we replicated the design focusing only on unrealistic stories to test whether the findings from Experiment 1 were dependent on the timing of source judgments.

Both experiments obtained the previously observed pattern: People used the information provided in the stories to answer subsequent test questions. Participants were more likely to provide accurate information if they read accurate as compared with neutral statements and were more likely to provide misinformation if they read misleading as compared with neutral statements. As with previous work, participants exhibited a liberal reliance on information from the texts. However, this reliance was reduced when participants read stories taking place in unrealistic settings as compared with realistic settings. These reductions were observed in two specific ways. First, participants were less likely to rely on *misleading* information if it appeared in unrealistic as compared with realistic stories. Second, participants exhibited reductions in reliance for difficult statements they were unlikely to know before reading the texts, with no reductions observed for easy, familiar statements. These differential reductions provide evidence that readers' acquisition of inaccurate information from fiction depends on the types of fiction they read. Experiment 2 also demonstrated these reductions were not dependent on the demands associated with making source-judgments during the test, as similar reductions obtained even when the judgments were delayed.

Why were reductions observed in these experiments, while previous attempts designed to encourage scrutiny and critical evaluation of text contents often fail to do so? Fluency and compartmentalization may provide possible answers to this question. With respect to fluency, readers rely on fictional information because previously read statements are familiar and easily retrievable from memory (Kelley & Lindsay, 1993). This retrieval fluency supports the use of earlier read material, while also instantiating feelings that the retrieved information is true. Here we hypothesize that unrealistic texts are less likely to instantiate similar patterns. The kinds of events described in science fiction and fantasy stories usually involve less familiar situations than are described in contemporary, real-world settings. In Experiment 1, participants in the unrealistic condition finished reading fewer stories in the time allotted ($M = 6.63$ of 9 stories finished) than did participants in the realistic condition ($M = 8.19$ of 9 stories finished) ($t(30) = 2.29, d = .81$), consistent with the notion that the unrealistic stories were

relatively difficult to read. Because of the resource requirements and comprehension challenges associated with processing less familiar, difficult information, readers may (1) encode the information superficially or not at all and/or (2) struggle with retrieving the difficult information from memory. Unfamiliar story details may be less likely to connect with familiar, readily accessible information in memory, reducing the likelihood that readers will develop feelings of fluency (see McKoon & Ratcliff, 1992; Myers & O'Brien, 1998). As a result, information from less familiar fictional contexts would be less salient or available in memory during subsequent tests and less likely to engender feelings of believability or truth. Any account along these lines, however, must reckon with the fact that participants showed no reductions in learning accurate information from the unrealistic texts and the notion that previous manipulations of text difficulty have not obtained differences in the effects of misinformation (i.e., Marsh & Fazio, 2006).

Of note, participants in our experiments correctly ascribed what they learned to stories, even when they reported that some of the information was nonetheless known beforehand. These sourcing patterns indicate that readers were often successful in compartmentalizing what they read. We hypothesize that unrealistic stories encourage compartmentalization precisely because their situations are so different from what readers are familiar with based on their understandings of the real world. The results of Experiments 1 and 2 indeed showed that participants were less likely to accept misleading information sourced solely to stories. Our suggestion is that unrealistic settings encourage accurate sourcing of information to support compartmentalization. Thus, the combined effects of enhanced compartmentalization and decreased feelings of fluency can reduce reliance on the contents of unrealistic texts.[3]

Other explanations for the observed effects might also be viable. For example, when participants are asked to complete subsequent tasks, they can retrieve episodic traces of previously read information, invoking a decision as to whether to trust that information or discount it. Participants may be willing to trust the veracity of information recalled from realistic stories but less willing to trust information from unrealistic contexts. These views align with the notion that the kinds of epistemic evaluations necessary for understanding text content can change as a function of expectations about the utility of that content. More generally, some kinds of contents, contexts, and tasks motivate the use of evaluative criteria that prohibits inaccurate information from influencing

[3]One interesting possibility is that the influence of fluency and compartmentalization might depend on whether participants are reading easy or hard misinformation items. For example, fluency might drive the effects of easy inaccuracies, whereas successful compartmentalization might protect against hard misinformation. We thank an anonymous reviewer for suggesting this provocative distinction.

subsequent activities (e.g., Prentice et al., 1997). Recent empirical accounts have considered situations under which the consequences of these kinds of epistemic evaluations can prove more or less successful (e.g., readers lack requisite prior knowledge; reader goals misalign with careful evaluation; Schroeder, Richter, & Hoever, 2008). We propose that text-driven features, made salient for example through beliefs about genre or the familiarity of text content, similarly influence evaluation processes.

For the current study, differential decreases in reliance on text information were observed precisely with respect to whether information was familiar or unfamiliar. Specifically, difficult statements were less likely to be used when they appeared in unrealistic texts, with no commensurate reduction for easy statements. One explanation for this pattern is that difficult facts did not connect with readers' prior knowledge and as a result were unlikely to be encoded or retrieved at a later time point, in line with our discussion of fluency effects. A second possibility connecting with notions of compartmentalization is that participants tagged or grouped unfamiliar statements into the same general category as the unrealistic context. The result would be a belief that unfamiliar, difficult statements came from the unrealistic story and hence were unlikely to be true. To date, readers' use of easy but inaccurate information has proven a challenge for researchers to explain and remediate. "Mere exposure" to facts, readers' familiarity with those facts (albeit familiarity with their accurate rather than misleading forms), and the demands of answering questions that connect with information from previous texts create a confluence of factors that encourages reliance (sometimes termed gullibility). In other work we have begun to test how comprehension goals and task requirements might help draw attention to the discrepancies between what participants know and inaccurate versions of that knowledge, to see whether more effective critical evaluation of text contents can be encouraged during experiences with fiction (Rapp et al., in press).

One activity that may support critical evaluation involves fostering readers' noticing of accurate and inaccurate information. Several projects have used monitoring tasks to determine whether requiring that participants track inaccuracies can help them avoid subsequent use of the information (Fazio & Marsh, 2008; Marsh & Fazio, 2006). These projects have demonstrated modest effects, with readers exhibiting similar patterns of reliance even when tasked with acknowledging discrepancies between what was read and prior knowledge. We suspect that noticing is only one component of a larger set of processes that needs to be enacted to support evaluative reading. To ensure readers will reject inaccuracies, they must also be encouraged to discount or replace noticed inaccuracies with correct information. Doing so may decrease the likelihood that inaccuracies will be encoded, and increase the availability of correct information from memory (Rapp & Kendeou, 2007, 2009). These supports connect with accounts of fluency and compartmentalization, suggesting avenues for future work on knowledge acquisition.

These issues also connect with classic and contemporary accounts that have considered the spontaneity and automaticity of reader validation during discourse experiences. According to one set of views, readers are unlikely to engage in critical evaluation unless they are specifically tasked with doing so and unless they have sufficient resources to accomplish such tasks (e.g., Gerrig, 1993; Gerrig & Prentice, 1991; Gilbert et al., 1990, 1993; O'Brien & Albrecht, 1992). According to other views, readers spontaneously engage in critical evaluation given it is a major component of comprehension (e.g., Richter, Schroeder, & Wohrmann, 2008; Schroeder et al., 2008; Singer, 2006). The current project did not provide a time course analysis to disentangle whether decreased reliance on story information is linked to immediate evaluations during initial encoding or to subsequent evaluation that occurs after initial processing. Instead, the current project shows that readers evaluate what they read, whenever that may happen, under particular circumstances (i.e., with unrealistic texts) as compared with under the types of circumstances that have been more regularly studied (i.e., with realistic texts). Accounts that highlight immediately enacted or strategically derived epistemic validation processes must consider the differential effects associated with responses within and across different text materials, like those in the current project. People can acquire knowledge from fiction, even inadvertently so, but the likelihood of that acquisition may be influenced by the familiarity of text content and the degree to which that content aligns with expectations and understandings of the world.

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APPENDIX

Below is an example Unrealistic text from Experiments 1 and 2. Critical facts are in caps and bolded. The correct information appears first, followed by neutral information (if included, otherwise blanks are represented by Xs), and misleading information.

ART THIEF

Here on Io the native Exoccerians, lizard people, are always asking you questions like "How are you?" or "Having a nice day?" for which they don't really want the real answers. Instead they want stock, short, acceptable answers and more flies to eat. But sometimes your answer isn't simple, and you just gotta tell the whole story. I'm sitting in this seedy little bar, on Jupiter's only inhabited moon, and you've just asked me why I've chosen to hang out in this particular bar. I can't just answer, "Because it's close to my place," or "because the molecularized beer is cheap," because neither is true and there's a story to be told . . .

I meet people, human, Martian or otherwise, wherever I go—at parties, on spaceships, in holograph stores. I get some great stories that way. But nothing compares to the story I'm about to tell you—it's about a Martian I met last year when I was here on Io for spring break. So I wandered into this bar, this little hole-in-the-wall kind of bar, because I was lost, and I wanted someplace to read my holographic-guidebook away from the pickpockets. I sat down next to this kinda hairy looking Martian who had obviously had way too much to drink, and he just started talking!

"Ah, my friend, the city! The living buildings! The people! My cyborg friend, can you believe we are on Io? I once lived in a pleasant city myself back on Earth, the capital of Kentucky, **FRANKFURT/XXXXX/LOUISVILLE**,—but compared to this—nothing!"

I glanced over at the hairy Martian. It was dark in the bar, like it is today. I couldn't really see him, and, frankly, I wasn't very interested in what he had to say. Why would I want to talk to a Martian on Io? A drunk, old Martian who looked like he hadn't showered in a few days.

The guy caught my glance. "So, little cyborg, you think I am nothing but a silly, pathetic Martian? No, you are the pathetic one—you are a student, correct? Well, listen to me, and you can learn a thing or two."

I glanced around the bar, thinking maybe I should switch seats. But manners kept me politely seated next to the old Martian.

"So, what do you do?" he asked me. "Is your spore-father paying for your trip? Do you ever make any money for yourself? Do you ever live dangerously, or do you just go to all the tourist sites and check things off your itinerary?" He polished off another radioactive vodka shot and banged his glass down onto the bar. I decided that maybe if I just ignored him he'd stop talking and, meanwhile, I'd just look up things in my holographic-guide book while finishing my drink.

"Me, I am an art connoisseur; holographic or two-dimensional. I do what it takes to get myself pretty, interesting paintings, and then I appreciate them, fully, unlike all those silly people who go to the museums just because they feel like they should. You have heard of the disappearance of **WOOD'S/XXXX/GREEN'S** *American Gothic*? One of my favorite paintings, it looks so nice above my bed… You look uneasy my cyborg friend. Don't worry. I am not a thief. I am not about to pick your pocket. What, you compare me to some idiot who convinces an old lady to part with her red **RUBY/XXXX/AMETHYST** ring?

Definitely crazy, I decided. Just my luck, to meet a crazy Martian on Io.

"But what is the most beautiful painting of them all? The *Lakefront Lilies*, painted in the year 2384, of course, and that is why I must have it for my home." He laughed at my look of disbelief. "You don't believe me? But you see, it was surprisingly simple. There are natural tunnels under the museum, I beamed into one of them from the basement of a nearby building.

The hard part, my friend, was getting the painting off the floating pedestal. What made it all possible, though, was that no one believed that anyone would ever try to steal the *Lakefront Lilies*—and when people assume something is impossible, they are bound to overlook something."

The drunkard paused and considered me. "You want to make some real money? By yourself?" he leaned closer and whispered into my ear. His breath was foul. "See what I will give you if you help me…" with that, he reached into his pocket and produced a blue stone which glistened even in the dim light of the bar. "It's a crystallized piece of fire. It's like the blue eye of a cat, no?"

I think he misinterpreted my silence as some kind of agreement or interest.

"Here's what I need you to do. Go to Heathrow airport **IN LONDON/XXXXX/IN DUBLIN** and use my sonic rocket ticket to fly back to Kentucky. That's all. I just need it to look as if I left Io. Then, if anyone should even think to track me, the last place they will look for me is here on Io. Or maybe I will travel back to Earth and see Europe. There is so much beautiful art in Europe to see… I would like to see that famous ceiling artwork of Michelangelo **IN THE SISTINE CHAPEL/XXXXX/ IN THE DUOMO**, or maybe I will go see his *David*. Yes, that would be quaint—Italy. I've always wanted to go to **VENICE/ITALY/PADUA** for a gondola ride, like travelers did in centuries past…."

He ended his reverie and looked sharply at me. "What say you? You want the crystallized fire?"

By this point in time I had finished my drink, settled my check, and figured out where I was headed next. I had no more reason to sit listening to a crazy Martian. So I stood up, put my holographic-book back in my backpack, and started towards the airlock. But for a

drunk, the old martian moved quickly—before I was two steps away, he had an incredibly firm grip on my upper right arm with his seven-fingered hand.

"You arrogant little cyborg," he hissed. "You don't believe a word I've said. You probably think I'm a crazy carting around a blue paperweight. I was being nice—offering you a chance for a little excitement and you walk out on me." His grip on my arm tightened, it was actually painful from his claws. "Before you go, my cyborg friend, I ask you to look in this metallic case."

He pointed with his tail to a scuffed metal case under his bar stool. I hadn't noticed it before. I shook his grip off, and just so he'd leave me alone, I looked in the case. What I saw was a laser pistol. After I stared at that for thirty seconds, I realized he actually wanted me to look at something else—a rolled up piece of parchment. All I could see was that it was an oil painting, with greeny-golds at the edges. But surely it couldn't be . . .

I don't know how long I just stood there with the open metal case in my hands. Suddenly the air was pierced with the sound of sirens, the old man brusquely grabbed the case away from me, and I was alone.

The next day I eagerly bought a holo-news disc—no art theft. Nor the next day, nor the day after that. I had classified it all in mind as a hoax on the old Martian's part until I got home to Venus. Waiting on my doorstep was a box addressed to me, and it contained the crystallized fire with a note attached: "I forgive you, my friend, for your lack of imagination. Thanks for listening to an old Martian. Now do something exciting with this cat's eye. I've given you the real thing, unlike what I left them in the Louvre."

I don't know how the old Martian got my address or even my name. I don't know what to think about the holographic *Lakefront Lilies* currently sitting in the Rotating Louvre. All I know for sure is that he sent me a fire crystal that I sold for $50,000—enough to pay off the rest of my college tuition, but instead I used it to take a trip around the galaxy. I'm doing something exciting like the old Martian said—and that's how I've come to be here in this bar talking to you. Revisiting the scene of the crime, so to speak.