

**Flash Force:  
A Visual History of Might, Right and Light**

Perhaps the greatest achievement of civilization has been the creation of a realm of culture which is not dominated by brute force—a place where might does not make right. Science is typically seen as the clearest fulfillment of this ideal, where truth is neither bent by the multitude of opinion nor distorted through the use of brute force. “One of the strongest, if still unwritten, rules of scientific life is the prohibition of appeals to heads of state or to the populace at large in matters scientific,” explained the historian and philosopher Thomas Kuhn.<sup>1</sup> How and when was the separation between might and right achieved in modern culture? A key moment of transformation occurred in spaces where “matters of fact” were “made visible.” In the Royal Society of London, where Robert Boyle and Thomas Hobbes debated about the existence of the vacuum, neither of them disputed the matters of fact at hand. “Mr. *Hobbes*,” claimed Boyle, “does not deny the truth of any of the matters of fact I have delivered.”<sup>2</sup> Since then, armies of facts have continued to leave scientific settings to reach much more remote areas, travelling first through expanding networks of print and later of electricity. The problem of *seeing* matters of fact, that is, of visibility, soon became as important as that of matters of fact themselves. Hence, recently, the philosopher and historian Hans-Jörg Rheinberger firmly asserted that making visible, rather than making facts, constituted the foundational task of modern science: “It is probably not too far-fetched to postulate that making visible something that does not manifest itself directly and therefore is not immediately evident – that is, does not lie before our eyes – is the foundation and at the same time the foundational gesture of the modern sciences.”<sup>3</sup> The development of clean sources of illumination, and particular of flash,

was essential for making facts visible. The history of the flash belongs to the century-long quest of finding pure sources of light and divorcing these from the potent explosions that initially produced them. It is a history that continued the Enlightenment project that associated light with reason and pure observation and dissociated both from destruction. This process enabled light to become, in the words of Jacques Derrida, “the founding metaphor of Western philosophy.”<sup>4</sup> Or, in the words of Marshall McLuhan, it permitted “electric light” to become “pure information”—the ultimate “medium without a message.”<sup>5</sup> Light was not always as pure as it turned out to be. Fire, light and smoke were all deeply connected until modern times. Even some of the first flash technologies, such as those based on magnesium flash-powder, were dangerous, at times inflicting “untold damage to the nervous system of unsuspecting subjects.” The first use of flash is usually attributed to Henry Fox Talbot, one of the inventors of photography. In 1851, in front of a large audience at the Royal Institution, he used a spark flash to photograph a page of *The Times* newspaper pinned on a rapidly rotating wheel—the resulting photograph was readable. Flash spark techniques were subsequently improved by many other scientists. But they were difficult to control, and their field of illumination extended only to a couple of inches. With the invention of light bulbs, scientists started detonating electric sparks within gas-filled glass tubes rendering them captive and, for the most part, harmless. A clear improvement came with the development of the electronic flash, or strobe, in which the burst of light was incredibly quick and which could be used serially, not having to be discarded after each use. These new flash technologies emitted their “powerful light in a fraction of a second, quietly and without smoke or danger of fire.” Subjects did not even blink, and although more brilliant than sunlight, “the eye seeing it is unaware of unusual brightness.”<sup>6</sup> How could such an



intense source of illumination not even cause an observer to blink? Scientists underlined this particular aspect of the new technology after a scandalous incident in which the figure skater Sonja Henie fell while performing and injured herself because of old flash systems. Philosophically and practically, flash technologies were an important step in the gradual production of a visual system which did not disturb the surrounding environment by being safe, harmless and clearly different from violent, explosive technologies.

The transformation of flash (from that given off by natural lightning bolts, to dirty and dangerous flash powder technologies, to clean sources of illumination) marked a stark change in modern visual culture. Sight could be extended into previously hard to reach places, from the interior of private homes it could now travel to caves, catacombs and ocean's depths. Photojournalism, as a practical medium and a sociopolitical force, depended on steady supply of flash bulbs. Flash appeared ever more innocent, increasingly divorced from technologies designed to alter or destroy the natural world.

The first book-length account of the strobe, *Flash! Seeing the unseen by ultra-high speed photography*, appeared in 1939, designating the MIT researcher Harold Edgerton as the main scientist responsible for developing the technology. To this day, most accounts of strobe technologies in the twentieth century cluster on his work.<sup>7</sup> In 1942 the ability "to halt with stroboscope and camera a bullet in flight" was hailed as one of the most important achievements of civilization, equal to the development of the telescope and microscope.<sup>8</sup> By the end of the war, strong sources of illumination and electronic strobes were widely available in both the United States and Europe. Techniques for synchronizing a flash with a particular event, using either a microphone or by having the event itself trip a circuit, also became generally

known. James R. Killian, a young science-writer in the 1930s who would later become president of MIT and one of Eisenhower's most trusted scientific advisors during the fateful Sputnik years, brought Edgerton's work to the fore. For more than forty years, he provided the interpretative frame—the "meaning of the pictures"—of strobe photographs. Strobe photographs were "literal transcriptions" that "provide a unique and literal transcript of that time world beyond the threshold of our eyes," being "scientific records" written in a "universal language for all to appreciate."<sup>9</sup> Killian considered the strobe an ideal technique for capturing short moments of time. He considered it alongside other "classical" instruments, such as the telescope and the microscope, which were traditionally conceptualized as expanding the reach of vision. He argued that the strobe showed how time could be expanded in the same way as space. Edgerton's machines, he explained, "manipulate time as the microscope or telescope manipulates space," enabling "us to see and understand by contracting and expanding not only space but time."<sup>10</sup> But at least one clever reader, commenting on the alleged stretching of time, ironically wondered "If Money Could be Stretched like That."<sup>11</sup> Despite the efforts of Killian and Edgerton, others started using strobes in a manner that did not fit with traditional prescriptions. These investigators developed alternative ways of thinking about representation and observation in art and science. For a few years in the late 1950s, a handful of radical scientists no longer looked away from the source of illumination and instead stared directly at the flash of light (sometimes with their eyes only a few centimeters from the source of light), developing new experiments to study and enhance the strange visions they saw.<sup>12</sup> To at least one observer, these visions appeared to be "like a number of scenes in a badly cut film."<sup>13</sup> New neurophysiological practices were developed where the experimental

subject stared at the stroboscope, often with closed eyes. Information was then collected from the subject through an Electroencephalographic machine (EEG) attached to a person's skull and amplified "ten million times or more". EEG had a long history, usually traced back to Hans Berger's discovery in 1924, but in the years following Berger's investigations the technique was increasingly used in conjunction with a strobe for diagnosing brain tumors and epilepsy. The controversial neurophysiologist and artificial intelligence pioneer William Grey Walter (1910-1977) spearheaded these investigations. Studies on the effects of light stimulation on the brain were also not new, but Walter's research was different from previous investigations since he used a "now available... 'high power stroboscope'... in which the duration of the flash is of the order of 10  $\mu$ sec."<sup>14</sup> The instrument was manufactured by Scophony, Ltd. one of the earliest makers of television sets. The subject's own experience of staring into a stroboscope became a valuable source of information. This stood in sharp contrast with Edgerton's methods. Even when Edgerton aimed his machine at a person's eye, such as to measure the time of a wink or to capture a delay in the iris's adjustment to light, the subject's experience was ignored.<sup>15</sup> In 1946 Walter published a number of influential articles detailing the effects of strobe light on the brain. The first findings of Walter and his co-authors were revolutionary: the instrument could be used to invoke epileptic fits—"although the patient was under the influence of large doses of anticonvulsant drugs and was almost free from spontaneous attacks."<sup>16</sup> While the strobe produced dangerous reactions on epileptics, it also evoked strange visions on most normal individuals. As Grey Walter slowly increased the strobe frequency, subjective sensations "of a mosaic or chessboard pattern, sometimes with a whirlpool effect superimposed"

sometimes appeared. At other times these sensations were more akin to actual hallucinations, producing "impressions of bodily movement or of organized visual experiences of a bizarre and sometimes alarming nature."<sup>17</sup> Flash could be used to change the electrical rhythmic patterns emitted by the brain. In the 1950s the British Neuroscientist John R. Smythies continued the research program inaugurated by Walter by studying the effects of strobe on normal individuals. He "borrowed and scrounged the simple equipment" which was now readily available from EEG labs.<sup>18</sup> From 1957 to 1958 Smythies worked intensively in the Laboratory of Psychology in Cambridge to study stroboscopic patterns. He used an Aldis 500 watt projector covered by an episcotister (a slit screen) and a "Standard E.M.I Electric Stroboscope."<sup>19</sup> He, along with his students, staff and subjects, would stare at it and record their observations while changing the strobe's frequency and varying other conditions. The more Smythies worked with the stroboscope the more complicated the patterns became. Some patterns seemed like "pond life", "bacteria", "germs", "plankton", and "lovely tropical fish in a blue tank". "Victorian wall paper" and "a terrific modern design for a wall-paper" also made appearances. Others were "described as 'streets and houses' swirling around" and looking like an "aerial photo of a city". A number of subjects "reported a continual stream of images of fully formed scenes, usually of commonplace objects and events such as trains, cars, street scenes, harbours, animals, people, etc." Nevertheless certain patterns (such as alphabetical symbols) *never* appeared, enabling Smythies to classify them into seven main types. Smythies came to work on the stroboscope after studying the effects of mescaline with the famous neurophysiologist Humphrey Osmond at the Psychiatric Unit of St. George's Hospital. With his coauthor, Smythies developed the first biochemical theory of

schizophrenia by arguing that a defect in the metabolization of adrenaline could produce in the body a substance similar to Mescaline (called the M-substance) that then created the effects of the disease. Smythies compared the strobe's "power of addiction" to the powerful drug.<sup>20</sup> While Walter continued his studies by using a strobe in combination with EEG techniques, for Smythies the "stroboscopic patterns" themselves proved valuable. In an article published in the prestigious *Nature* journal, he explained how scientists had scarcely any means for studying "how large populations of neurons interact in perception and other functions in the intact and unpoisoned cortex." One technique used a micro-electrode, but it had the disadvantage of recording from only a few neurons. The other technique, electroencephalography, suffered from the opposite problem, it "will only record summated activity of vast populations of neurons." In contrast to both of these options, strobe patterns could be valuable images displaying the intimate workings of the brain:

*It is possible that the stroboscopic patterns, with their many constant and consistent features, and their complexity and geometrical nature, and their consistent response to the change of a number of parameters, can serve as a basis of deductions about the necessary features of the visual mechanisms responsible for them.*

Because "the individual features of the patterns could correlate with personality tests or electroencephalograph patterns," it was necessary to establish their "natural history."<sup>21</sup> Smythies encouraged his subjects to draw the patterns in pastel colors, and included numerous images in his articles. C.D. Broad, Professor of Moral Philosophy, was one of his subjects.<sup>22</sup> Smythies forcefully backed Walter's assertion "that television uses the same mechanical principles as are used in the

physiological mechanisms mediating visual perception."<sup>23</sup> His interest on the strobe was largely philosophical. One of his earliest publications on the topic used it as evidence to fight against a realist view of perception. The change in analogizing the visual mechanisms in the brain as televisual instead of as cinematographic brought with it important changes in philosophy. Smythies established a distinct philosophy of mind connected to his research. Just as a television set does not "give us a direct view of the events televised" the televisual system in the brain also did not provide a direct view of reality.<sup>24</sup> He fought ardently against the view "in which it is believed that the physiological processes of perception mediate a direct view of the physical world." He disparagingly tagged this position as "naïve realism" and called his own philosophy the "Representative Theory of Perception."<sup>25</sup> In subsequent publications Smythies extended Walter's insight even further. He developed a system for finding out details about the inside of a television set *without opening it up*. The type of patterns on the television screen that appeared when a studio was illuminated by strobe depended on the type of raster mechanism inside the television. Analogously, Smythies speculated that the patterns which a person saw when staring into a stroboscope could "give us information as to details of operation of the mechanisms responsible for their production."<sup>26</sup> In this way, even if scientists treated the brain "essentially as a 'black box'" where "the input is a temporally intermittent and spatially uniform light stimulus of the retina" and the "output is a report by the organism of the perception of geometrical patterns," strobe research could help reveal the contents of the cerebral black box. Support for these studies soon came from the noted scientist Heinrich Klüver, who in 1942 had already made a connection between mescaline hallucinations and those "induced by

simply looking at disks with black, white or coloured sectors rotating at certain speeds."<sup>27</sup> Since these effects also appeared in hypnagogic hallucinations, visualizations of entopic phenomena, and in the visual phenomena of insulin hypoglycemia, both Klüver and Smythies believed that the "form constants of hallucinations represents a worthwhile field of study."<sup>28</sup> Experimentation with stroboscope spread along with a new experimentation with drugs. In *Heaven and Hell* (1956), Aldous Huxley explained: "To sit, with eyes closed, in front of a stroboscopic lamp is a very curious and fascinating experience."<sup>29</sup> His experiences with the stroboscope followed those with mescaline, which were recounted in *The Doors of Perception* (1954). Huxley was fascinated by the work of Smythies and Osmond, who advocated a totally new approach to the study of schizophrenia, described by Huxley as "that most characteristic plague of the twentieth century." In doing research with mescaline and lysergic acid [a precursor to LSD], Smythies and Osmond found similarities between their effects, concluding that the mental disorder might be a chemical disorder. On a trip to California in the Spring of 1953, Osmond gave to Huxley who was "on the spot and willing, indeed eager to be a guinea pig" his first dose.<sup>30</sup> Huxley remarked on the "slight danger involved in the use of the stroboscopic lamp," particularly in epileptics: "One case in eighty may turn out badly." The point in question that fascinated Huxley was the same that would later intrigue Carl G. Jung, that these experiences were not created by the person undergoing them, but rather that they came from elsewhere: "They are ... the work of a highly differentiated mental compartment, without any apparent connection, emotional or volitional, with the aims, interests, or feelings of the person concerned."<sup>31</sup> The strobe was particularly useful; because it was means of having visionary experiences without chemical aids; they

were obtained by means of *physics*: "With the stroboscopic lamp we descend from chemistry to the still more elementary realm of physics."<sup>32</sup> The type of action on the brain was of a different, more direct kind: "Its rhythmically flashing light seems to act directly, through the optic nerves, on the electrical manifestations of the brain's activity." In 1959 Allen Ginsberg was a subject at the Mental Research Institute in Palo Alto, where he experimented with LSD, a strobe and an EEG machine. Ken Kesey, another subject exposed to LSD and strobe lights at the nearby Veteran's Administration Hospital (who later recounted his experiences in *One Flew Over the Cuckoo's Nest*), started organizing the first acid-drug strobe parties. Ian Sommerville, William S. Burroughs's boyfriend, soon constructed a simple flicker machine, known as the "dreamachine" designed to democratize self-experimentation with flicker. Burroughs was so intrigued by flicker that he went to a lecture, talked to Walter and publicized Walter's work. By the mid-sixties he was advertising flicker as a way "to achieve the same results [as taking drugs] by nonchemical means."<sup>33</sup> He described using "flicker, music through head phones, cutups and foldins" to produce his novels, and he illustrated the technique in his films. By the end of the sixties the strobe had become essential paraphernalia of the drug revolution. In "How to Change Behavior," Timothy Leary explained: "We have recently learned from W. Grey Walter and William Burroughs about photostimulation as a means of consciousness alteration. Concentrated attention to a stroboscope or flicker apparatus can produce visionary experiences."<sup>34</sup> In 1966 the experimental filmmaker Tony Conrad made the film *The Flicker* designed to expose the audience to strobe lights for them to experience their hallucigenic effects. The artist and poet Bryon Gysin wrote about the dreamachine in *The Process* (1969) earning for this the description by the

famous punk rocker Genesis P-Orridge of him being “a Dreamachine [in] human form.”

The famous psychologist Carl G. Jung became interested in Smythies’s work. He invited him to his home, where they delighted in some harmless Freud bashing.<sup>35</sup> Intrigued by Smythies’ assertion that mescaline visions have “nothing to do with the personality having them,” Jung saw in the work of Smythies and Osmond a corroboration of some of his work on the collective unconscious. Some of these experimenters not only advocated a new relation between science and art, and between health and disease, but even asked that observations be considered sometimes as wholly “disconnected” from the person experiencing them. But most researchers continued to simply look away...

the World of Time and Motion,” 22.

<sup>10</sup> ———, “Papa Flash and His Magic Lamp,” 6.

———, “The Meaning of the Pictures: Exploring the World of Time and Motion,” 9.

<sup>12</sup> “If Money Could Be Stretched Like That,” *The Electric Journal* 28, no. 9 (1931).

<sup>13</sup> Jimena Canales, ““A Number of Scenes in a Badly Cut Film”: Observation in the Age of Strobe,” in *Histories of Scientific Observation*, ed. Lorraine Daston and Elizabeth Lunbeck (Chicago: University of Chicago Press, 2011).

<sup>13</sup> John R. Smythies, “The Stroboscopic Patterns: 1. The Dark Phase,” *British Journal of Psychology* 50(1958): 110.

<sup>14</sup> William Grey Walter, V.J. Dovey, and H. Shipton, “Analysis of the Electrical Response of the Human Cortex to Photic Stimulation,” *Nature* 158(1946): 540.

<sup>15</sup> Killian Jr., “The Meaning of the Pictures: Exploring the World of Time and Motion,” 180-81.

<sup>16</sup> Walter, Dovey, and Shipton, “Analysis of the Electrical Response of the Human Cortex to Photic Stimulation,” 541.

<sup>17</sup> William Grey Walter, “Features in the Electro-Physiology of Mental Mechanisms,” in *Perspectives in Neuropsychiatry: Essays Presented to Professor Frederick Lucien Golla by Past Pupils and Associates*, ed. Derek Richter (London: H.K. Lewis and Co. Ltd., 1950), 74.

<sup>18</sup> John R. Smythies, *Two Coins in the Fountain: A Love Story* (BookSurge, 2005), 41.

<sup>19</sup> Smythies, “The Stroboscopic Patterns: 1. The Dark Phase,” 107.

<sup>20</sup> *Ibid.*: 108-11.

<sup>21</sup> John R. Smythies, “A Preliminary Analysis of the Stroboscopic Patterns,” *Nature* 179(1957): 524. For the term “natural history” see ———, “The Stroboscopic Patterns: 2. The Phenomenology of the Bright Phase and After-Images,” *British Journal of Psychology* 50(1959): 306.

<sup>22</sup> John Geiger, *Chapel of Extreme Experience: A Short History of Stroboscopic Light and the Dream Machine* (Brooklyn, N.Y.: Soft Skull Press, 2003), 42-44.

<sup>23</sup> John R. Smythies, “The Stroboscope as Providing Empirical Confirmation of the Representative theory of Perception,” *British Journal for the Philosophy of Science* 6, no. 24 (1956): 332 n. 4.

<sup>24</sup> *Ibid.*: 334. Italics original.

<sup>25</sup> *Ibid.*

<sup>26</sup> Smythies, “The Stroboscopic Patterns: 2. The Phenomenology of the Bright Phase and After-Images,” 307.

<sup>27</sup> Cited in John R. Smythies, “The Stroboscopic Patterns: 3. Further Experiments and Discussion,” *British Journal of Psychology* 51(1960): 254.

<sup>28</sup> Smythies, “The Stroboscopic Patterns: 1. The Dark Phase,” 116.

<sup>29</sup> Aldous Huxley, *Heaven and Hell* (London: Chatto and Windus, 1956), 56.

<sup>30</sup> ———, *The Doors of Perception* (New York: Harper and Brothers, 1954), 11-12.

<sup>31</sup> Cited in Huxley, *Heaven and Hell*, 20.

<sup>32</sup> *Ibid.*, 55.

<sup>33</sup> William S. Burroughs, “Points of Distinction Between Sedative and Consciousness-Expanding

Drugs,” in *LSD: The Consciousness-Expanding Drug*, ed. David Solomon (New York: G.P. Putnam’s Sons, 1964), 172.

<sup>34</sup> Timothy Leary, “How to Change Behavior,” in *LSD: The Consciousness-Expanding Drug*, ed. David Solomon (New York: G.P. Putnam’s Sons, 1964), 105.

<sup>35</sup> John R. Smythies, “A visit to Dr. Jung,” *Alabama Journal of Medical Science* 18, no. 1 (1981): 35-36.

#### Selected Bibliography

- Boyle, Robert. “An Examen of Mr. T. Hobbes His Dialogus Physicus de Natura Aëris.” In *The Works of the Honourable Robert Boyle*, edited by Thomas Birch. London: J. & F. Rivington, 1772 [1662].
- Burroughs, William S. “Points of Distinction Between Sedative and Consciousness-Expanding Drugs.” In *LSD: The Consciousness-Expanding Drug*, edited by David Solomon, 168-73. New York: G.P. Putnam’s Sons, 1964.
- Canales, Jimena. ““A Number of Scenes in a Badly Cut Film”: Observation in the Age of Strobe.” In *Histories of Scientific Observation*, edited by Lorraine Daston and Elizabeth Lunbeck, 230-54. Chicago: University of Chicago Press, 2011.
- Derrida, Jacques. *Writing and Difference*. Chicago: University of Chicago Press, 1978.
- Edgerton, Harold E., and James R. Killian Jr. *Flash! Seeing the Unseen by Ultra High-Speed Photography*. Boston: Hale, Cushman & Flint, 1939.
- Geiger, John. *Chapel of Extreme Experience: A Short History of Stroboscopic Light and the Dream Machine*. Brooklyn, N.Y.: Soft Skull Press, 2003.
- Horton, Paul B. “Does History Show Long-Time Trends?” *The Scientific Monthly* 55, no. 5 (1942): 461-70.
- Huxley, Aldous. *The Doors of Perception*. New York: Harper and Brothers, 1954.
- . *Heaven and Hell*. London: Chatto and Windus, 1956.
- “If Money Could Be Stretched Like That.” *The Electric Journal* 28, no. 9 (1931): 544.
- Killian Jr., James R. “The Meaning of the Pictures: Exploring the World of Time and Motion.” In *Flash! Seeing the Unseen by Ultra High-Speed Photography*, 9-22. Boston: Hale, Cushman, and Flint, 1939.
- . “Papa Flash and His Magic Lamp.” In *Moments of Vision: The Stroboscopic Revolution in Photography*, 1-17. Cambridge: MIT Press, 1979.
- Kuhn, Thomas S. *The Structure of Scientific Revolutions*. 2nd ed. Chicago: University of Chicago Press, 1970.
- Leary, Timothy. “How to Change Behavior.” In *LSD: The Consciousness-Expanding Drug*, edited by David Solomon, 97-113. New York: G.P. Putnam’s Sons, 1964.
- McLuhan, Marshall. *Understanding Media: The Extensions of Man*. [1st] ed. New York: McGraw-Hill, 1964.
- Rheinberger, Hans-Jörg. “Making Visible. Visualization in the Sciences – and in Exhibitions?” *Max Planck Institute for the History of Science*, no. 399 [2010]: 9-22.

Shapin, Steven. *A Social History of Truth: Civility and Science in Seventeenth-Century England*. Edited by David L. Hull, Science and Its Conceptual Foundations. Chicago: University of Chicago Press, 1994.

Smythies, John R. “A Preliminary Analysis of the Stroboscopic Patterns.” *Nature* 179 (1957): 523-24.

———. “The Stroboscope as Providing Empirical Confirmation of the Representative theory of Perception.” *British Journal for the Philosophy of Science* 6, no. 24 (1956): 332-35.

———. “The Stroboscopic Patterns: 1. The Dark Phase.” *British Journal of Psychology* 50 (1958): 106-16.

———. “The Stroboscopic Patterns: 2. The Phenomenology of the Bright Phase and After-Images.” *British Journal of Psychology* 50 (1959): 305-24.

———. “The Stroboscopic Patterns: 3. Further Experiments and Discussion.” *British Journal of Psychology* 51 (1960): 247-55.

———. *Two Coins in the Fountain: A Love Story*. BookSurge, 2005.

———. “A visit to Dr. Jung.” *Alabama Journal of Medical Science* 18, no. 1 (1981): 93-94.

Walter, William Grey. “Features in the Electro-Physiology of Mental Mechanisms.” In *Perspectives in Neuropsychiatry: Essays Presented to Professor Frederick Lucien Golla by Past Pupils and Associates*, edited by Derek Richter, 67-78. London: H.K. Lewis and Co. Ltd., 1950.

Walter, William Grey, V.J. Dovey, and H. Shipton. “Analysis of the Electrical Response of the Human Cortex to Photic Stimulation.” *Nature* 158 (1946): 540-41.