Parallels Between Visual and Textual Processing

Abstract—Campbell argues that the perception of unity in written discourse is part of a more general perceptual phenomenon and is, in fact, analogous to the perception of visual unity. Specifically, she argues that Grice’s Maxim of Relation operates analogously to the Gestalt principle of Continuity in visual perception. However, she also concludes that Grice’s other three maxims have no analogs in Gestalt theory. We believe Grice’s other maxims actually do have analogs in principles of visual perception, but the relationship between the two is opaque because they are stated in domain-specific terms. We suggest meta-principles that connect the two domains.

Index Terms—Document design, Gestalt principles, principles of visual perception, reading processes.

Campbell [1] hypothesizes that principles of visual perception developed in Gestalt psychology also play a role in the processing of text: “the cognitive principles which explain why humans ‘sense’ unity in ... a configuration of visual shapes ... are the basis of principles that explain why we ‘sense’ unity in a string of sentences ...” [1, p. 1]. In particular, she argues that Gestalt principles of Continuity, Similarity, and Proximity create the perception of unity in visuals, much the same way as a principle from linguistic pragmatics, Grice’s Maxim of Relation, creates the perception of unity in text.

For example, the Gestalt principle of similarity, which says that viewers expect similar items to be related, is illustrated in Fig. 1. The principle of Similarity compels viewers to perceive the elements in Fig. 1 as rows rather than as columns because the items in rows are similar, but those in columns are not.

Likewise, Campbell argues, Grice’s Maxim of Relation says that readers (or listeners) expect items in a discourse to be related. (For the sake of brevity, we will use the term “readers” throughout when discussing textual perception; however, the principles described in this paper apply equally to both printed and spoken texts.) This effect is enhanced when related items are put into syntactically parallel constructions. For example, Campbell compares the following two versions of a passage from an article in a veterinary medicine journal (the verb phrases of interest have been italicized).

(1a) The dog was placed under general anesthesia ....

[1] The tibiotarsal joint was

Fig. 1. Illustration of Gestalt principle of similarity.

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+ + + + + + + +

- - - - - - - -
accessed via osteotomy ... Two fragments ... were identified.

(1b) The dog is placed under general anesthesia .... We accessed the tibiotarsal joint via osteotomy .... Two fragments ... were identified.

[1, p. 46]

The sentences in (1a) are perceived as a unified whole because the verb phrases are the same (past tense, passive voice). The sentences in (1b) are perceived as less unified because the verb phrases are inconsistent (is placed is present tense, rather than past; and accessed is active voice, rather than passive).

While Campbell is to be credited for her insight into the relation between the Gestalt principles that govern visual perception and the Gricean maxims that govern textual perception, we believe that her argument stops short of exploring the full potential of this relationship. She argues that Grice’s Maxim of Relation is the only one with analogs in visual perception, stating that there are “three additional principles of discourse coherence that are suggested by Grice’s work, but that appear to have no analogs in Gestalt theory: manner, quantity, and quality” [1, p. 27]. Campbell comes to this conclusion because she assumes that all of Grice’s maxims subserve discourse “coherence,” and that all Gestalt principles subserve “unity”—the visual analog to coherence. She states, “As with coherence involving manner and quantity, coherence involving the quality of information appears to have no analogous principles in Gestalt theory” [1, p. 35].

We believe, however, that each of Grice’s other maxims subserves a different property that, in turn, does have an analog in Gestalt psychology, as shown in Table I.

The relationship between the Gestalt principles and Grice’s maxims is not obvious because both are stated in domain-specific terms (i.e., visual and textual). However, when viewed from a more abstract perspective, each of the four pairs is a special case of a meta-principle, as outlined in Table II.

We feel that there are enough parallels between principles of Gestalt psychology and linguistic processing (especially as explained through Grice’s maxims) to pursue the analogy. Our purpose here is to enumerate a number of these parallels that suggest that visual and textual processing are subserved by at least some of the same principles.

Our discussion is organized as follows. First, we elucidate four common properties of Gestalt psychology and linguistic theory. Second, we explore the concept of “bridging” in Gestalt psychology and linguistic theory. Third, we demonstrate analogs between specific Gestalt principles and Grice’s maxims. Fourth, we investigate degrees of “goodness” for visual and textual processing, under ideal, normal, and degraded conditions.

**Gestalt Theory and Linguistic Theory: Shared Theoretical Assumptions**

Before looking at the particulars of Gestalt psychology and linguistic theory, we want to begin by

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<th>GESTALT PRINCIPLE</th>
<th>GRICE’S MAXIM</th>
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<td>1. <strong>Continuity</strong>: Viewer expects elements to extend along a continuous line.</td>
<td>1. <strong>Relation</strong>: Reader expects items in a discourse to be related.</td>
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<tr>
<td>2. <strong>Figure/Ground</strong>: Viewer expects a single figure against a single background.</td>
<td>2. <strong>Manner</strong>: Reader expects discourse to be unambiguous.</td>
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<tr>
<td>3. <strong>Closure</strong>: Viewer interprets a partial figure as whole.</td>
<td>3. <strong>Quantity</strong>: Reader expects discourse to contain neither too much nor too little information.</td>
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<tr>
<td>4. <strong>Constancy</strong>: Viewer expects objects to remain stable across different contexts.</td>
<td>4. <strong>Quality</strong>: Reader expects discourse to be truthful, not misleading.</td>
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examining some of the more general common ground that unites these two approaches to human perception. First, both approaches are antireductionist. That is, they assume that higher order perceptions cannot be reduced to physiological mechanisms. According to Brennan, “Gestaltists argue that the very attempt to reduce the psychological event to its physiological components results in a loss of the psychological events” [2, p. 217]. As Schriver puts it, “A chair reduced to its parts is no longer a chair but rather a heap of sticks” [3, p. 304]. Similarly, linguist Steven Pinker expresses this same point of view:

[Ordinary language] philosopher John Searle has argued that the physico-chemico properties of brain tissue somehow produce the mind just as breast tissue produces milk . . . . But recall that the same kinds of . . . chemicals are found in brain tissue throughout the animal kingdom, not to mention in brain tumors . . . . Of course, something about the tissue in the human brain is necessary for our intelligence, but the physical properties are not sufficient, just as the physical properties of bricks are not sufficient to explain architecture and the physical properties of oxide particles are not sufficient to explain music” [4, pp. 64–65].

Second, both theories are compatible with a “nativist” interpretation. That is, they assume that perception is enabled by innate capabilities of the human species. According to Brennan, “Underlying Gestalt psychology was the nativist proposition that the organization of mental activity predisposes the individual to interact with the environment in characteristic ways” [2, p. 217]. Along the same lines, Pinker discusses the abilities of very young infants to perceive and interpret visual stimuli:

“ . . . infants see objects, remember them, and expect them to obey the laws of physics . . . , [Yet] they could not have learned anything by the standard techniques of interaction, feedback, and language. Nonetheless, they are sagely understanding a stable and lawful world” [4, p. 319].

Likewise, Chomsky’s arguments for nativism in the realm of language are well known:

A normal child acquires the bulk of his or her first language (other than vocabulary) before ever starting school; thus, it is clear that teachers do not “teach” a child language. Indeed, children who never attend school in their lives acquire language. Likewise, parents do not “teach” their children language. In fact, most parents have no conscious knowledge of the rules of their language [5, p. 211].

Third, both Gestalt psychology and linguistic theory are what we might call “participatory” theories. That is, they assume that the mind plays an active role in perception. Brennan notes that “the Gestalt psychologists . . . recognized the inherent organization and activity of the mind” [2, p. 220]. As Schriver puts it in her discussion of visual perception, humans “actively organize what they see. They . . . impose structure . . . .” [3, p. 304]. Likewise, writing about speech perception, Gee observes that “Listeners are actively predicting what will be in the speech stream and actually placing it there, in a sense, in some cases” [6, p. 251].

Fourth, both theories assume that perception is “automatic.” In the

### TABLE II

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<tr>
<th>Meta-Principles Connecting Gestalt Principles and Grice’s Maxims</th>
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<td>1. <strong>COHESION:</strong> Perceiver will interpret a stimulus in the way that requires the least effort (i.e., will follow the “path of least resistance”).</td>
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<tr>
<td>2. <strong>CLARITY:</strong> Perceiver will impose a single interpretation on a stimulus (i.e., will treat perception as a “zero sum game”).</td>
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<td>3. <strong>COMPLETENESS:</strong> Perceiver will interpret a stimulus as whole (i.e., as conveying “the whole truth”).</td>
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<tr>
<td>4. <strong>CORRECTNESS:</strong> Perceiver will interpret a stimulus at face value (i.e., as conveying “nothing but the truth”).</td>
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visual realm, Brennan observes that “The salient features of shapes and forms we see on a background are ..., spontaneous activities and not an acquired skill” [2, p. 223]. Likewise, Pinker notes that “We perceive surfaces involuntarily ...: contrary to popular belief, we do not see what we expect to see” [4, p. 260]. In the realm of language, the automatic nature of perception is summed up well by an anecdote cited by linguist Jerry Fodor.

One day ... my friend, colleague, and sometimes coauthor Merrill Garrett made what seems to me to be the deepest remark that I have yet heard about the psychological mechanisms that mediate the perception of speech. “What you have to remember about parsing,” Merrill said, “is that basically it’s a reflex” [7, Dedication].

In short, the common general assumptions underlying Gestalt psychology and linguistic theory motivate an investigation of similarities between more particular components of these theories.

**Bridging**

One fundamental similarity between visual and textual processing is that they both utilize the concept of “bridging,” that is, inferring information that is not explicitly presented. Take a moment to examine Fig. 2. What do you see?

Now take a moment to read Interchange 2a, based on an interview between a reporter and a United States Senator during the Anita Hill–Clarence Thomas hearings in 1991. How do you interpret the Senator’s answer to the reporter’s question? (See Interchange 2a at the top of this page.)

Viewers typically describe Fig. 2 as containing two triangles (one with a black border and one without). Readers typically interpret the verbal interchange between the reporter and the Senator as conveying the Senator’s belief that, indeed, Anita Hill is lying. However, Fig. 2 does not, upon inspection, contain any triangles; yet we nevertheless perceive them. Similarly, the Senator does not, upon inspection, actually state that Anita Hill is a liar; yet we nevertheless perceive that as his belief. In fact, the Senator actually went on to deny that allegation. (See Interchange 2b at the top of this page.)

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**Interchange 2a**

REPORTER: Do you think Anita Hill is lying?
SENATOR X: If someone sexually harassed me,
I wouldn’t follow them to another
job or call them repeatedly on the phone.

[8, p. 181]

**Interchange 2b**

REPORTER: Do you think Anita Hill is lying?
SENATOR X: If someone sexually harassed me,
I wouldn’t follow them to another
job or call them repeatedly on the phone.

REPORTER: So you do think that she is lying.
SENATOR X: I didn’t say that.

[8, p. 181]
These two seemingly disparate examples—one visual, one verbal—have in common the fact that they evoke perceptions that are not, strictly speaking, part of the stimuli themselves. In Fig. 2, we perceive a triangle that is literally not there; and in Interchange 2a, we perceive a proposition that is literally not stated.

**ANALOGS BETWEEN GESTALT PRINCIPLES AND GRICE’S MAXIMS**

In this section, we will look at principles from Gestalt psychology and demonstrate how they operate analogously to Gricean theory. In doing so, we will propose that both visual and textual perception adhere to four meta-principles that unite particular subprinciples within Gestalt theory and Gricean theory. The meta-principles are cohesion, clarity, completeness, and correctness.

**Cohesion** The first meta-principle, cohesion, says that perceivers will exercise the least effort in relating things. We have already looked at one example of cohesion at work in the visual and textual domains: the pluses and minuses displayed in Fig. 1, and the passage from the veterinary journal in (1a).

As an additional visual example, consider Fig. 3, which depicts coyote tracks entering and exiting a water puddle. Take a moment to trace the coyote’s path. Fig. 3 illustrates the Gestalt principle of Continuity: viewers expect elements to extend along a continuous visual line. Chances are that when you traced the coyote’s path, you went either from (a) to (d) or from (c) to (b). Explains Schriver, “The footprints at (d) are said to provide a good continuation of the footprints at (a) because they line up reasonably well ..., The footprints at (b) do not provide good continuation to those at (a) because of the sharp angle between the two paths” [3, p. 313]. It is important to note that the path from (a) to (b) is not an impossible route for the coyote to have taken—just that it is not the first one that we imagine. In the verbal domain, Grice’s Maxim of Relation closely parallels the Gestalt principle of Continuity. According to the Maxim of Relation, readers expect discourse elements to be related to each other, and will interpret them as related in the absence of compelling reasons not to. For example, consider sentence (3).

(3) The woman reported that she had been experiencing headaches.

The most natural interpretation of she is as referring back to The woman mentioned earlier in the sentence, although (like the coyote path from (a) to (b)) it is also possible to interpret she as referring to a second female, one not mentioned in the sentence. What the Gestalt principle of Continuity and Grice’s Maxim of Relation have in common is that perceivers tend to look for the “path of least resistance” in interpreting visual or textual information.

Violations of the Gestalt principle of Continuity arise when visual elements fail to follow a continuous line. For example, consider the graph in Fig. 4, which was produced by a technical writing student.

Fig. 4 is confusing to interpret because of its three-dimensional quality. For example, consider the leftmost “Public” bar (for 1975). At first glance, the bar’s value may appear to be more than 80%.

This is because the “path of least resistance” extends from the horizontal background grid leftward to the 80% value on the y axis. A second look, however, shows that the background grid changes direction; the actual value of the bar in question is slightly more than 70%. Texts that violate the Maxim of Relation create the same disorienting effect. For example, passage (4) is from an experiment described by Duin.

(4) 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. It is important not to overdo things. That is, it is better to do too few things at once than too many. In the short run this may not seem important, but complications can arise. A mistake can be expensive as well. At first the whole procedure will seem complicated. Soon, however, it will become just another fact of life ..., [9, p. 97].

Subjects were asked to read passage (4) quickly, to put it aside, and to recall as much information as possible. Some subjects, however, were given the title of the passage before they started reading:
“Washing Clothes.” Those subjects were able to recall a significantly greater amount of information from the passage, because the title enabled them to infer the relation among the ideas and enhanced the passage’s comprehensibility.

Clarity The second meta-principle, clarity, says that perceivers seek to impose a single interpretation on a stimulus, to the exclusion of others. In the visual realm, the Gestalt principle of Figure/Ground illustrates this tendency. When presented with an image like the classic “face/vase” phenomenon shown in Fig. 5, viewers expect a single figure against a single background. Hence, we are able to see either a face or a vase—but not both at once. A number of similar illusions have been used to illustrate this phenomenon: for example, the duck/rabbit shown in Fig. 6.

While such images illustrate how viewers seek clarity in interpreting visual stimuli, similar principles operate in the interpretation of text. Here Grice’s Maxim of Manner is relevant. This maxim states that readers expect unambiguous discourse and treat it as a “zero sum game.” So strong is this expectation that, when presented with ambiguous structures in psycholinguistic experiments, readers often perceive only one interpretation at first and must be “coached” to perceive the second interpretation. For example, consider sentence (5).

(5) Jane hid the letter from Dan.

Most readers will interpret this sentence as meaning “Jane didn’t want Dan to see the letter.” In fact, however, there is another interpretation that means “Jane hid a letter that Dan had written.” The difference lies in whether the prepositional phrase from Dan is interpreted as adverbial (modifying hid) or as adjectival (modifying the letter). This difference can be seen in the two different passives that can be constructed based on the original sentence: The letter was hidden from Dan by Jane (adverbial) and The letter from Dan was hidden by Jane (adjectival).

Problems may arise in technical discourse because of ambiguous wording. One example is the Rail Car Rhetoric case, constructed by Walzer [10] based on examples by Shimberg [11]. The case involves an engineer and a technical writer who both work for a firm that designs and tests rail cars. While working together on a proposal for a new rail car for the New York–New Haven Railroad, the engineer revises the technical writer’s draft in a way that allows (but does not force) the reader to draw false inferences—i.e., the revisions allow the engineer to promote misinterpretations without stating actual falsehoods. For example, the technical writer’s description of a fire prevention system that does not yet work consistently in all types of fire conditions is given in (6) (emphasis added).

(6) An electronic system that would bring the train to a gradual halt and would automatically open all the doors to the trains is currently in the developmental stage. Further testing is needed to assure reliable performance. We are confident that we can develop a system that would ensure the safety of the passengers in the event of a fire [10, p. 158].

However, this version is rejected by the engineer and replaced by (7) (emphasis added).

(7) In the event of a fire, a sensitive electronic system has been designed to bring the train to a gradual stop and automatically open the doors [10, p. 157].

As Walzer points out, the problem with (7) lies in the Maxim of Manner: designed is ambiguous, since it can mean either “to conceive” or “to execute.” In this case, the engineer is clearly hoping the reader will impose the latter interpretation on designed.

The point is that the same impulse underlies perception in both the Gestalt principle of Figure/Ground and Grice’s Maxim of Manner. Perceivers seek a single, unambiguous interpretation.

Completeness The third meta-principle, “completeness,” says that perceivers tend to fill in missing information; that is, partial images or texts are perceived as complete. The Gestalt principle of Closure reflects this tendency. One illustration of this principle was given earlier in this paper, in the Kanisza triangle shown in Fig. 2. Viewers unfailingly see two triangles in that image, even though no complete triangle is actually present. Likewise, viewers interpret an image like that in Fig. 7 as the number 8, even though it is technically not complete.

In the textual domain, Grice’s Maxim of Quantity is a counterpart to the Gestalt principle of
(9)

FARMER BROWN: Hey, Sam, my mule's got distemper.

What'd you give yours when he had it?

SAM: Turpentine.

[a week later]

FARMER BROWN: I gave my mule turpentine like you said and it killed him.

SAM: Did mine, too.

[12, p. 237]

Closure. This maxim says that readers assume they are getting “the whole truth”—i.e., that critical information is not being omitted.

Interestingly, perceivers can be misled in similar ways by violations of both the Gestalt principle of Closure and the Maxim of Quantity. Simply put, we draw the wrong conclusions if we do not have enough information. For example, consider Fig. 8. This figure is compatible with the interpretation that it is a capital letter S. There is enough information to “fill in” that interpretation. However, this figure is too incomplete to be perceived as a number 8 (compare Fig. 7).

A similar misinterpretation is fostered when readers are presented with discourse that is missing a crucial element. For example, compare sentences (8a) and (8b).

(8a) John likes football more than Gloria does.
(8b) John likes football more than Gloria.

Sentence (8a) is similar to Fig. 6: even though it does not explicitly state the proposition “John likes football more than Gloria likes football,” the information can be inferred from the pro-form does, which substitutes for likes football. Sentence (8b), however, is similar to the more problematic image in Fig. 8. In the absence of a pro-form following Gloria, we find ourselves unsure about how to interpret the sentence. Is it equivalent to “John likes football more than Gloria likes football?” Or to “John likes football more than he likes Gloria?”

Just as Fig. 8 can be interpreted as either an S or an 8, so (8b) can be interpreted as having two different meanings.

The second example goes back to the Rail Car Rhetoric case. The engineer claims that the rail car being designed “travels at speeds in excess of 250 mph”—a speed dramatically better than the existing system. The problem is that the engineer omits critical information: namely, that this speed was reached on new, state-of-the-art test track. (On the track actually in place, the proposed car’s speed would not exceed that of the existing cars.) Since no information is provided about where the speeds were attained, the reader is likely to assume that the car was tested on the same type of track currently in place. This assumption, though, will lead the reader to the wrong inference.

Correctness. The final meta-principle, “correctness,” says that perceivers assume that they are receiving accurate information. In the realm of vision, this is illustrated by the Gestalt principle of Constancy, which states that objects remain stable across different contexts. For example, viewers perceive the higher A’s in Fig. 9 as farther away than the lower A’s, because Constancy dictates that the A’s are all the same size. Actually, the A’s are of different sizes, but they are perceived as the same, with the higher ones more distant than the lower ones.

An example of a figure that violates Constancy is given in Fig. 10.
Fig. 10 is “maddening” because it cannot be resolved as one “true” three-dimensional figure. If you cover up the top of the figure, it looks like a two-pronged tuning fork. If you cover up the bottom of the figure, it looks like a three-pronged tuning fork. These two perceptions cannot coexist.

The tuning fork image in Fig. 10 is paralleled very closely by “garden path” sentences, such as the classic example in sentence (10).

(10) The horse raced past the barn fell.

Our tendency is to process noun–verb sequences as filling the roles of agent and action: hence, we are “led down the garden path” and interpret The horse as the agent of raced. This interpretation works fine until we reach the end of the sentence—when we realize that The horse is the subject of fell. At this point we must reinterpret raced not as a past tense verb, but as a past participle modifier of The horse. This yields the correct interpretation of the sentence: “The horse that was raced past the barn fell.” (Unlike the tuning fork example, we are able to resolve this sentence into one final interpretation.)

In the realm of linguistic perception, the principle of Constancy is paralleled by Grice’s Maxim of Quality. If the Maxim of Quantity says that readers expect “the whole truth” in discourse, the Maxim of Quality says that they expect “nothing but the truth.” In other words, readers assume that they are being given accurate descriptions based on sufficient evidence. While falsehoods are obvious examples of violations of Quality, (mis)leading questions represent another less obvious case. For example, O’Barr [13] cites a study in which two groups of viewers were shown identical footage of a traffic accident. After viewing the film, one group was asked question (11a).

(11a) “Did you see a broken headlight?”

Thirty percent replied “Yes.” The second group was asked question (11b).

(11b) “Did you see the broken headlight?”

Seventy percent replied “Yes.” The definite pronoun the in (11b) presupposes the existence of a broken headlight; therefore, the second group “believed” that they had seen one.

To summarize this section, principles of visual perception from Gestalt psychology have close parallels with the principles of linguistic perception encompassed in Grice’s maxims. In both the visual and the linguistic realms, perceivers expect information that is cohesive, clear, complete, and correct.

**DEGREES OF “GOODNESS”**

In this final section, we want to raise the idea that both visual and textual perception operate on a continuum of “goodness.” That is, viewers and readers are rarely presented with perfect stimuli upon which to base their perceptions; instead, they must constantly recover and reconstruct missing components in the visual and written input. At the same time, visual or linguistic stimuli that are degraded beyond what we call the “point of recoverability” cannot be successfully perceived. We will illustrate these “degrees of goodness” with three examples: ideal stimuli, normal stimuli (i.e., somewhat degraded but still recoverable), and useless stimuli (i.e., degraded beyond the point of recoverability).

As a visual illustration of the highest degree of goodness, consider the image in Fig. 11.

On the discourse level, a high degree of goodness is illustrated by (12a), a notice from a doctor sent to a woman after her annual Pap smear.

(12a) I have received a report of the Pap smear taken from the cervix at the time of your recent examination. This Pap smear shows no evidence of abnormal or unusual cells. Your smear is therefore normal. We will contact you in 12 months to schedule another Pap smear.

Both Fig. 11 and passage (12a) illustrate 100% completeness. The viewer does not need to “bridge”
in order to create the visual image of a square. Likewise, the reader does not need to “bridge” in order to derive the message that her Pap smear is normal.

Real life, however, rarely presents us with 100% information; indeed, viewers and readers not only are capable of filling in incomplete information, but in fact (unconsciously) expect to have to fill it in [14, pp. 211–212]. The need to “bridge” is a normal state of affairs. Real life, then, often presents us not with a perfect figure but with one like Fig. 12.

The image in Fig. 12 has been degraded, but not past the point of recoverability—i.e., not past the point at which the viewer can recover with certainty the image it is intended to convey. Similarly, the passage in (12b) is degraded (in comparison with the “perfect” discourse in (12a)), but its essential message, that the reader’s Pap smear is normal, is still recoverable with a fairly high degree of certainty:

(12b) I have received a report of the Pap smear taken from the cervix at the time of your recent examination. This Pap smear shows no evidence of abnormal or unusual cells. We will contact you in 12 months to schedule another Pap smear.

Messages like (12b) pose no problem in interpretation for readers who have the requisite background knowledge (i.e., that Pap smears are generally accurate, that they normally need to be taken only on an annual basis, that any cell abnormality would indicate the need for an immediate re-test, and so forth). In fact, for readers who have the requisite background knowledge, it is hard to interpret (12b) as saying anything but “Your smear is therefore normal.” However, as demonstrated by Shuy [15], not all readers bring the same background information to texts such as warning labels, especially when fairly technical knowledge (e.g., medical information) is involved. Writers who rely on readers to draw inferences in these cases may be running the risk of having readers miss the intended meaning—even if the writer thinks that “everybody knows X.”

Bad visual imagery, and bad writing, result most clearly when the perceiver is presented with images or texts that are degraded past the point of recoverability. For example, consider Fig. 13.

Likewise, consider (12c).

(12c) I have received a report of the Pap smear taken from the cervix at the time of your recent examination. We will contact you in 12 months to schedule another Pap smear.

Passage (12c) omits critical information: the writer’s message is unrecoverable, just as the square in Fig. 13 is unrecoverable. Let’s look at another example from technical discourse that also illustrates “degrees of goodness,” this time from the warning label on a plastic bag. Passage (13a) illustrates a “perfect” warning.

(13a) WARNING: To avoid danger of suffocation, keep this bag away from babies and children. This bag is not a toy!

This passage contains three good elements for a warning. First, it is explicitly labeled as a warning. Second, it tells the reader what to do (keep this bag away from babies and children). Third, it tells the reader the possible consequences of ignoring the warning (danger of suffocation). Now consider (13b), which is perhaps adequate, but not as good as (13a).

(13b) WARNING: Keep this bag away from babies and children. This bag is not a toy!

Note that (13b) lacks one of the elements found in (13a): there is no mention of the tragic consequence—suffocation—that may result from ignoring the warning. Readers with the requisite background knowledge may be able to infer this consequence, but it would be better if it were explicitly stated.

Now compare (13c), reproduced as it appeared (in its entirety) on a plastic bag that was sent in to Consumer Reports by a reader [16].

(13c) THIS IS NOT A TOY, ETC.

Passage (13c) is woefully inadequate as a warning: it is not explicitly labeled as one; it does not state the consequences; and it does not even state the action that the reader is being directed to take. While a reader might be able to infer these items, there is sort of a catch-22 involved: any reader who has the requisite background knowledge to draw these inferences probably does not need the warning in the first place.

CONCLUSION

Much research has been done on visual unity, but without regard to its analogs in discourse processing. Likewise, much research has been done on discourse unity, but without regard to its analogs in visual perception. Campbell’s work constitutes a breakthrough study in this respect. However, she stops short of exploring the full potential of her basic premise, i.e., that discourse and visual perception proceed analogously.
We have tried to show that visual and textual perception exhibit striking parallels in terms of the strategies that viewers and readers use to impose unity upon images and texts. In particular, we have explored parallels between Gestalt principles of Continuity, Figure/Ground, Closure, and Constancy, and Grice’s Maxims of Relation, Manner, and Quantity, and Quality. These parallels are summarized in Table III.

Such research has direct implications for a better understanding of both visual and textual elements in fields such as technical writing. For example, one practical by-product of such research is a refinement of principles for constructing graphics in technical writing [3], [17]. Second, one of the most debated issues in current linguistic theory, is whether innate linguistic ability reflects a specific psychological module or, conversely, a manifestation of more general intellectual capabilities. Although our primary goal has been to show how principles of visual perception can enhance understanding of how readers process visual texts, the discovery of analogs between textual and visual perception could provide an important new perspective on larger theoretical questions such as the nature of our innate linguistic ability.

### Table III

**Parallels Between Gestalt Principles and Grice’s Maxims**

<table>
<thead>
<tr>
<th>Meta-Principle</th>
<th>Gestalt Principle (Vision)</th>
<th>Example</th>
<th>Grice’s Maxim (Language)</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohesion (&quot;path of least resistance&quot;): Perceiver will interpret stimulus in the way that requires the least effort.</td>
<td>Continuity: Viewer expects elements to extend along a continuous line</td>
<td>Coyote tracks</td>
<td>Relation (Be Relevant): Reader expects items in a discourse to be related</td>
<td>The woman reported that she . . .</td>
</tr>
<tr>
<td>Clarity (&quot;zero sum game&quot;): Perceiver will impose a single interpretation on a stimulus.</td>
<td>Figure/Ground: Viewer expects a single figure against a single background</td>
<td>Face/vase</td>
<td>Manner (Be Clear): Reader expects discourse to be unambiguous</td>
<td>Jane hid the letter from Dan.</td>
</tr>
<tr>
<td>Completeness (&quot;the whole truth&quot;): Perceiver will interpret stimulus as whole.</td>
<td>Closure: Viewer interprets partial figure as whole</td>
<td>Number 8</td>
<td>Quantity (Be Informative): Reader expects discourse to contain neither too much nor too little information</td>
<td>John likes football more than Gloria.</td>
</tr>
<tr>
<td>Correctness (&quot;nothing but the truth&quot;): Perceiver will interpret a stimulus at face value.</td>
<td>Constancy: Viewer expects objects to remain stable across different contexts</td>
<td>Tuning fork</td>
<td>Quality (Be Truthful): Reader expects discourse to be truthful, not misleading</td>
<td>The horse raced past the barn fell.</td>
</tr>
</tbody>
</table>

### References


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