

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, *Hatpin 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, Ōuchi–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 chose one of my illusion works, *Hatpin 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

Hatpin 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 Tautvydas Davainis'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 *Hatpin urchin* in 2008.

The Ōuchi–Spillmann illusion was also included

An image of the Ōuchi–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 "Ōuchi illusion" but I asked the agent to label it "Ōuchi–Spillmann illusion" to pay respect to the discoverer Lothar Spillmann, who had recently published a paper entitled "The Ōuchi–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 Ōuchi–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

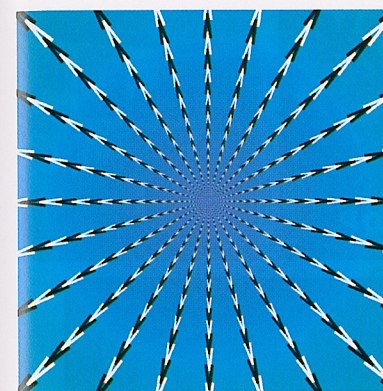


Figure 1. *Hatpin urchin* (2008, <http://www.psy.ritsumeikan.ac.jp/~akitaoka/opart5e.html>). The radial arms appear to expand or contract abruptly, triggered by the eye movement of observers. This work was adopted for the cover of "Special Issue: 169 Best Illusions" published by *Scientific American 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).

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 glazing ball, both of

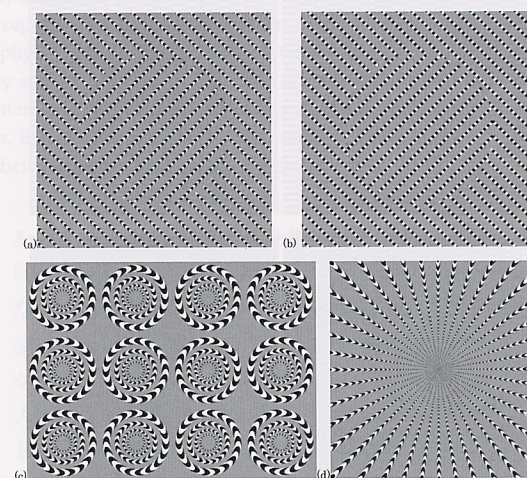


Figure 3. "Moving stripes" illusion. In (a) and (b), the inset appears to drift. (c) Each block of rings appears to rotate quickly. (d) Radial arms appear to expand or contract.



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

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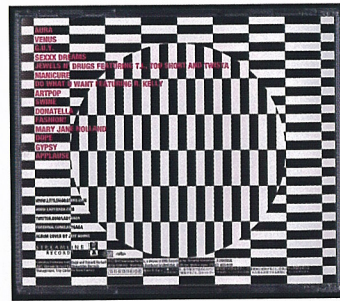


Figure 5. The back cover of the CD showing an image of the Ōuchi-Spillmann illusion (reproduced with permission from UNIVERSAL MUSIC LLC).

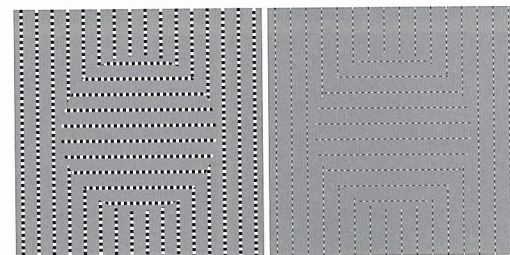
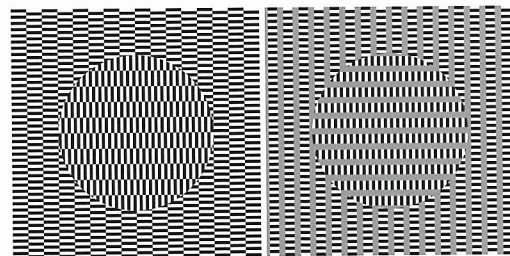


Figure 6. Continuation between the Ōuchi-Spillmann illusion (the upper left image) and the "moving stripes" illusion (in the three other images). Each inset appears to move.

which were created by Koons. This cover design calls to mind the painting *The Birth of Venus* produced by Italian artist Sandro Botticelli in 1483 (Figure 7b).

Moreover, I would like to point out an unnoticed meaning. I

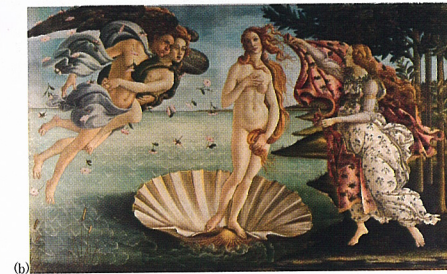


Figure 7. (a) The front cover of ARTPOP (reproduced with permission from UNIVERSAL MUSIC LLC); (b) Sandro Botticelli's *The Birth of Venus* (around 1483); (c) Richard Hamilton's *Just what is it that makes today's homes so different, so appealing?* (1956).

think this image also pays homage to the early pop artwork *Just what is it that makes today's homes so different, so appealing?* (Figure 7c) produced in 1956 by British painter Richard Hamilton, which is one of the most famous pieces in pop art history (Livingstone, 1990).

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「知覚科学」という学際的な領域の確立を目指して

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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; 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、情報を人がどのように受け取るのか、意識の先端に上る現象を、脳活動と関係付けることにより、脳と心の不即不離の関係を解明するような分野である「知覚科学」という学際的な領域の確立を目指し、分野の壁を越えた研究が迅速になされるように、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、本研究院に、理学、工学、芸術などさまざまな分野の専門性を持った人材が集まっていること、さらには、知覚心理学および関連分野を専門とする研究者がまとま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何名かの研究者が、各地からとり寄せた材料に色々なスパイスを混ぜ合わせると新しい創作料理ができるように、この好奇心にあふれる研究者を統合すれば、これまででできなかったことができるようになるのではないかと考えたのです。

当センターでは、学際的な研究を広く迅速に行うために「フロンティア共有型研究システム」と名付ける新しい研究システムを導入しています。二つ以上の分野で実績

を認められた研究者のみを集め (例:「数学と脳科学」「聴覚心理学と信号処理」「視覚心理学と人工現実研究」などの組み合わせ)、異なる領域を担当する研究者が、少しずつ領域に重なりを持たせることにより、コミュニケーションの効率化を図っています。環境や物、情報を人がどのように受け取るのか、心の側面から解明することを目指し、知覚 (perception) をキーワードに、本センターの構成員は、一つに繋がっています。

一般的に、学際的な研究を行う場合、まず会議を開いて違う分野の研究者同士が知識を共有する必要があります。しかし当センターでは、研究者が共有する専門分野を手がかりに意思疎通を行うことで、いきなり本質的な部分から研究を始めることができます。それはまるで、異なる楽器を持った音楽奏者が集まり、共有する楽譜を見て、即興で、音のハーモニーを奏でることができるかのようなものです。研究が面白くなります。これによって、研究の迅速化も期待できると考えています。

当センターの設置を記念して、2013年4月1日には、「知覚と言語の間で (Between Perception and Language)」と題して、設立記念シンポジウムが行われました。発達心理学、応用言語学、英文学研究、多変量解析、音声科学、音響学、人工現実研究、バイオ統計学、脳研究、科学基礎論などの幅広い分野からの、最新の話題と古典的な話題とがうまく組みあわさりました。山下が指導を受けた David Hirsh 博士 (シドニー大学) にも来日して、講演い

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