Visual illusion in ARTPOP and pop art

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Lady Gaga’s fourth CD album ARTPOP, designed by American pop artist Jeff Koons, adopted one of my illusion works, namely, *Hapton urchin*, as the main inside design. This occurrence was significant for the study of visual illusion in the following three senses: first, it drew people’s attention to visual illusion; second, the chosen illusion was novel; and third, for the first time in its history, visual illusion was recognized as ubiquitous.

**Key words:** visual illusion, motion, pop art, Ouchi–Spillmann illusion

Lady Gaga’s fourth CD album ARTPOP included artworks of visual illusion

American pop artist Jeff Koons designed the cover and inside of Lady Gaga’s fourth CD album ARTPOP, which was released on November 6, 2013. He adopted a novel type of visual illusion that features a moving, shaking, or jerking optical effect, as well as one of my illusion works, *Hapton urchin* (Figures 1 and 2). This occurrence was significant for the study of visual illusion for reasons other than the expected interest to visual illusion from people influenced by Lady Gaga’s superstar status worldwide. In this paper, I will try to cast light on unnoticed but significant influences.

The chosen illusion is novel in the study of visual illusion

*Hapton urchin* is an artwork of a novel type of motion illusion, which I tentatively call “moving stripes illusion.” The basic images are given a drifting expression (Figures 3a and 3b), a rotating demonstration (Figure 3c), and a radially moving expression (Figure 3d). The illusion of motion is achieved by meeting the “necessary condition” of arranging stripes of black (dark) and white (light) elements placed in front of a gray background (intermediate luminance) (Kitaoka, 2012). Stripes of black and white squares are sufficient for rendering the illusion (Figure 3b), whereas adding oblique components to the stripes enhances the effect (Figures 3a, 3c, and 3d). No models have been proposed to explain these characteristics.

As far as I know, the first demonstration of this illusion is attributed to American mathematical artist Jeff Berkeley in his artworks of fractals *Fractal Illusion* (Figure 4a) and *Fractal Zap* (Figure 4b) created in 1993 and 1994, respectively. Koons did not choose these images for the CD design. Instead, he included Tautvys Dautavė’s illusion artwork *5 minutes after the Philadelphia Experiment* produced in 2010, which appears to be a derivative of Berkeley’s artworks. In my case, I encountered Berkeley’s artworks before 2008, extracted the “moving stripes” illusion from them, and then created *Hapton urchin* in 2008.

The Ouchi–Spillmann illusion was also included

An image of the Ouchi–Spillmann illusion was adopted for the back cover of the CD (Figure 5). This image was also produced and provided by me. Koons’s agent consulted with me regarding this illusion, and I informed her of the study of this illusion. This illusion had been called “Ouchi illusion” but I asked the agent to label it “Ouchi–Spillmann illusion” to pay respect to the discoverer Lothar Spillmann, who had recently published a paper entitled “The Ouchi–Spillmann illusion revisited” in *Perception* (Spillmann, 2013).

I was unaware of the intention of Koons for including the illusion. However, I imagine that he intuitively thought of the Ouchi–Spillmann illusion as being closely related to the “moving stripes” illusion. This idea might be plausible because the latter is obtained by reducing the image of the former (Kitaoka, 2012), as shown in Figure 6.

Significance of visual illusion being chosen by the pop artist

Pop art is an art movement that emerged in the 1950s in Britain and the USA (Livingstone, 1990). Jasper Johns, Robert Rauschenberg, Andy Warhol, and Roy Lichtenstein gained fame as pop artists in the 20th century. Pop art challenges traditions of fine art or high art, as well as includes imagery from popular culture or industrial mass products, such as advertising, news, designs, comic books, commodities, or mundane cultural objects. In other words, objects or motifs used in pop art are popular to the general public or regarded as ubiquitous. Visual illusion had never met this criterion before the information and communications technology revolution because people experienced visual illusions or illusion works in psychology textbooks or in science museums. At present, people can see them on the Internet. This ubiquitous nature of visual illusion has been accomplished by the parallel development of telecommunications technology and infrastructure, PCs, cell phones, as well as a variety of communication networks. Furthermore, many contributors in the world continue to study visual illusion or create illusion works.

Jeff Koons, one of the most prominent contemporary pop artists, chose visual illusion for the CD design of the superstar Lady Gaga’s ARTPOP. The ubiquity of visual illusion was confirmed by this event, creating a historical mark in the study of visual illusion.

Some remarks

The design of the front cover of ARTPOP (Figure 7a) shows a nude sculpture of Lady Gaga with a blue glowing ball, both of which appear to be moving. This effect is similar to that of the Ouchi–Spillmann illusion (Figure 5). Some features of the front cover of ARTPOP are novel and novel, as well as novel. The front cover of ARTPOP is an example of a double illusion, combining the Ouchi–Spillmann illusion and the “moving stripes” illusion.

Figure 1. *Hapton urchin* (2008, http://www.pyx.ritsumei.ac.jp/~akioka/opart.html). The radial arms appear to expand or contract abruptly triggered by the eye movement of observers. This work was adopted for the cover of “Special Issue: 169 Best Illusions” published by *Scientific American Mind* in 2010.

Figure 2. The inside of Lady Gaga’s fourth CD album ARTPOP designed by Jeff Koons. The background of the original work was changed from blue to pink (reproduced with permission from UNIVERSAL MUSIC LLC).

Figure 3. “Moving stripes” illusion. In (a) and (b), the inset appears to drift. (c) Each block of rings appears to rotate quickly. (d) Radial arms appear to expand or contract.

Figure 4. Jeff Berkeley’s artwork *Fractal Illusion* (1993) and *Fractal Zap* (1994) (reproduced with permission from Jeff Berkeley).

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In aspiration of establishing a new area of perceptual science

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Research Center for Applied Perceptual Science, Faculty of Design, Kyushu University, has been established in April, 2013. We aim at establishing a new research area, perceptual science. Perceptual research has often been performed as parts of different disciplines, mainly psychology, physiology, and informatics. All these disciplines will be connected closely to each other in the new interdisciplinary area. It is of vital importance to understand how humans gather and structuralize information related to the interaction between environments and humans, and humans need a lot of information in order to adapt to environments. Each of our members is expected to cultivate new research fields when necessity arises, which will enable very efficient interdisciplinary cooperation.

2013年4月、九州大学芸術工学研究院にて、「応用知覚科学研究センター（Research Center for Applied Perceptual Science）」が発足しました。当センターでは、環境や物、情報の人どのように受け取るのか、主体の先端による現象を、脳活動と関係付けることにより、脳心の不明解の関係を解決するような新分野である「知覚科学」という学際的な領域の確立を目指し、分野の壁を超えた研究が進化にされるように、さまざまな工夫をしています。

当センター設置の背景には、本研究室に、理学、工学、芸術などさまざまな分野の専門性を持つ人材が集まっています。さらに、知覚心理学会との関連分野を専門とする研究者がまざって活動していることがありました。センター長である中島を含む同僚の研究者が、各地から寄せられた材料を色んな角度からあたかも自分が新しい創作物をつくることができるような、新しい情報研究ができるように、この好奇心にあふれる研究者を交わず、これまでにできなかったことができるようにするのではないかと考えています。

当センターでは、学際的研究を広く進化に行うために「フロントリア共通型研究システム」を名付け新しい研究システムを導入しています。二つの以上の方で実験を認められた研究者のみを集め（例：「数学と国文学」「視覚心理学と信号処理」「視覚心理学と人工知能研究」などの中身あり）、異なる分野を担当する研究者が、少しずつ協力しあいながらに Fusahara 815-8540, Japan.
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