

# FASCINATING SHAPES

## A STUDY OF FORM AND EMOTION

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### 1. INTRODUCTION

The definition of good design has many layers. At the outermost layer, broad ideas like clarity and honesty are emphasized, as in Dieter Rams' well-known set of principles (Lovell, 2011). Nearly every product wants to be perceived clearly, but as designers find themselves working within certain categories, communicating more specific ideas becomes a priority. Consider the clean, white standard that comprises much of medical device design. With this standard firmly engrained, the opportunity to differentiate two brands becomes more and more narrow. Two competitors in this business, Ethicon and Covidien, have carefully developed design themes with specific meaning in mind to differentiate their businesses. Judging from the copy on their home page, Ethicon's message centers on "trust" and "advancement." Covidien stresses "positivity" and "results" on their website. At the surface, the brands appear to share many similarities, but each believes their unique message will help set them apart from the competition.

As ideas like "trust" or "positivity" are being established, designers must go to work to make them tangible. Designers have the primary responsibility within an organization to create the interaction points that people will experience. These interactions, when handled correctly ~~and consistently~~, will connect people with the intended message the brand seeks to communicate. In turn, these messages, often in the form of emotions, can spark interest, influence purchase behavior, and solidify long-term relationships with the brand. When brands aren't expressed consistently, people may become confused about the experience they're supposed to have and fail to choose the product that is right for them. Many designs fail because they fail to communicate the right emotion.

How do designers give life to messages like "trust" or "positivity?" Consistency is one important factor. All brand touchpoints from advertising to packaging to product must be congruent. Branding as two-dimensional, visual communication is a relatively mature design discipline, and so the emphasis of this study has been on the less explored area of three-dimensional branding. Product form, complicated by manufacturing constraints, inherent affordances, and cost implications, is one of the most difficult of all brand touchpoints to maintain in a way that is consistent with the others. Imagine if a product's form was closely translated from the brand's logo. We'd have computers shaped like apples, shoes shaped like checkmarks, and stores shaped like bulls eyes! So how do designers create "trust" or "positivity" *through form*? As important as this objective is, few tools exist to do this reliably. Much of this work is currently based on intuition or trial and error. The design discipline's understanding of form's ability to communicate specific meaning is still very limited. This study aims to further understand the potential of form to communicate emotion, while seeking out methodologies to help designers develop it consistently and accurately.

### 2. BACKGROUND

Many psychologists have studied the emotional meaning of shapes, curves, and lines. Pioneered by Poffenberger (1924), an upward curve has been found to represent a positive emotion, while a downward curve represented a negative one. There is also good anecdotal evidence to support this finding – a person's smile shares the same curve as the Puffenberger study, as does speech when describing something positive: "I have reached the height of success in my career." Other research has uncovered

links between emotions and color, lines, shapes, and speech. This body of work offers an excellent foundation for designers to build upon.

But what about a specific positive emotion like “trust”? What form is trustworthy? Given the specific meaning embedded in most brands, designers must be able to go deeper than valence alone. Ethicon and Covidien both want positive experiences for the people they serve, but they’re going about it in different ways. Confounding this problem are a product’s functional requirements (ergonomics, manufacturability) that inherently have their own forms and therefore messages. As a disclaimer, this study only proposes to scratch the surface at what can be explored regarding product form and emotion.

To identify the specific emotions for this study, we looked for common ground of existing research by Kobayashi (1992) and Desmet (2012). Kobayashi’s research pairs emotions with colors, while Desmet’s research defines a set of emotions that products can specifically convey. Comparing these two studies, we identified three emotions that were shared: fascination, desire, and satisfaction. These words make good sense to study because they represent emotions that brands almost universally desire. *Fascination* stimulates interest around new products. *Desire* is linked to purchase decisions. *Satisfaction* can create long-term commitments and repeat use of a product.

Another challenge of building the study was to identify a variable for manipulating form. Form is vastly complex and difficult to describe accurately without getting highly mathematical. While the math approach has its merits, we decided to approach form in a more lexical way so that designers would find it useable and applicable to their day-to-day work.



Figure 1. Using the form map (left) allowed participants to project three emotions into initial form vocabularies.

Kobayashi’s research identified “hard” and “soft” colors relating to the three emotions fascination, desire, and satisfaction. To better define “hard” and “soft” in terms of form, we created a small pilot study. The study maps a series of shapes along two dimensions of hardness, and asks people to position the emotions onto the map where they best correspond. The first dimension is angularity: a “harder” shape might be made up of more acute angles, which is often achieved through concave curves. On the other hand, a shape can become “softer” by making the sides convex, thereby making the angles at the vertices more obtuse. The second dimension is roundness. A harder shape may have small or even no radii on its corners. A softer shape may have larger radii. Coincidentally, the ultimate expression of softness in both cases is a circle. This approach established a map of 9 shapes (fig. 1) that were shown

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to 19 designers. Participants placed a dot on the map wherever they felt an emotion best corresponded with a shape. Some patterns were identified: *fascination* was linked to concave shapes, *desire* was linked to convex shapes, and *satisfaction* fell somewhere in the middle, although slightly convex. This provided a hypothesis we could test. Would concave products be perceived as more fascinating? Would convex products be more desirable?

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### 3. STUDY

To select product stimulus for the study, it was important to identify a product with a broad range of form possibilities/conventions. People are naturally biased in favor of the typical look of products in a given category, and this needed to be controlled. Using the same form map from the pilot study, a series of product groups were mapped out to identify subjects with a broad range of typical forms. For example, eyewear was disqualified, given that many eyeglasses have round, convex shapes and far fewer have sharp or concave ones (in spite of current trends). We observed that many product categories do not feature concave surfacing prominently as a convention, which we'll address at the end of the paper. We selected three products that exhibited a range of convex and concave forms: shampoo bottles, toasters, and vases. Four designs for each product were created: a concave design, a convex design, a neutral design made up primarily of straight lines, and a combination design with both concave and convex elements together (s-curves). The designs were controlled so that only the largest, primary surfaces varied from design to design. Other elements, like the toaster's slots or the shampoo's caps, were held constant so as not to affect the results. In effect, this study focuses on the silhouette and other salient formal qualities. The models were built in CAD and then rendered in grayscale with soft lighting to make the forms easy to comprehend (fig. 2-4).

Online surveys were used to collect responses. Initial tests showed that subjects with considerable industrial design experience had significantly different form preferences compared to subjects without the same level of experience, so we ensured that a majority of non-designers participated. This was monitored by screening people with a "design expertise" question. Participants were asked to force rank the four designs for each product according to five prompts: first impression, satisfaction, fascination, desire, and a final impression. The first impression and final impression questions were fixed, and the three questions about specific emotions were randomized to control any biases created by question order.



Figure 2. Sample of stimulus for toaster survey.

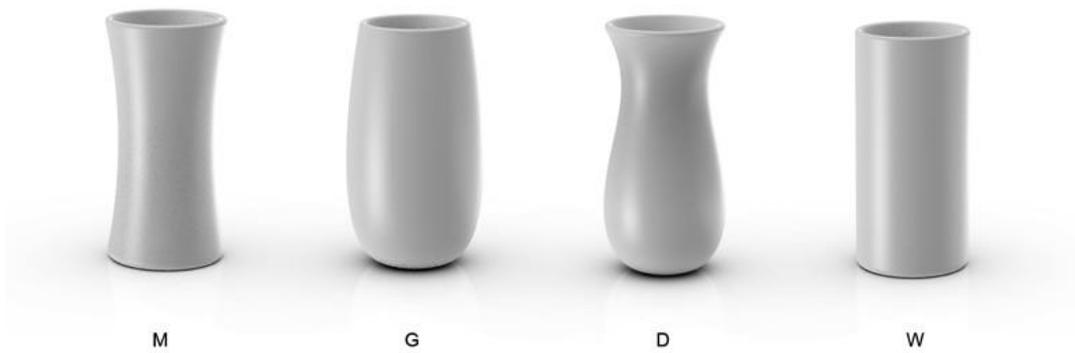


Figure 3. Sample of stimulus for vase survey.



Figure 4. Sample of stimulus for shampoo survey.

#### 4. INITIAL FINDINGS

The results of the study showed a relationship between certain forms and emotions (fig. 5). The convex designs most closely aligned with a feeling of satisfaction. Based on the percentage of top-two box

scores, the convex vase (33%) and toaster (35%) received the most votes in their category, while the convex shampoo bottle (24%) received the second most in its group. Concave designs were selected as most fascinating. The concave vase (37%), bottle (28%), and toaster (40%) consistently outranked the convex design in this emotion. For desire, the combination (s-curve) design was most preferred across the vase (37%), bottle (31%), and toaster (30%). The straight design consistently received low scores with each question for all products. By contrast, the combination design consistent scored highly.

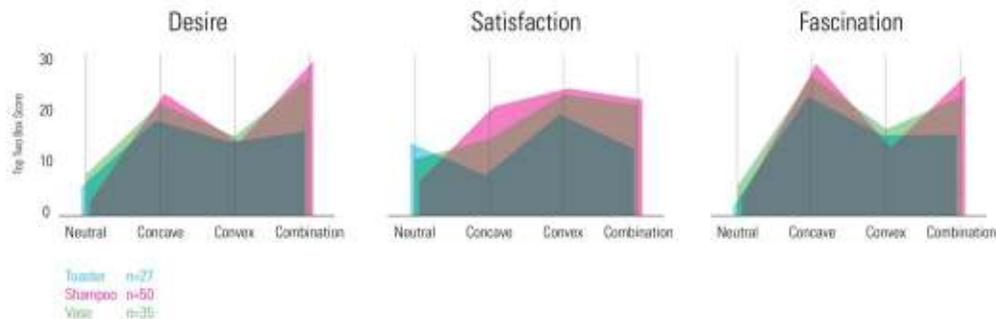


Figure 5. Visualized results show a relationship between concave and *desire* and convex and *satisfaction*.

## 5. FOLLOW UP STUDY

This study produced a clear pattern, but we wanted to go deeper to understand why a given [shape-form](#) corresponded with an emotion. We asked participants to explain why they made their top and bottom choices with each emotion, which produced potential links between form and emotion. Regarding their connection with *fascination*, concave designs were described as rare, unusual, or atypical forms. With *satisfaction*, the convex designs were described as appearing full. With *desire*, combination designs were described as complex and feminine.

The descriptions from participants provided the framework for a second study to better understand why choices in the first study were made. To diversify the stimulus, we used a different question format as well as different stimulus. Maintaining the product categories with broad form possibilities, we showed another round of convex, concave, neutral, and combination forms. In this study, we used photographs of real products: water bottles, car headlamps, and computer desktop speakers. Subtle changes, like making the bottle lids a common color, were made to the images in order to achieve consistency. Any elements in the image that were considered to be potentially distracting were removed. For each image, five different three-point scale questions were asked: simple/complex, rare/common, appears empty/appears full, masculine/feminine, dislike/attracted to. Thirty-eight people participated in the study, using the same participant profile goals as the first study.

With this study, no patterns emerged to support the first round of surveys. The most popular responses for one product were not consistent across products with the similar form vocabulary. For example, results of the first study suggested that combination designs would be perceived as feminine, the potential source of their *desire*. When showed combination designs in the second study, the water bottle

was significantly feminine but the headlamp and computer speaker were not. This inconsistency suggests the importance of functionality or affordances in the product, which we'll discuss further in the analysis section.

## 6. ANALYSIS

While convex forms were linked with satisfaction, concave forms linked with fascination, and combination forms linked with desire, deeper consideration should be done before designers apply these findings directly on a project. First, it is important to consider how the typical conventions of a category might influence form decisions. Evaluating competitive products using the map from the pilot study will reveal trends and conventions. For example, a category focused narrowly around one form archetype will require less change to create meaningful differentiation. Even if concave shapes are linked to fascination, concave eyewear, for example, will not be preferred because of it is too far from the overwhelmingly typical shape of glasses: convex. In this case, much more subtle changes to the convexity might be more successful. Second, designers should consider a brand's equity words and explore methods that reveal forms to correspond with them. Techniques like card sorting, collaging, or co-creation have the potential to be useful in this phase. Based on the research conducted here, we recommend doing two rounds of research – one round with basic, category non-specific forms and a second round that is focused on the category. Once some opportunities have been identified, designers can then begin to reference the findings in this study by considering the role that concave and convex surfaces might have in their work. These opportunities can be used as ideation spaces for further development or as principles for brand languages.

Why did certain forms relate to certain emotions? We didn't find any connections in our follow up study, but there are a few other potential explanations to consider. First, the functional roles of the product could have been influential in some way. We observed that all of the designs used as stimulus were containers (for bread, shampoo, or flowers), and that the affordances of this product type might influence preferences. This may be supported by the inconsistencies between our first surveys and the follow up studies. The varied results in our follow up study, which used car headlamps and computer speakers, suggest that affordances may influence people's responses. Conducting similar studies with products like tools or jewelry might reveal what role affordances play when linking form and emotion.

The second explanation could come from a linguistic connection between the words and their forms. Ramachandran popularized the connection between speech sounds and shapes, known as the "bouba/kiki effect." In this study, a cross-cultural sample of people connect the sound of the word "bouba" to a soft, amorphous blob, while "kiki" is an angular, star-like form. The same connections could be made between the speech sounds of "fascination," "satisfaction," and "desire" and the formal qualities of concave, convex, and combination forms. The use of synonyms in future rounds of research would help search for any linguistic bias. In addition to "desire," researchers might additionally ask about forms that represent "lust," "yearning," or "craving." Researchers could also ask participants to provide their own synonyms, considering that each participant's concept of an emotion will be somewhat different.

Earlier in this report, we mentioned that many product categories do not feature concave surfacing prominently as a convention. The apparent rarity of concave surfaces offers an opportunity for further study. Preferences for convex forms might be learned ones, based on technical requirements like moldability or shipping efficiency. They could also be inherent, based on the ergonomic grip convex products often afford or our natural aversion to sharp corners. Regardless, a link between "fascination" and concavity might be based on the limited opportunities designers have to create these forms. This limitation could present opportunities for some categories. BMW's design language over the past decade featured concave surfaces in a way that polarized (fascinated?) audiences, helping them grow in popularity despite criticism.

While people were capable of justifying their choices when prompted, the follow up study showed that people's real reasons for connecting forms and emotions may have been different. They may very well have been subconscious reasons that they can't articulate. In reality, neuroscientists have discovered that

as much as 95% our decision-making process is made at the subconscious level (Pradeep, 2010). With this in mind, the importance of research methods that observe behaviors rather than self-reported data ~~might be more meaningful~~ should be noted.

## 7. CONCLUSION

Designs will succeed when they succeed in communicating the right emotions. This report calls for designers to take a greater strategic interest in the forms that they impart on branded products. It only scratches the surface at what might be discovered regarding form and its relationship with emotions, cultures, as well as products of a different scales, functions, complexities, or levels of detail. While this piece of research focused on concave and convex surfaces, certainly other formal qualities may be effective ways of conveying emotional meaning. Given the importance of brand equity to businesses, we hope to continue to find the connections between form and emotion that can become principles and methods to be applied towards good design in any category.

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