

As artists, we often use emotions to guide us as we create the most engaging possible designs. And yet, sometimes it's hard to put our fingers on what makes a design so effective. Why do viewers feel *excited* when looking at one illustration, and *glum* while viewing another? More importantly, can all those feelings impact the way our viewers interpret our message? Spoilers: science has the answers! In this issue, we'll explore what human cognition says about **emotional design**, and learn how shapes and colors can create striking, emotive comics. Let's dig in!

We all know that our emotions can dictate whether we like or dislike a cartoon. But research shows that emotions can also affect learning, particularly when those emotions are prompted by design choices.¹ Case in point, one study on educational immune cell diagrams found that certain colors and shapes evoked positive emotions when compared to a neutrally designed diagram, fostering cognitive processes and recall after learning.² And the science says there may be a physiological reason for this too; a study on emotion and memory demonstrated how epinephrine, an emotion-evoking hormone (e.g. fear, excitement, anger, etc.), was able to enhance the recall of presented images.³ With emotional design, we can use similar strategies to help a viewer connect with—and remember—a story we're trying to tell.

For starters, let's discover how shapes can be used as emotional prompts in educational comics. A number of studies suggest that characters with rounded features, large eyes, and attributes suggesting innocence, naivety, and honesty have been shown to induce positive emotions (aka. *baby-face bias*⁴). If you've seen the Japanese art style called Chibi, often found in anime and manga, this visual strategy may be familiar to you. Likewise, "attractiveness" (aka. *halo effect*⁵) or human traits in non-human entities (aka. *anthropomorphism*⁶) have been shown to also boost emotional appeal. Furthermore, pareidolia—or the phenomenon where we see a pattern where there is none (like a surprised face in an electrical outlet)—can also trigger these kinds of subliminal emotional responses, so long as the viewer can pick up on the hidden forms.

Images (from top to bottom):

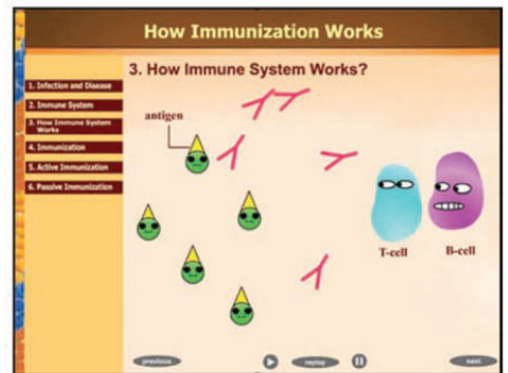
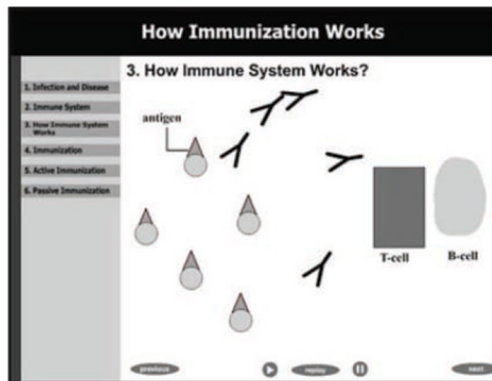
Example of emotional design from Um, Plass, Hayward, & Homer (2012). The diagram on the left lacks most emotional design elements, while the image on the right employs shape, color, and anthropomorphism to evoke emotion.

An example of the Japanese Chibi art style.

Source: <https://commons.wikimedia.org/wiki/File:Dibujo-20-2.png>

Example of Pareidolia: The Jurist by Guiseppe Archimboldo. What looks like a human face is actually a fantasy of fish and poultry.

Source: https://commons.wikimedia.org/wiki/File:Giuseppe_Arcimboldo_-_The_Jurist_-_WGA00837.jpg

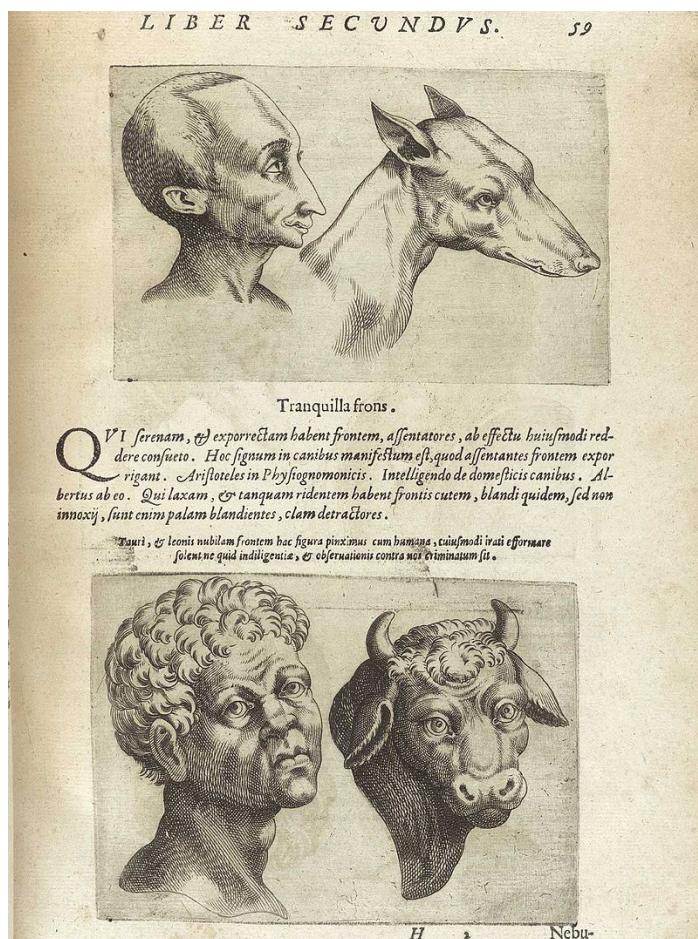


But it's not all rainbows and lollipops. For as the epinephrine study suggests, negative emotions also impact how we process information. For example, in an early study on subliminal affect⁷, researchers demonstrated how participants were more likely to rate ideographs (e.g. Chinese characters) as likeable or unlikeable when shown smiling and frowning faces beforehand. And in opposition to those cuter, rounder shapes, sharp or square characters are suggested to have a negative affect, as compared to those more appealing baby-faced ones.⁸

Yet the charm of our characters doesn't end here. Quite the contrary, artists have relied on mental shortcuts, or heuristics, for centuries to subtly "hack" into their viewers' mental schemas (aka. the memory structures we build over our lives through experience).¹⁶ Historically called physiognomy⁹, the exploitation of one's outward appearance to infer a person's character stems from our innate desire to categorize and stereotype encounters. [IMAGE04] Today in cartoons, we call these caricatures. While stereotyping is not recommended in real social situations, the assumption that physical traits can give us insight on a person's personality still lives on in both our language (e.g. terms like

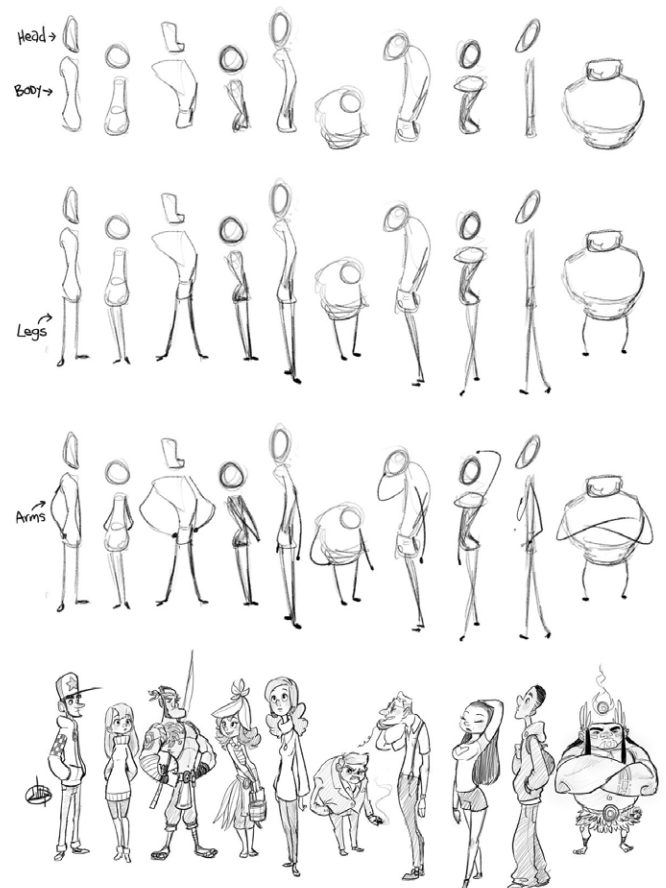
"thick-headed", "stiff-necked", and "stuck-up") and our artwork, be they political cartoons, the Sunday funnies, or your favorite commercial graphic novel. By understanding what shapes and features pair with readers' most popular assumptions, the savvy cartoonist can reinforce (or quash) expectations with great emotional effect.¹⁰

Shapes are one thing, but what about color? Well, the literature on color can also guide us in making good decisions while we aim to evoke the right emotions in our audience. For instance, a study on children showed that brighter colors were more associated with positive emotions, and darker colors were more connected to negative emotions.¹¹ Likewise, higher levels of saturation and value were shown to influence feelings of excitement and relaxation, which generated positive attitudes in readers.¹² Not only are these helpful guidelines for creating lovable or detestable types, but by inverting the association, we can further break rules, creating a jarring perceptual contrast which can enhance the richness and the emotional complexity of characters.



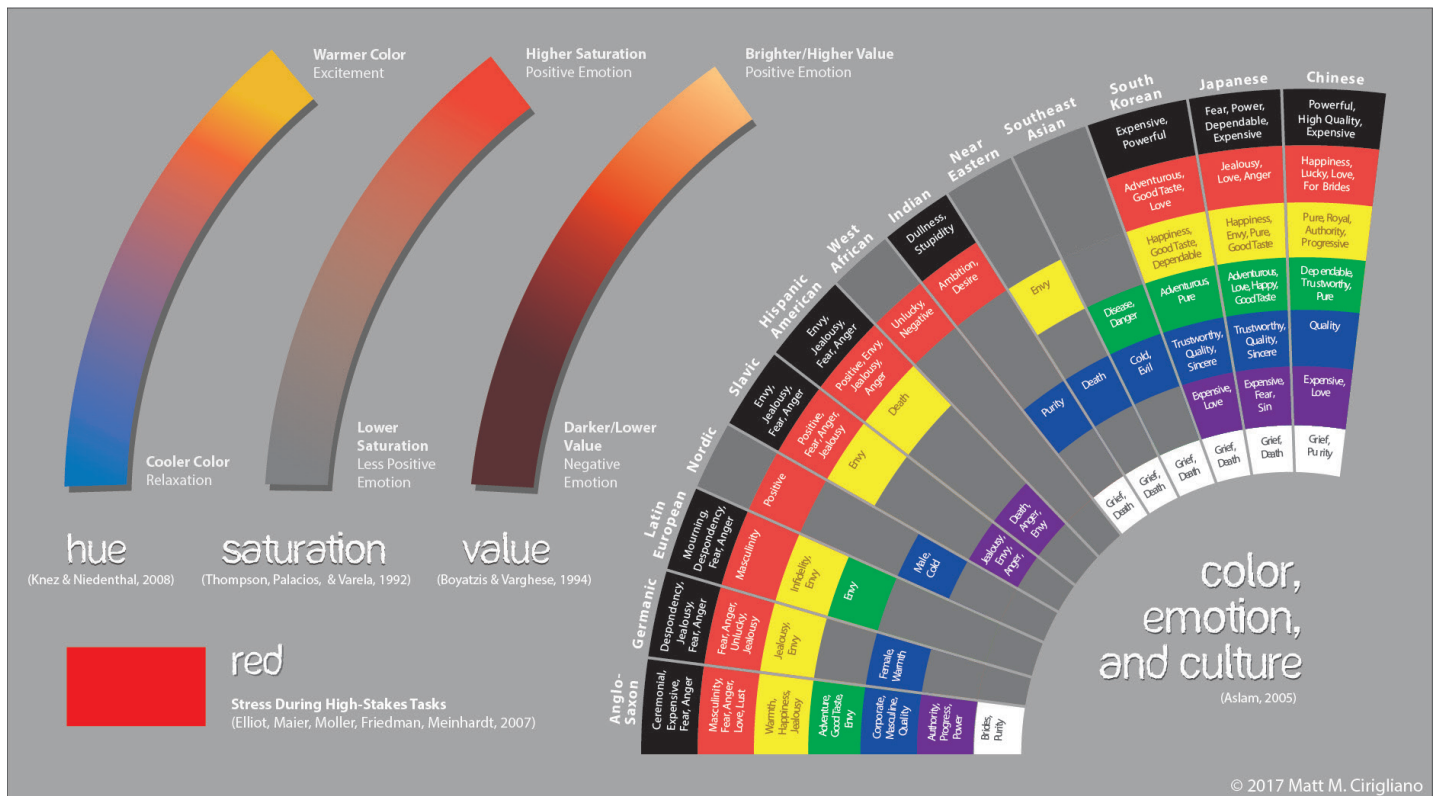
Historical examples of physiognomy; Giambattista Della Porta, *De humana physiognomonia* (Vico Equense [Naples]: Apud Iosephum Cacchium, 1586).

Source: <https://en.wikipedia.org/wiki/Physiognomy>



Examples of postures and physiques that telegraph certain personality expectations. By LuigiL at deviantart.com.

Source: <http://luigil.deviantart.com/art/Character-Sketch-Process-337001786>



Coloring characters is one thing, but setting is another beast entirely. One study on learning games shows that a digital maze lit with warm colors (e.g. orange and yellow) generated greater arousal and quicker completion times than a maze lit with cooler colors.¹³ And as for red...well, this rosy hue was actually shown to impair performance in high-stakes tasks, like test-taking for instance.¹⁴ In comics, a blazing red background could help create a stressful setting for your plot's third and final act.

Lastly, when it comes to color, there's one more thought to entertain, and that is the concept of culture. Oftentimes, we may forget that colors have varying significances when viewed through different cultural lenses. For example, in Anglo-Saxon contexts, the color white evokes happiness and purity—but in some Eastern cultures, the color white may also imply death and mourning.¹⁵ Because of this, and the occasionally contrary connotations therein, it's important to consider our target audiences before tackling a comic's design.

In sum, so long as we're well versed on the science, we as artists have the power to strategically affect how our readers interact with our content. We can create evocative characters and settings—manipulating color, shape, and context to foster greater emotional appeal—and enhance our cartooning potential in education and beyond. Bring on all the feels!

Matt is a medical artist and PhD candidate studying human cognition, learning games, and medical education at NYU.

For more on Matt's work, visit:

Website: www.mattcirigliano.com

Twitter: @MattAnatomy

References: 1. Plass, J. L., & Kaplan, U. (2015). Emotional design in digital media for learning. *Emotions, technology, design, and learning*, 131-161. 2. Um, E. R., Plass, J. L., Hayward, E. O., & Homer, B. D. (2012). Emotional design in multimedia learning. *Journal of Educational Psychology*, 104, 485-498. 3. Cahill, L., & Alkire, M. T. (2003). Epinephrine enhancement of human memory consolidation: interaction with arousal at encoding. *Neurobiology of learning and memory*, 79(2), 194-198. 4. Lorenz, K., & Generale, S. (1950). Ganzheit und Teil in der tierischen und menschlichen Gemeinschaft [Wholeness and part in animal and human community]. Part and Parcel in Animal and Human Societies, 3, 9. 5. Dion, K., Berscheid, E., & Walster, E. (1972). What is beautiful is good. *Journal of personality and social psychology*, 24(3), 285. 6. Dehn, D. M., & Van Mulken, S. (2000). The impact of animated interface agents: A review of empirical research. *International Journal of Human-Computer Studies*, 52, 1-22. doi:10.1006/ijhc.1999.0325. 7. Winkelman, P., & Zajonc & Norbert Schwarz, R. B. (1997). Subliminal affective priming resists attributional interventions. *Cognition & Emotion*, 11(4), 433-465. 8. Plass, J. L., Heidig, S., Hayward, E. O., Homer, B. D., & Um, E. (2014). Emotional design in multimedia learning: Effects of shape and color on affect and learning. *Learning and Instruction*, 29, 128-140. 9. Weschler, J. (1982). A Human Comedy: Physiognomy and Caricature in Nineteenth Century Paris. 10. Eisner, W., & Poplaski, P. (2008). *Expressive anatomy for comics and narrative: principles and practices from the legendary cartoonist*. WW Norton & Company. 11. Boyatzis, C. J., & Varghese, R. (1994). Children's emotional associations with colors. *The Journal of genetic psychology*, 155(1), 77-85. 12. Thompson, E., Palacios, A., & Varela, F. J. (1992). Ways of coloring: Comparative color vision as a case study for cognitive science. *Behavioral and Brain Sciences*, 15, 1-74. 13. Knez, I., & Niedenthal, S. (2008). Lighting in digital game worlds: Effects on affect and play performance. *CyberPsychology & Behavior*, 11(2), 129-137. 14. Elliot, A. J., Maier, M. A., Moller, A. C., Friedman, R., & Meinhardt, J. (2007). Color and psychological functioning: The effect of red on performance attainment. *Journal of Experimental Psychology: General*, 136, 154-168. 15. Aslam, M. M. (2006). Are you selling the right colour? A crosscultural review of colour as a marketing cue. *Journal of marketing communications*, 12(1), 15-30.