

## **The semiotics of non-virtuous data visualization: why information design can never be pure**

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“a proper visualization is a kind of narrative, providing a clear answer to a question without extraneous details” (Fry, 2008).

“Information design is defined as the art and science of preparing information so that it can be used by human beings with efficiency and effectiveness” (Horn, 1999).

Clear, simple, efficient, effective: as these quotations from two books on information design suggest, the ideal informational display seeks to visually transfer, from a sender to a receiver, a set of data objectively, without embellishment or subjective coloration. Edward Tufte (Tufte 1983) famously warned against “chartjunk” – irrelevant or superfluous material that is inefficient at best, actively deceptive at worst. He instructs the conscientious designer to use restraint, to eliminate any elements or traits that do not further the mission of communicating the data. Indeed, the very ink impressed on the printed surface should be thought of as the mirrored exemplification of data, transferred so immaculately from world to page that one might begin to think of it as a single entity: “data-ink”.

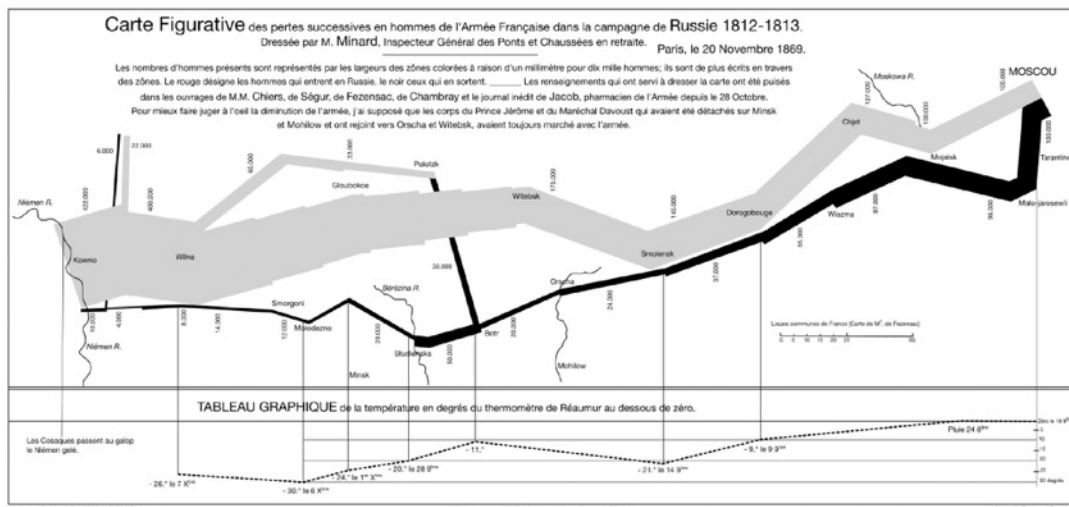
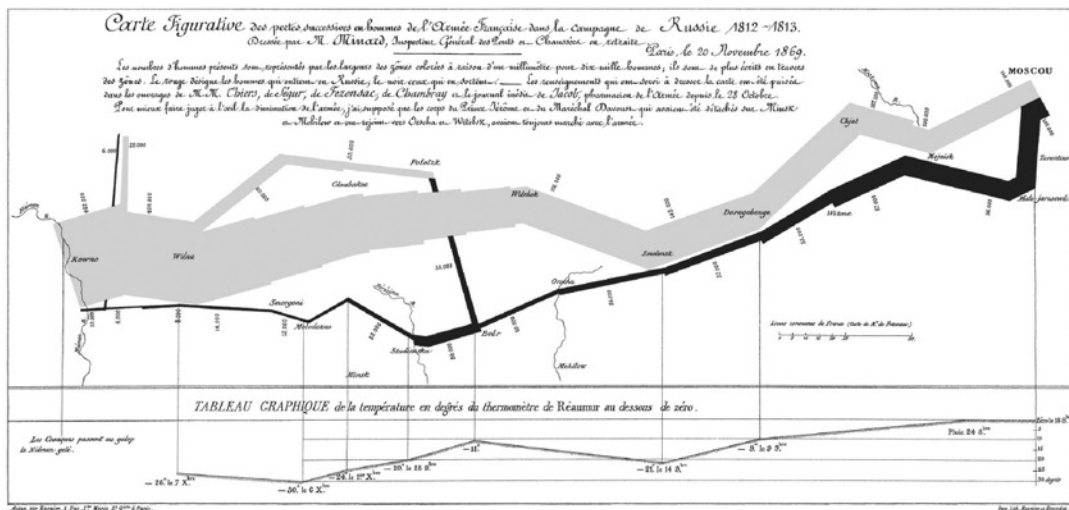
“The interior decoration of graphics generates a lot of ink that does not tell the viewer anything new. The purpose of decoration varies--to make the graphic appear more scientific and precise, to enliven the display, to give the designer an opportunity to exercise artistic skills. Regardless of its cause, it is all non-data-ink or redundant data-ink, and it is often chartjunk.”

Accept the constraint (and beauty) of the world as it is revealed through the data, he tells us, don’t add anything to the mix. Be dispassionate, like Jack Webb in the original *Dragnet* TV series: “Nothing but the facts.”

These are virtues with which I completely agree; however, in this article I want to show why semiotics suggests the *perfectly* virtuous informational display is an unachievable ideal.

Here's an overview of my argument: A Peircean semiotic framework lays out a process by which any visual motif, upon repeated use, must always become culturally entangled. This has implications which entail that representational objectivity must be seen as a spectrum, requiring the designer to make choices, each choice encumbered with a certain degree of cultural chartjunk. Given this deep semiotic cultural entanglement, the question then becomes not how to eliminate all non-efficient or non-objective visual elements, but rather, which culturally-embedded choices are most relevant and ethical for a designer to make, given this imperfect world.

## Minard, meet Minard



The problem can be confronted by looking at the two informational displays presented in Figure 1a and 1b. The first is Charles Joseph Minard's famous 1869 graph showing Napoleon's disastrous Russian campaign of 1812-13. The second is a slightly revised version of this graph produced by Martin Grandjean a century and a half later (Grandjean 2014). The first question we must ask: do the displays carry the same information? If, by information, we mean simply the six parameters Minard set out to communicate – location, troop numbers, temperature, direction, distance, advance/retreat – the maps are identical. Yet, beyond these parameters, there is a clear visual difference in the text, color, line-weight and other features of the displays that function as a kind of 'shadow information' that needs to be accounted for. Indeed, given that both the original and the recreation are both in French, the motivation behind making any change in the display suggests some additional value must be behind Grandjean's intent in making the changes, for it cannot be that he was interested in a solution to the problem of language or the problem of factual correction.

One might argue that the change of typeface, the new color palette, the shift from heavier to hairline rules, and other changes are simply not significant. But if they are non-significant then they do not result in an effect in our perception that is meaningful. They carry no value at all. Yet Grandjean's changes do create an effect in us: the chart looks cleaner, more efficient, more up-to-date, and somehow more objective. Indeed, if, as Luciano Floridi suggests, information's source is at core precisely the detection of change, interruption or discontinuity (Floridi 2011), then any detectable change in a graphic element or visual features must result in new information for us.<sup>1</sup>

### *Semantic refraction and genre shifts*

Both displays are products of the cultures from which they arose, cultures separated by 150 years, cultures with different expectations and standards for presenting graphical information. It is possible that Martin Grandjean has adroitly subtracted all the remaining 19th century chartjunk ornamentation from Minard's original, leaving us a pure distillate. Indeed, to our eyes, the ornate script employed in Minard's original might be considered something "to enliven the display, to give the designer an opportunity to exercise

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<sup>1</sup> For Floridi, information is something that is one or more data, where the data are both syntactically structured in a way that is "well-formed" (i.e. understandable according to some code, convention, or rubric) and meaningful (capable of enacting change in a receiving system). A datum is "a putative fact regarding difference or lack of uniformity within some context." (Floridi 2016). The "putative fact" is an assumed real condition of difference or discontinuity. These hedge words are in place because the individual datum is not directly perceived as such, but is rather an abstraction, an implicated or inferred deduction. There is always a membrane between the information and the datum that is the information source. In this relational, mediated sense, data is very much parallel to the notion of signs.

artistic skills”, in other words, typographic chartjunk. Grandjean replaces this calligraphy with a more sober text block and the labels, simplifying it, bringing the attention solely to the data to be communicated. And if his efforts are rewarded by our perception that the display is now neutral and completely efficient, has he not succeeded admirably?

Perhaps he has. But before we decide the question, we should pause to consider the historical and technological contexts of the original. In comparison with our own day, technologies in 1869 imposed radically different constraints. The Minard graphic chart is engraved. In the mid-19th century, before the advent of graphic art photography, engravings were executed by handwork, which means that the letterforms were generally written directly onto the metal plate. Certainly, a more austere form could have been chosen, but even that choice becomes questionable when it is considered that the tradition in Europe at the time was to introduce a work with a tributary preface, seen as a title or dedicatory page, in which explanations were carried out somewhat in the manner of a florid oration. An “oratory” preamble, therefore, placed directly on the chart itself (which is what Minard has accomplished) would have been seen already as an efficiency, much more simple and many times more efficient than the common alternative of the day. Indeed, a more stripped-down treatment would likely have been perceived as boorishly rude, unsuitable for its purpose in society. Furthermore, the astonishing skill to handwrite the letters so well that even today one needs close inspection to discover that they are not, in fact, a font, was itself an exemplification of the importance of the work and pointed to the seriousness of the undertaking. Far from the often cartoonish effects of contemporary chartjunk, these elements combine to convey a sense of gravitas – at least, they might have been expected to do so for the audience of one hundred fifty years ago. What is ornamental to us was serious propriety to them.

In any case, from the standpoint of the data set that Minard wishes to communicate, the losses of the military campaign, the overlaying of these other kinds of information are simply irrelevant. From the perspective of this intention, all these ancillary informations simply represent a blurring, or perhaps what we might call a *refraction* of the intended informative substance. This refraction is not the noise of fundamental communication theory, which results from imperfect media transmission channels (Shannon, Weaver, 1963). Rather, this is a socio-cultural, semiotic blurring or “seeing double” that is accompanying the visualized data set. Can this culturally burdened refraction be filtered and eliminated? Has this, indeed, been accomplished by Martin Grandjean’s vectorization?

Refraction is a result of the braiding together of three strands: the raw data to be made visual (the intended, or target, data set), the technical graphic resources available to accomplish it, and *genre* – the semantic rhetorical display mannerisms of the time, place and purpose of production. A data set cannot be communicated to the eye without making it a visual entity, and making it a visual entity requires the

presumably skillful use of the graphic materials and techniques at hand. The problem of refraction essentially reduces to a basic question: Is it possible, in this process of making visual, for the visual entity to be stripped of the third strand, genre? If it were to prove possible to strip out the genre, then the data should be able to be presented purely, clear and objective, without refractory cultural overtones. But if it is not possible to filter out the refractory genre data, then we must live with the impossibility of a completely virtuous display of information design.

So, how does genre function semiotically? First we will look at the semiotics of genre by examining two cases where genre is exposed by shifting its stylistic system into unfamiliar contexts. Then, after a brief overview of fundamental Peircean concepts, we'll introduce semantic profiles, which can serve as a tool for categorizing types of semantic approaches. Finally we'll return to the Minard diagrams, seeing how their story is informed in the light of the semiotic theoretical framework.

*Genre shift example one: "ratcheting"*

In Peircean semiotics, when a sign is a result of social consensus and is used repeatedly so that it takes on the aspects of habit or principled system, that sign is a symbol (Peirce 1931-58; 1992). A genre is a kind of meta-symbol: a symbol that is linked, simply through repeated use, to a particular cultural function, milieu, or practice. In a genre, the visual elements that are common to it are called the genre's style, and the genre is the relational tie between that style as habituated visual system and the cultural practices within which they are recurrently employed. For example, in cinema, the stylistic scene described within these brackets: {a deserted, rainy, urban street after midnight} – is a stylistic symbolic device linked to the genre "film noir".

In order to see what role genre plays, take a look at examples from the world of industrial design. In this first case study, we track an instance of a particular graphic stylistic motif. The object shown in Figure 2(a) is a portable radio that is made to be carried to worksites and other locations in which a robust



appliance is necessary to withstand temperature and moisture extremes and rough physical treatment. Figure 2(b) is a detail of an automobile.

The visual trait I want to call attention to in both of these machines is the particular quality of the interrupted line. In the radio, this feature is found not only in the representational portrayal of the (pretend) mechanical fittings surrounding the speakers – a motif that is clearly pictorial and which is designed to represent armor securing the “vulnerable” speaker – but is further employed in an expressionistic manner throughout the other surfaces: in the angular tilt of the entire front panel, the handle slot, and the angled linear division of the red and black cladding. Whether pictorial, as in the speaker housings, or expressionistic as in the other forms, this disrupted, angled line pervades the design of this radio. It contributes neither to its function as a radio nor to its ability to be durable, it simply *symbolizes* durability.

In the automobile we see a similar employment of angular forms around the headlamps. Some of these lines seem to allude to the flow of wind across the surface, while others suggest vents although there are no actual vents on the front quarter panel. What stands out here, as on the radio, is the apparent extreme effort to produce these angularities – and the total lack of functionality in terms of the utility purpose of the object.

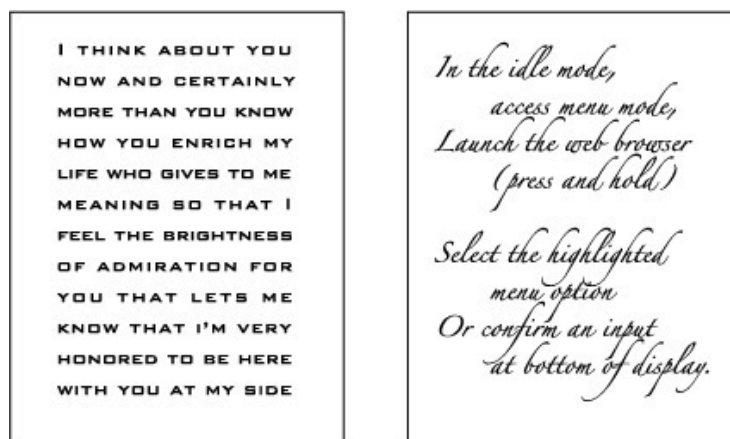
Let’s call this motif *ratcheting*. Ratcheting is the use of a non-functional, angled discontinuous motif where a straight line, for utilitarian purposes, would suffice. Since utilitarian function is abandoned, ratcheting can only be an attempt to use form for a purely semiotic purpose. It could be that this is a completely random coincidence of expressionistic form being used on two dissimilar devices. Yet, it is interesting to track this visual motif back in time. It has an antecedent.

While it may be an impossible task to prove conclusively the cultural transmission of details such as the ratcheted surface, we notice that this stylistic form was non-existent fifty years ago. How did it arise? What is the earliest evidence for it? The earliest use that I have been able to locate is the conspicuous ratcheting on the Transformer toys of the 1980s (Figure 2c). A Transformer was a kind of action figure that could be articulated and folded in such a way as to morph a mechanical object into a superhero. In the imaginative play of the child, the superhero contained the power to transform into a seemingly inanimate, object, and back again into superhero form. Both the inanimate object and the superhero exemplified power: while the superhero in its human-ish form exemplified power through a “body-builder” physique, its machine form would invariably be a highly technical one, with a host of buttons, vents, nozzles and facets. In addition to a highly developed physique, the superhero would be also be endowed with high-tech equipment: visor, helmet, body armor, boots, and belts equipped with various implements. The key was that the child needn’t know what any particular implement or vent

actually did; in fact, it was better that the child did not know, because ignorance in the face of such a plethora of parts simultaneously exemplified and enhanced the unfathomable power of the action figure. “Unfathomable ability” was exactly the thematic core and symbolic heart of this line of toys.<sup>2</sup> Inverting the modernist formula “form follows function”, Transformers were always sculpted in exceedingly complex forms; the inevitable implication was that since each figure had a surfeit of surfaces and forms, it must also have a surfeit of powerful functions.

The ratcheting on the radio and on the headlamps of the automobile may well represent a shifting of this visual trope from the genre of action figures to utilitarian objects.<sup>3</sup> The non-utilitarian ratcheting of surface and line suggests that there must be functional powers to this object that are covert. Through a generation of use in western culture, ratcheting has become symbol for power.

#### *Genre shift example two: cross-dressing Valentine texts*



A second example of genre shifting and semantic refraction can be found in experiments in typography. Figure 3 shows examples of texts that have been shifted from one cultural domain to another. There is a pair of texts, one is the text from a Valentine’s Day greeting card, the other is from an instruction booklet

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<sup>2</sup> Perhaps the genesis of ratcheting goes back a bit earlier. Transformers themselves may have been influenced, in part, by the Star Wars space ships of the movie of 1977. In making these space ships, the modelers used off-the-shelf plastic model kits of fighter planes and battle ships and assembled them in a “mashup” of parts to add to an abundance of technical “doohickies”. Like the Transformers, the effect is to create a sense of awe before the unfathomable. These are instances in a long line of strategies to create a sense of mystifying and miraculous power going back to the blinking light bulbs of early science fiction movies, and in mythology, back to the tales of monsters with many heads or angels glowing in light with wings that permit transcending the physical time/space sphere.

<sup>3</sup> It is worth noting that the child who played with the action figures would now be the adult consumer of these utilitarian objects.

for a mobile phone. The customary visual form of the respective genres has been swapped. Although we know the verbal text of the Valentine is a love poem (albeit a very bad one!), it is extremely difficult to *feel* it as a love poem. Similarly, the instructions become difficult to take as instructions because of the poetic allusions of the typesetting.

Celebrations  
of Valentine's Day  
are opposed to  
Indonesian culture  
and religious norms."

Celebrations  
of Valentine's Day  
are opposed to  
Indonesian culture  
and religious norms."

**#RESIST**  
colonisation of the mind

Indonesian Ulema Council



A more complex and nuanced play with this kind of genre shift is found in the work of the futurist UI/UX designer Conrad Fulbrook, currently at MIT. Figure 4 is an example of work from his MFA thesis in which he foregrounds, and simultaneously questions, received cultural norms of romantic love by displaying a verbal message that is in opposition to the western notion of Valentine's Day (Fulbrook 2015, 50). The composition and typeface already create an ambiguous interpretive space by using the edges of the page to crop off a portion of the message, including the opening quotation mark, while retaining just enough material for complete readability. The cropping has the paradoxical effect of both intensifying the message while at the same time making it somehow less "official" and bureaucratic. The message is typeset in a very European/American modernist style, so that when the tagline "#RESIST colonisation of the mind" (Figure 4b) is added, there is confusion about who is doing the colonizing: the Indonesian Ulama Council, or the American greeting card and florist industries?

In all these instances, visual elements are carrying simultaneous, parallel informations. The designs take into account not only the forms required for their respective performative duties, but these designs also employ cultural genres and tropes to promise benefits, establish emotional alliances, and proclaim the objects' place within a culture. The very act of making physical is also an act of propaganda.

Through genre, culture has encoded memory. Within visual entities, even when the intent is to perform a purely utility-function, this memory is embodied, performing a strictly semiotic communicative function. This is the information that is in the shadow – information that from the standpoint of the intended data set, is the source of refractory noise.

Yet, the question remains: must it be so? Can utility function be distilled, like fine whiskey, from this this mishmash of cultural over-coding? For the information designer who is bent on communicating only the target data – "facts and nothing but the facts" – the problem is to find a way to dispense with these cultural and historical memories, which stick like burs to the visual display the virtuous designer is striving to keep as clean and objective as possible. Can one discover an absolutely rational and objective choice for the "making visual" so that the display reveals the data and nothing but the data?

### **A Peircean semiotic overview**

To probe further, a bit of background in Peircean semiotics is required. There are several variations of Peircean semiotic models which differ in subtle details (Morris 1946, 1955; Deeley 1990; Merrell 1996, 2000; less closely, Eco 1976). Regardless of differences in their details, however, all Peircean semiotic systems share a triadic relational view of sign action. A sign is one of three elements that are in a mutual relation: a sign is something that stands for something else (the referent) to an understanding (the

interpretant).<sup>4</sup> Anything – a physical object, a natural event, a graphic display, sounds, a thought – that can enter in to this kind of relation can act as a sign. Rather than being a physical or mental thing, a sign is the function, or role, something performs in the service of affecting a change in an understanding system.<sup>5</sup> If information is thought of as a change in the understanding, signs are the functional catalysts for information, information’s enactor.

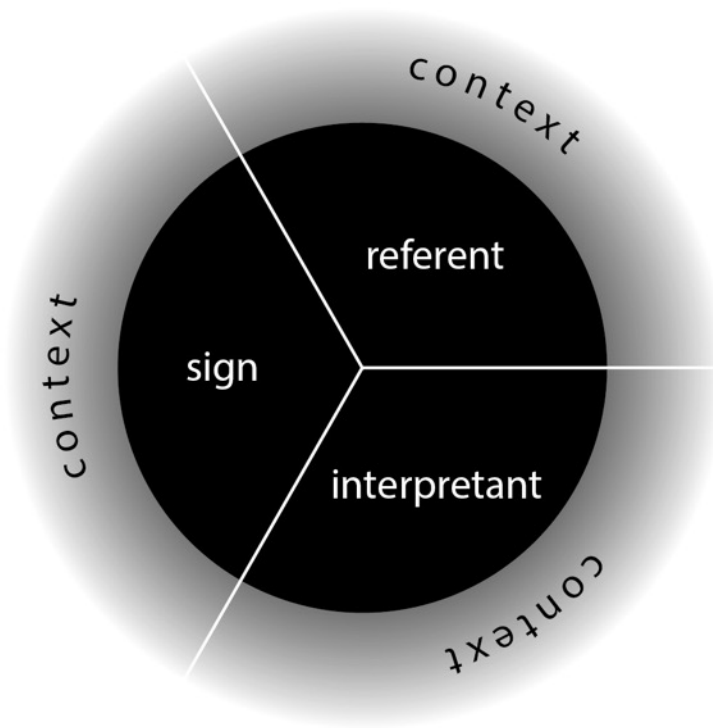


Figure 5 shows an enhanced version of this model.<sup>6</sup> The triadic set of relations between the sign, its referent, and the interpretant – taken as an integrated unit represented as a disk – comprise the Semiotic Moment (Skaggs 2006). Meaning is developed through the growth of the original Moment as any given S/R/I unit begins to generate subsequent Moments. This developmental evolution is encouraged

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<sup>4</sup> In some accounts these terms may change. Some people use the word representamen instead of sign, and object instead of referent. Virtually all Peircean models agree in using the term interpretant.

<sup>5</sup> In classical Peircean semiotics, the interpretant is an effect on an interpreting system. This leaves plenty of room for a semiotics of artificial intelligence and other non-human semiotic dynamics. For our more limited purposes, we will assume the interpreting system is a human mind, in which case the word “understanding” may be employed as the synonym for interpretant’s effect, as long as it is taken to include not just intellectual understanding, but all mindful operations (for example feeling).

<sup>6</sup> The Peircean three-part model offers some advantages over the dyadic Saussurean approach, especially working in the visual arts. For more information on the differences between these two branches of semiotics, see Noth: *Handbook of Semiotics*, and Chandler: *Semiotics for Beginners*.

by the transactions a Moment has with the contexts within which it is situated. The transactions between contexts and new Moments are enabled by Moments at smaller scales (Savan 1976; Merrell 1996; Skaggs 2006).

Let's take some examples of these contexts. The context of the sign includes all the environmental stimuli at hand that contribute to the apprehending of the actual visual entity that, upon perception, acts as sign. For instance, for a display to function as a "Baggage Claim" directional at an airport, the semiotic sign's<sup>7</sup> context includes all the visual stimulation around the placard as well as the placard itself. In this case, the visual entity (i.e. the particular designed placard) that ends up serving in the role of sign, must be able to establish a presence separate from these other stimuli. It is from its context that, in perception, the sign emerges. In any Semiotic Moment, a sign is essentially selected from the non-signs of the contextual environment.<sup>8</sup> One of the designers primary jobs is to 'plant' the visual entity, ensuring it will be picked up by the receiver, selected from its contextual background to act as sign.

The context for the referent includes all the possible things that a given placard might be taken to represent. Even though, in a carefully crafted piece of information design, the target referent is a particular data set, that data set is within a context of all the other data which it is *not*.<sup>9</sup> One of the important jobs of the designed placard, as it acts in the Semiotic Moment as a sign, is for it to distinguish, for the understanding, this (and no other) specific referent – in a sense, to pluck out the applicable referent from those that are not applicable. The placard's work, in its function as semiotic sign, is to be surrogate for this applicable referent, which can only be isolated and contacted through the mediation of sign.

The context of the interpretant includes the mindset of the receiver, the receiver's knowledge base, language, culture and personal background – those audience-side preconditions to the understanding.<sup>10</sup> This concept is summarized by the oft-heard slogan, "Keep the customer in mind." It may better be said: "Keep the customer's mind in mind." The designed placard, acting as a sign, squares

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<sup>7</sup> In this discussion, I use the word 'sign' in its semiotic sense, using the word 'placard' to refer to the physical object.

<sup>8</sup> This selection process is a semiotic process that is also accomplished by sign-referent-interpretant, i.e. Semiotic Moments of a smaller scale.

<sup>9</sup> Peirce conceived of this referent contextualization as a "dynamic object" which he saw as what the sign is really intending to refer to. In his words, the object "determines" the sign. It is almost as if the referent has agency, *choosing* a qualified surrogate to represent it. But in the model sketched here, a lesser claim is made: the referent's context is simply the set of possible referents – dynamic, real, ultimate, truthful, or otherwise – without prejudice.

<sup>10</sup> This concept was hinted at by the concept of "apperceptive mass" postulated by the early psychologist Wilhelm Wundt.

its referent to the understanding of the receiver, so that the receiver, deplaning, begins to move toward a revolving carousel holding her luggage.

**Affective and conceptual registers: presence (P), expression (E), denotation (D), connotation (C)**

By this fundamental semiotic mechanism, a stream of semantic, freshly meaningful information passes between the world (sender) and the interpreter (receiver). But one should not think of the “content” as simply being the “meaning” of a display, as if meaning were a single, simple thing. Semiotics helps us to realize that meaning is actually a complex set of changes to the interpreting system. As interpretant, this semantic information is processed in two registers: as affect (feeling) and as concept (Skaggs 2017). Each of these represents a kind of information, or informational sub-channel.

*The affective register*

The affective register consists of *presence* and *expression*.

Presence is the ability, solely on the basis of visual features, of a display to command attention. For example, a large bright red disk may have great presence when seen in the context of small, drab visual elements. Indeed, this precisely the strategy Raymond Loewy employed when he redesigned the Lucky Strike cigarette package in the 1940s. The new package had tremendous presence in comparison with its competitors, stood out, commanded attention on the shelf.

Expression is the feeling or tonality that is conveyed, solely on the basis of the display’s visual qualities. Consider the variation in feeling between the fonts *University Roman* and *Rieven Roman* (Figure 6). Although The twenty-sixth character of the alphabet is rendered in each case, their



expressions are very different.

### *The conceptual register*

The conceptual register of the interpretant consists of denotation and connotation (Skaggs 2017).

Denotation is the specific, direct, convergent meaning. Both Zs in Figure 6 denote the same thing: the last letter of the alphabet. Your passport photo, regardless of its color gamut – and your name, irrespective of the font it is set in – each denote the same self (you) as an individual person.

Connotation is divergent, consisting of the associated interpretations that flow within the semantic process. For instance, the name of a political leader may carry associated concepts depending on what is notorious about the politician's ideas and actions. Drought carries the connotation of poor harvests, hardship, high prices, perhaps starvation. Apart from their expression, stylistic motifs can, through their repeated use in a culture, come to acquire strong conceptual connotations: art nouveau reminds one of *fin de siècle* Paris, stencil letters on a drab green background might connote military applications, and so on. Such formal elements have been conceptualized within society to become a general class, a genre, and as such, represent shared connotations. Yet, connotations can also be highly idiosyncratic, particular to each individual's life experiences.

### *Semantic profiles*

Any graphic display can be typed by these four semantic variables (let's abbreviate them P, E, D and C). If we allow for a simple binary judgment – high or low – in assessing the valency (potency) of each of these four dimensions, we generate a table of sixteen fundamental semantic profiles (figure 7).<sup>11</sup>

Semantic profiles are similar to personality types. They tell us nothing of the content of the display, but rather they describe the manner in which the semiotics of the display function graphically – *independent* of its content. This is similar to personality typing: a person's personality type tells us nothing about their level of education or ideas, or their spiritual beliefs, but rather the manner in which someone tends to address and interact in the world.

The sixteen semantic profiles are arranged in four "staves". The first stave, which includes types I-IV, contains the four types that share the qualities of being high-presence and high-expression. They are projective in their presence and what might be termed soulful in their expression. The second stave contains the types (V-VIII) that are strongly projective in their presence, but weak in expression – what

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<sup>11</sup> For reasons too intricate to address here, these semantic profiles can be extended to 64 types if the message is considered in terms of what it asserts about the world. The basic sixteen semantic profile types pertain to the communication simply as a display strategy. For more discussion of this, consult Chapter 6 in *FireSigns*.

Semantic Profile	Affective Register		Conceptual Register		Conceptual meta-classes
	Presence	Expression	Denotation	Connotation	
I	●	●	●	●	Projective Soulfuls
II	●	●	●	*	
III	●	●	*	●	
IV	●	●	*	*	
V	●	*	●	●	Projective Apathetics
VI	●	*	●	*	
VII	●	*	*	●	
VIII	●	*	*	*	
IX	*	●	●	●	Recessive Soulfuls
X	*	●	●	*	
XI	*	●	*	●	
XII	*	●	*	*	
XIII	*	*	●	●	Recessive Apathetics
XIV	*	*	●	*	
XV	*	*	*	●	
XVI	*	*	*	*	

Valency:  
 ● High  
 \* Low

we may be excused for anthropomorphizing as “apathetics.”<sup>12</sup> The third stave is comprised of the types ( IX-XII) that are weak in presence, recessive. But these third stave semantic types are powerful in their expression, recessive but soulful. Finally, the fourth stave contains the semantic profile types that are weak in both presence and expression – the recessive apathetics.

Each of these staves is then broken into the four classes of combinations that are possible in terms of denotation and connotation. These are called the conceptual meta-classes. The first meta-class is a display that is strong in both denotative and connotative substance. The second is strongly denotative, but weak in its connotation. This second meta-class is the class to which the virtuous information designer aspires. The third is weakly denotative but strongly connotative, while the fourth is weak in both denotation and connotation. (One would presume that information designers would want to avoid the fourth meta-class!)

<sup>12</sup> Perhaps “passionate/dispassionate” would be a better word choice for the descriptors of expression, but in a sense, expression seems to deserve a colorful descriptor pair such as “soulful/apathetic.”

The claim of this semiotic model is that there is no other *kind* of display content that is possible.

<sup>13</sup>These sixteen semantic profiles describe all the potential ways that content can be delivered. For a given sign event (i.e., Semiotic Moment), the model provides a typology of sign exchange. It is a corollary that, upon being perceived and acting as a sign, every display must have at least some valency of each of these four dimensions: presence, expression, denotation, connotation. Valency may be *low* but never *no*.

For instance, depending upon its format and where it is located in the environment, a display may have greater or lesser presence, but it is not possible for a display (if it is perceived at all) to have null presence. Camouflage is an attempt to avoid detection, but if a camouflaged object is perceived, then it at least has a low valency of presence. Similarly, it is impossible for a display, no matter how assiduously one may try, to be rinsed of all connotations. This is entailed because when one has an experience, that experience becomes the backgrounded context for subsequent interpretants, and so any future interpretant must be influenced by the resonance with it and other previous experiences that contextualize it. No experience is unadulterated data collection, and no sign can free itself from connotation. A graphic visualization of data must always accept the connotative hues that surround it because they are implicit both in the process of making the data graphically visual, and ultimately in the receiver's semiotic process of visual perception and cognition. Expression happens because we feel as we perceive. Connotation happens because we have experiential memory. Denotation happens because we are constructed in such a way as to try to 'make sense' of our experience, no matter how unexpected. If no denotation is intended, we still supply it by seeing ships in clouds and faces on the moss of stones.

### ***Conclusion: Minard redux***

So we return to the two Minard diagrams with which we began the discussion: what are their respective semantic profiles? There is little question but that they are both strongly denotative. This is a tribute to Minard's ability to synthesize the target data into a timeless graphic form. But given the antiquarian nature of the typography, frames, and borders, to our contemporary eyes the original diagram also becomes strongly connotative. With a high valency in both denotation and connotation dimensions, it belongs to the first conceptual meta-class. Grandjean's contemporary interpretation, by jettisoning precisely those graphic features that are signifiers of antiquity, weakens the connotative impact of the interpretant, which positions the second diagram in the second conceptual meta-class.

If we wished to fully type the semantic profiles of the two diagrams, by taking presence and expression into account, the original diagram would have a semantic profile of Type I, V, IX or XIII. The

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<sup>13</sup> Although it is possible to divide these types into finer degrees, so that, for instance, valency could be identified by a five or a ten-step scale, instead of the two-step scale used here.

second diagram would be typed as a Type II, VI, X and XIV. It is not necessary here to determine these semantic types with greater precision. (Indeed, the determination of a display's presence is completely dependent upon its contextual environment and is therefore always provisional in the abstract.) For our purposes at the moment, it is enough to notice that although the two diagrams purport to be equivalent displays, they are communicating distinctly different informations. While the *target* information (Minard's intent to show the *Grande Armée's* calamitous loss of personnel) remains essentially equivalent in the two diagrams, the *refracted informations* (the highly expressive and connotative graphic features) are vastly opposed.

While the move to reduce the connotative dimension in Grandjean's diagram is not unethical, neither is it an apolitical one. What Grandjean is doing (even if this is an unconscious decision) is to highlight the imputed clarity and objectivity of Minard's work by helping the contemporary viewer to see through the graphic physicality of the display. We are blind to those visual qualities that bind to our own time. By dispensing with the typography and graphic elements that connote antiquity, or elegance, or other attributes that are irrelevant to the intent to show troop data, Grandjean hopes to laser our attention solely to the target data set, to reduce the refraction of the display. But in doing so, semiotics instructs us that these decisions remain in the service of someone willing, cajoling, or enticing a viewer to see the world from a certain position, imposing a frame that is both a culturally-determined viewpoint and a constantly evolving one. Even if the designer avers that no such political act was intended, the viewer will yet be affected by the genres, the symbols, the memories of a culture. Designers may just as well embrace it: every design decision creates refraction. The virtuous designer doesn't deny refraction, but rather considers the receiver's interests in making the choice among refractions to employ. Not even the minimalism of graphic elements and the use of Helvetica can overcome the inevitable evolving interpretations between what we see today as "clean and objective" and what future eyes may see as "so quaintly twenty-first century."

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