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On a New Type of Optical Illusion

Joseph Plateau

Translated by Richard George Elliott

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Abstract

This is a short open letter to the French-speaking scientific community dated January 1833. It is significant for offering the first published, *unequivocal* description of the "illusion of movement" achieved using animated drawings via the device commonly known as the Phenakistiscope. Joseph Plateau's letter can be paired with the next article in this issue, an almost contemporaneous essay by Simon Stampfer that outlines near identical discoveries in greater detail. Together, these texts provide the foundation for a key aspect of cinematographic technology and its artistic potential.

KEYWORDS: Joseph Plateau, optical illusions, proto-cinematography, Phenakistiscope, animation

Introduction by ***Barnaby Dicker*** (Royal College of Art)

Dated January 1833, this open letter to the scientific community marks a pivotal moment in the development of cinematography; a moment Joseph Plateau effectively shares, on quite independent terms, with Simon Stampfer (see his "Stroboscopic Discs: An Explanation," this issue). Here, Plateau, then a professor of physics and chemistry at the Institut Gaggia, Brussels, picks up on experimental research on and around perception in which he was actively involved and makes an advance on passing observations published by Michael Faraday in 1831. Plateau describes his fabrication of and experiments with a device that subsequently carried many names, but settled—in connection with Plateau—as the Phenakistiscope. The advance that we now recognize as being so pivotal concerns the recognition of the perceptual effects and the potential—be it artistic, scientific, social, cultural—of the intense grouping of depictions presented in rapid kinetic series; in other words, the production of the so-called "illusion of movement." Put in the language of scientific perception studies, this is an insight regarding ways in which real motion can generate apparent motion (and apparent stasis).

After producing some tests, including the pirouetting dancer that accompanied the publication of this letter, and (probably the earliest known example) a *bee circling a flower (Figures 1 and 2, respectively), Plateau enlisted the help of painter Jean-Baptiste Madou early in 1833. Madou's discs appear to have reached Britain, Faraday and London society shortly afterwards, thanks to Adolphe Quetelet. As a direct result, Rudolph Ackermann published a set of discs in July 1833 (Figures 3–5). Other sets derived from Plateau's lead appeared within the same year: in France, by Alphonse Giroux; in Belgium, by Dero-Becker; and with two more from Ackermann in London.*[1]

Notes to Introduction

1. For details concerning Plateau and the Phenakistiscope, see: Laurent Mannoni, *The Great Art of Light and Shadow: Archaeology of the Cinema* (Exeter: University of Exeter Press, 2000), 215–22; David Robinson, *Masterpieces of Animation 1833–1908*, Griffithiana 43 (1991); and Maurice Dorikens (ed.), *Joseph Plateau 1801–1883: Living Between Art and Science* (Flanders: Provincis Oost, 2001).

On a new type of optical illusion by Joseph Plateau

It is known that Mr Faraday, in the *Journal of the Royal Institution*,[1] has published a report of certain optical illusions, consisting in the main of a description of those that present themselves when one observes two wheels turning rapidly one behind the other. Mr Faraday was not, at that time, familiar with the observations I had made on this type of phenomenon a considerable time before, as recorded in the *Correspondance* (volume IV, page 393[–6], and volume VI, page 121[–6]). I should like to take this opportunity to announce that no sooner had my researches come to the attention of Mr Faraday, by means of a letter that appeared in the November 1831 issue of the *Annales de physique et de chimie*, than he hastened to write to me and to acknowledge, in a manner most flattering to myself, the antecedence of my observations. However, the report to which I refer also contains several very curious experiments that are all Mr Faraday's own, and it is the principle on which some of these are based that has led me to imagine the type of illusion that is the subject of this article.

Cut out a disc of white card measuring at least 25 centimetres in diameter. Divide it into a certain number of equal sectors, for example sixteen. Next, cut a series of slits [*fentes*] 3–4 millimetres wide and 2 centimetres long close to the circumference, following the direction of the lines. Then colour the obverse of the card black and, lastly, make a hole in the centre so that the disc can be made to revolve around a wire or large needle. Having thus prepared the device, set it spinning rapidly in front of a mirror, with the white side facing the mirror, and look with one eye through the gauze that the slits seem to form as they move in such a way that the image of the disc in the mirror may be seen. This image, as Mr Faraday, to whom we are indebted for the experiment, has shown, will appear completely motionless. You will be able to distinguish the sixteen slits, as well as the sixteen lines dividing the sectors, in a state of absolute immobility, regardless of the speed with which the disc revolves. Mr Faraday supposes the explanation for this curious phenomenon to be too straightforward to linger over, and indeed a little reflection is all it takes to work it out. I will nevertheless explain it here because it will allow me to elucidate in turn the various effects that form the main subject of this article. Each time a slit passes before the eye it enables the observer to see the image of the disc in the mirror. But because the slits are small, the image can only be perceived for a very small portion of a revolution and, as a result, it is almost as if what one sees, during this brief instant, is the image of an immobile disc. Now, because the images that succeed one another on the back of the eye are perfectly identical and, furthermore, by virtue of the duration of these impressions, providing the speed is sufficient, these identical images will link up in such a way as to present to the eye a uniform appearance

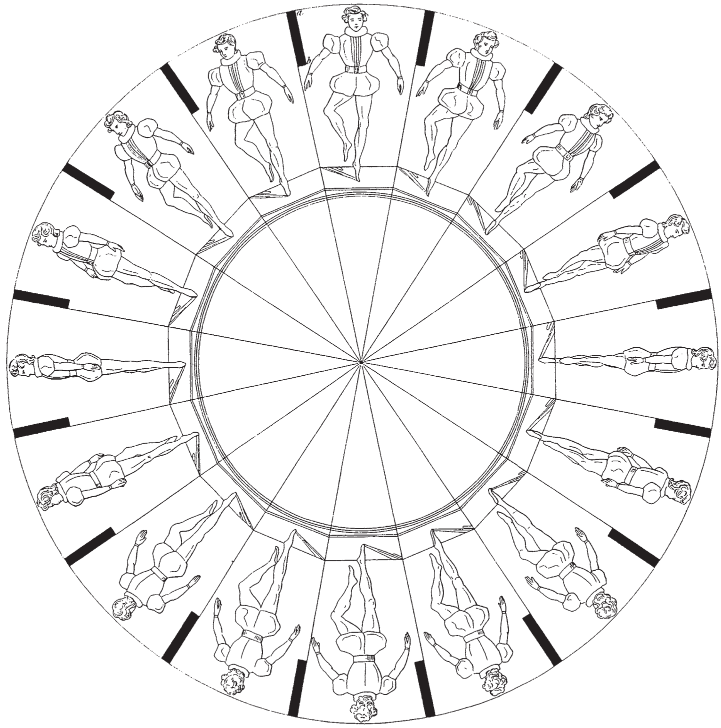

Figure 1
Joseph Plateau, *Phenakistiscope disc design: pirouetting dancer*, 1833. © Museum of the History of Sciences, Ghent University.

which will necessarily be that of a perfectly immobile disc along with its slits and dividing lines.

In the space between the bottom of the slits and the center of the disc, Mr Faraday then draws several concentric circles, two or three for example, equidistant from one another. He then, by means of radii sections, divides each of the rings thus formed into a number of equal parts, which slightly differs to the number of slits. Thus in the case of a disc with sixteen slits, the first ring will contain, for example, seventeen or eighteen sectors, the second fourteen or fifteen etc. Finally, each of the sectors within the same ring is divided into two, one of which is painted black while the other remains white. A disc with sixteen slits will therefore have seventeen or eighteen black spaces separated by the same number of white spaces in one ring, and fourteen or fifteen black spaces and as many white spaces in another, and so on. Now, when the disc thus prepared is set in rapid motion and observed in the mirror as previously described, it is clear that the images of each of the black squares viewed through the successive slits are identical in form, though not entirely identical in their position with relation to the eye, in such a way that their position will appear to gradually change, with the singular effect that all the rings will appear to be rotating around the centre of the disc in a different direction depending on whether the

Figure 2
Joseph Plateau, *hand-painted Phenakistiscope disc: bee circling a flower*, 1833. © Museum of the History of Sciences, Ghent University.

number of black spaces is higher or lower than the number of slits, all the while the slits themselves retain their apparent immobility.

Let us now go a step further. If, instead of dividing the disc into concentric rings, as does Mr Faraday, we draw a figure of some sort in one of the sectors, and repeat the same figure, positioned in the same way, in each of the other sectors, it stands to reason that when we subject the disc to the experiment in the mirror, these small figures will be observed in a state of perfect immobility. But now, instead of merely identical figures, let us make figures that follow some sort of series, passing by degrees from one form or position to another, such that each sector contains a figure differing slightly from the one that has preceded it. With the image of each sector successively occupying the same position in the mirror in relation to the eye and providing the speed is sufficiently fast for all these successive impressions to link up, though not so fast that they merge, we will appear to see each of the little figures gradually changing state. One can immediately imagine what curious effects can be produced on the basis of this principle. I have provided one example in the plate that accompanies this account (Figure 1): each sector, as one can see, shows a little dancer performing a pirouette. Over the course of the series of figures the dancer turns further and further in one direction, eventually returning to the position from which he started while the ground beneath his feet remains identical in each of the sectors. Well

Figure 3
Unknown (after Jean-Baptiste Madou), *Phenakistiscope ("Phantasmascope") disc: spiraling colored circles*, published by Rudolph Ackermann, 1833. © Museum of the History of Sciences, Ghent University.

now, when we subject this disc to the experiment in question, we see to our surprise, and the illusion is complete, all these little dancers turning on their own axes on an immobile floor, the rapidity and direction of their pirouettes depending on the speed and direction of the motion in which the disc is set.[2]

I will not dwell on the variety of curious illusions that can be produced by this new means, but leave to the imagination of those who would like to try these experiments the trouble of obtaining the most interesting effects from them. I will simply observe that the experiment works best in the evening, with a candle positioned between the mirror and the disc, in closer proximity to the latter. Should one wish to observe the effect during the daytime, the various elements need to be arranged in such a way that the mirror is leaning against a window and the disc is thus receiving as much light as possible. A certain distance from the mirror is also necessary: if one is too close, the images lose their clarity.

Brussels, 20 January 1833.

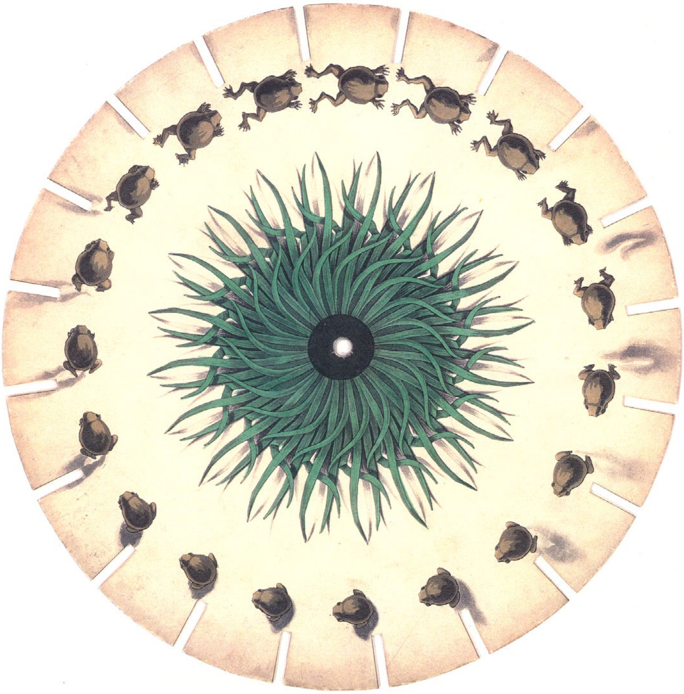

Figure 4
Unknown (after Jean-Baptiste Madou), *Phenakistiscope ("Phantasmascope") disc: hopping frog with grass,* published by Rudolph Ackermann, 1833. © Museum of the History of Sciences, Ghent University.

Figure 5
Unknown (after Jean-Baptiste Madou), *Phenakistiscope ("Phantasmascope") disc: dancing monkeys*, published by Rudolph Ackermann, 1833. © Museum of the History of Sciences, Ghent University.

Notes

1. Editor's note: Michael Faraday, "On a Peculiar Class of Optical Deceptions," *Journal of the Royal Institution of Great Britain* 1 (1831): 205–23.
2. It has only been possible to render the figures as line drawings; one can imagine that in order to create the best possible illusion, they would need to be shaded and coloured.