MILK AND MELANCHOLY

IT IS NOT RIGHT FOR ME TO LOOK UPON THE DEAD AND TO STAIN MY EYES WITH THE MISTS OF DYING MEN.

Euripides, Hippolytus

The Photogenics of Milk

How did milk enter photography? More specifically, how did a *splash* of milk become a universally recognizable photographic image? The milk-drop coronet pictures made by Harold Edgerton over a period of several decades are almost certainly the most familiar images of a milk splash, but they were not the first. Neither did Edgerton ever explain his use of milk as a subject. For that, we must turn to Arthur Mason Worthington, who used milk in the study of fluid dynamics more than fifty years before Edgerton first made his well-known images.

In 1908, A.M. Worthington published a popular retrospective account of his scientific investigations under the title *A Study of Splashes*. Worthington began his short book by recalling that, in the spring of 1875, his schoolfriend H.F. Newall had shown him the traces left by water and mercury drops on soot-covered glass plates. Worthington recounted being struck by the beauty of their radial symmetry and, intrigued by the mystery of their variety, he resolved to investigate the causes of these patterns. While pursuing his Master of Science at Oxford, he joined the laboratory of the great German physicist H.L.G. Helmholtz at the University of Berlin. There, he readily reproduced Newall's apparatus and began the pursuit that would direct the entire course of his career.

But Worthington's investigations into the traces and patterns of drops required a greater visibility of materials. He observed that, "Mercury, from its high reflecting power, is easy to see; water, from its transparency … [is] very difficult to see."[1] He darkened water with indigo, but it remained visually elusive, so he substituted milk, which, he said, had "the advantages of appearing white on a black ground, of being semi-transparent, and of showing blue or darkish where it [was] spread thinly over the black plate."[2] Even though Worthington continued to investigate mercury's unique properties, milk proved to be a better object of investigation. Where the shadowed parts of mercury traces were almost indistinguishable from the soot base, the forms made by milk could always be readily discerned. Because milk diffuses light through its mass, it also permitted the thickness of the liquid in the final splash pattern to be accurately estimated by the degree of carbon visible through it. But despite making rapid progress in his research, Worthington was not satisfied with capturing only the trace of a drop on the soot-covered slide. He wanted to see the many changing forms of the drop upon its impact with the plate.

It had been known since the invention of the Leyden jar in the mid-eighteenth century that the sudden discharge of a spark had the optical effect of halting motion. In 1834, Charles Wheatstone had described how, by a flash of light, "a rapid succession of drops of water, appearing to the eye a continuous stream, is seen to be what it really is, not what it ordinarily appears to be."[3] Worthington used the sudden illuminating spark of the Leyden jar to isolate a single moment in the fall of a drop, making it possible for him to see each stage in its collision with a surface and, with the aid of the retinal afterimage, to sketch each stage in detail. The apparatus required to accomplish this was readily available; the problem, as Worthington saw it, was to regulate exactly the magnitude and frequency of the drop so that the experiment could be reproduced. Worthington quickly devised a means to do so, and although he could not see two successive phases of the same drop, by precise adjustment of timing he was eventually able to see every stage in the process. When Worthington undertook to record the impact of a drop on a liquid surface, milk again proved superior, as its light colour and partial translucence allowed the drop to be observed as it dispersed into water. Worthington therefore used milk as a standard material in his extensive studies of the splash patterns made by smooth and rough spheres, which he described at length in *A Study of Splashes*.

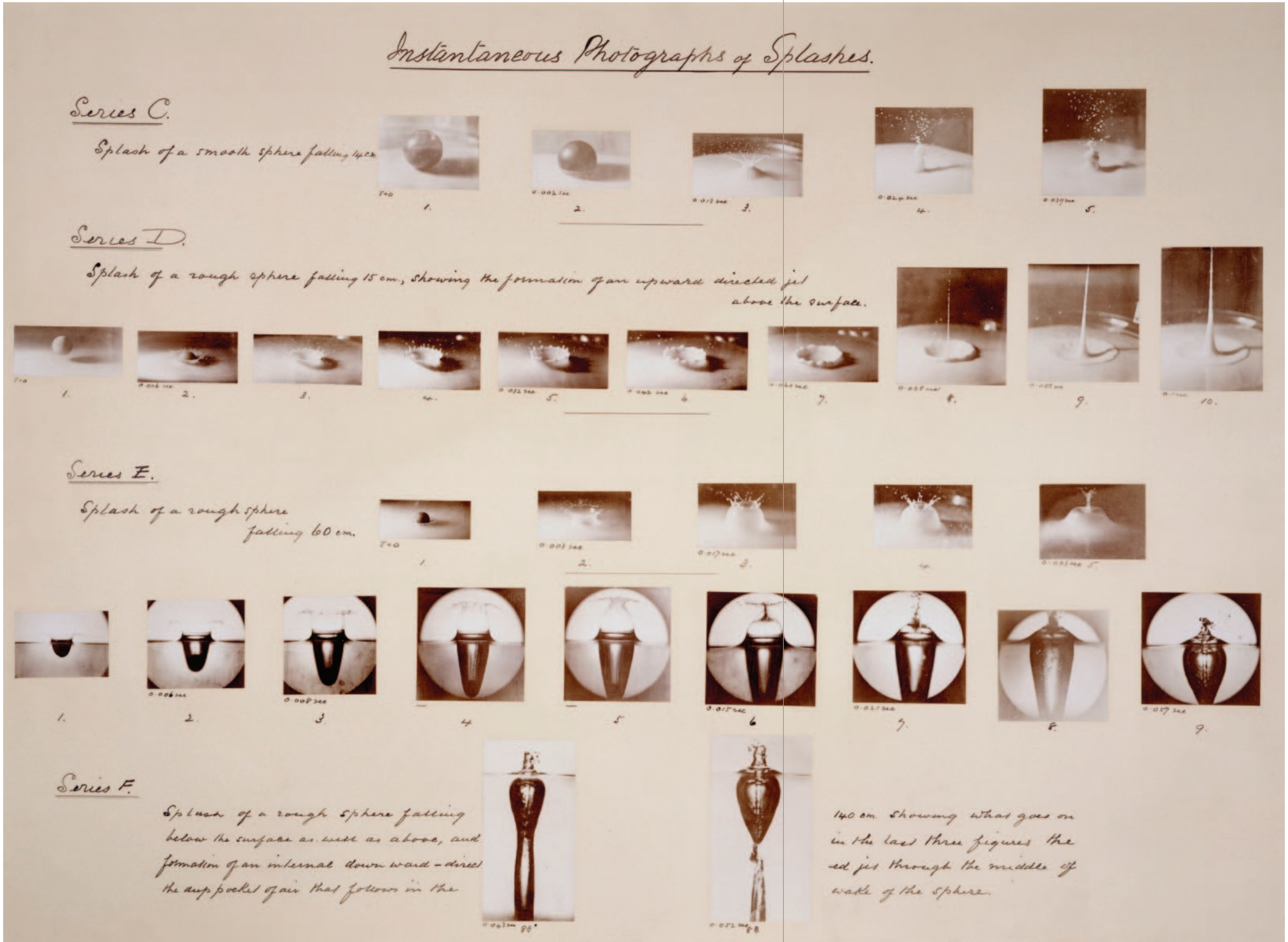
If, for theoretical purposes, milk behaved without any appreciable difference from water, Worthington was nevertheless aware that, as a material, it seemed somewhat unscientific. He concluded his first report by acknowledging that, "It may be objected that any results with so variable a substance as milk must be unsatisfactory," but then justified its use in terms of the limited scope of his work. "My object," he wrote, "was to study the type of form before proceeding to quantitative measurement."[4] Milk had proved itself ideally suited for the study of form, but Worthington assumed that its variable density and viscosity would make it unquantifiable. As it was, however, Worthington's studies did not develop in the direction he anticipated, and by the time he published *A Study of Splashes*, he had experimented with milk for more than thirty years.

Substituting milk for water not only led Worthington to discover the formal process of a drop's collision with a surface, it also revealed milk's high coefficient of visibility. Milk's freedom from both the obstructive effect of glare and the evasive effect of transparency made it an ideal photographic object. The diffusion of light through its mass is not unique to milk; it also occurs in imperfectly cast glass and in smoke or vapour-filled atmospheres. Materials and conditions that exhibit visual cloudiness are generally described as turbid. In fluids, turbidity is usually caused by suspended particles, such as silt in a river, and implies an adulteration of a condition of perfect clarity, especially by darkening or occlusion. Milk's

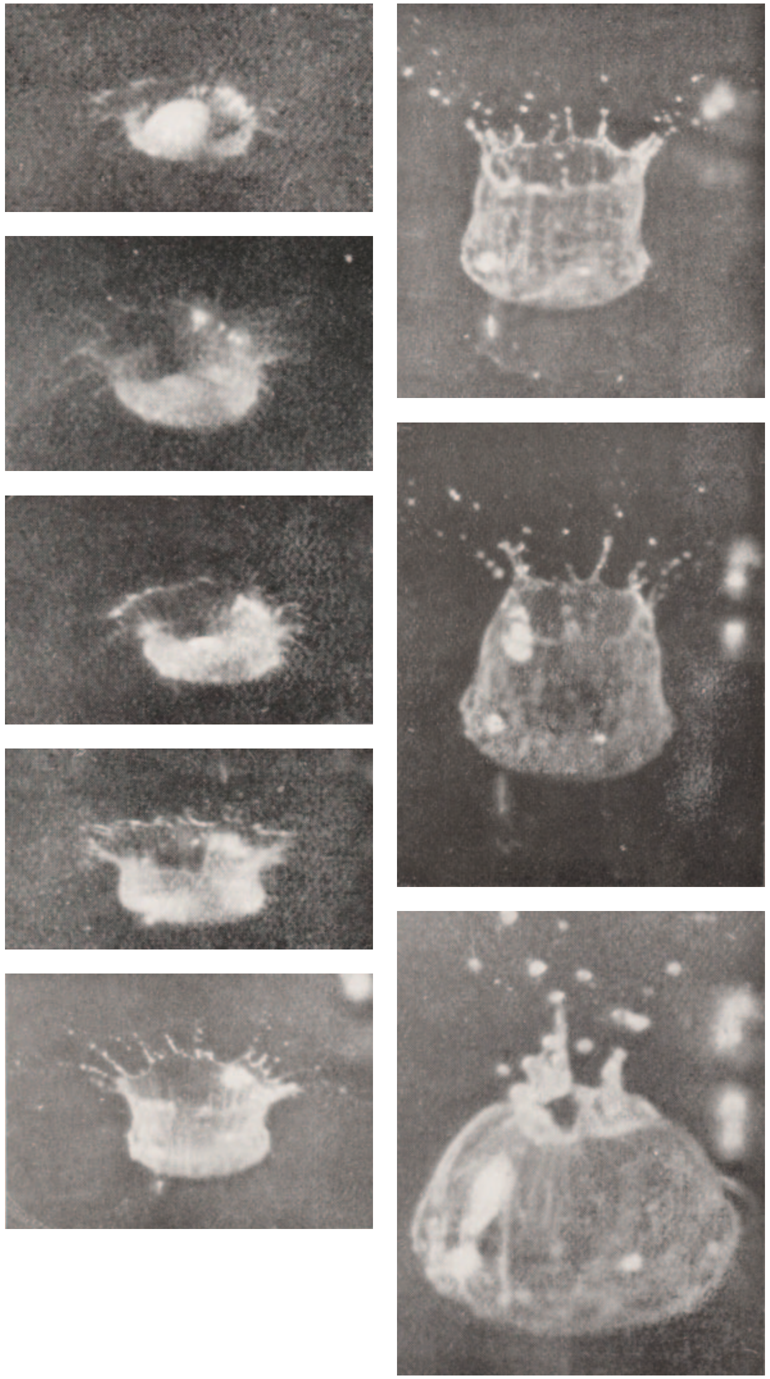
turbidity results from a complex mixture of fat, protein, corpuscles, lactose, chyle and plasma, but it constitutes a special case because, unlike other turbid fluids, it is neither dark nor subject to the settling of suspended particles over time. The scattering of light rays within milk gives it an appearance both dense and luminous. Milk's unique receptivity to light causes it to shine forth as if internally illuminated, as if brightness itself were made fluid. Milk thus shares in the allure possessed by all glowing things.

Worthington did not just happen upon the use of milk. The turbidity he recognized in it was a privileged concept in the scientific circles to which he was introduced by Helmholtz. In *Techniques of the Observer*, an important critical revision of visual history, Jonathan Crary noted the significance of this quality for one of the inaugural texts of physiological optics, Johann Wolfgang von Goethe's *Theory of Colours* (1810). Crary observed that, for Goethe, "Perception occurs within the realm of … *das Trübe* – the turbid, cloudy or gloomy. Pure light and pure transparence are … beyond the limits of human visibility."[5] Goethe's investigation of vision, as Crary showed, was conceived in opposition to the dominant doctrine of geometric optics, which had been consolidated by Newton in his celebrated *Optics*, first published in 1704. Transparency was a prime theoretical postulate of geometric optics; it was the quality that guaranteed perfect accord between the act of seeing and the condition of clarity of mind. The transparency of geometric optics functioned as an analogue to the philosophical values of Idealism and ascribed an almost morally pure status to materials such as crystal, clean air and perfectly clear water. Countering this model with a powerful empiricism, Goethe identified the body as the actually lived and inescapable ground of visual experience.

The important place of turbidity in this new system of visual values corresponded to an overriding interest in the eye's capacity to produce visual experience in the absence of external stimulation. This phenomenon, called subjective vision, is experienced in its simplest form when a subject whose eyes are closed is aware of seeing something – amorphous, perhaps, but something nonetheless. It is also experienced in the lingering afterimage produced by bright lights. Idealist geometric optics could not account for these experiences and the pressure to explain them threatened to unravel its entire system of values. Physiological optics effectively wrenched vision from the grip of philosophy and subjected it to a radical empiricism. Its fundamental claim was that seeing is a function of the body rather than the mind. This postulate had broad methodological implications, as can be seen in Goethe's recommendation that experimentation begin with "a drop of scented water, of spirit varnish, of several metallic solutions ... to give various degrees of opacity to water."[6] For Goethe, transparency was a fault that needed to be remedied in order to make water



A.M. Worthington
Instantaneous Photographs of Splashes
Series C, D, E and F
1900



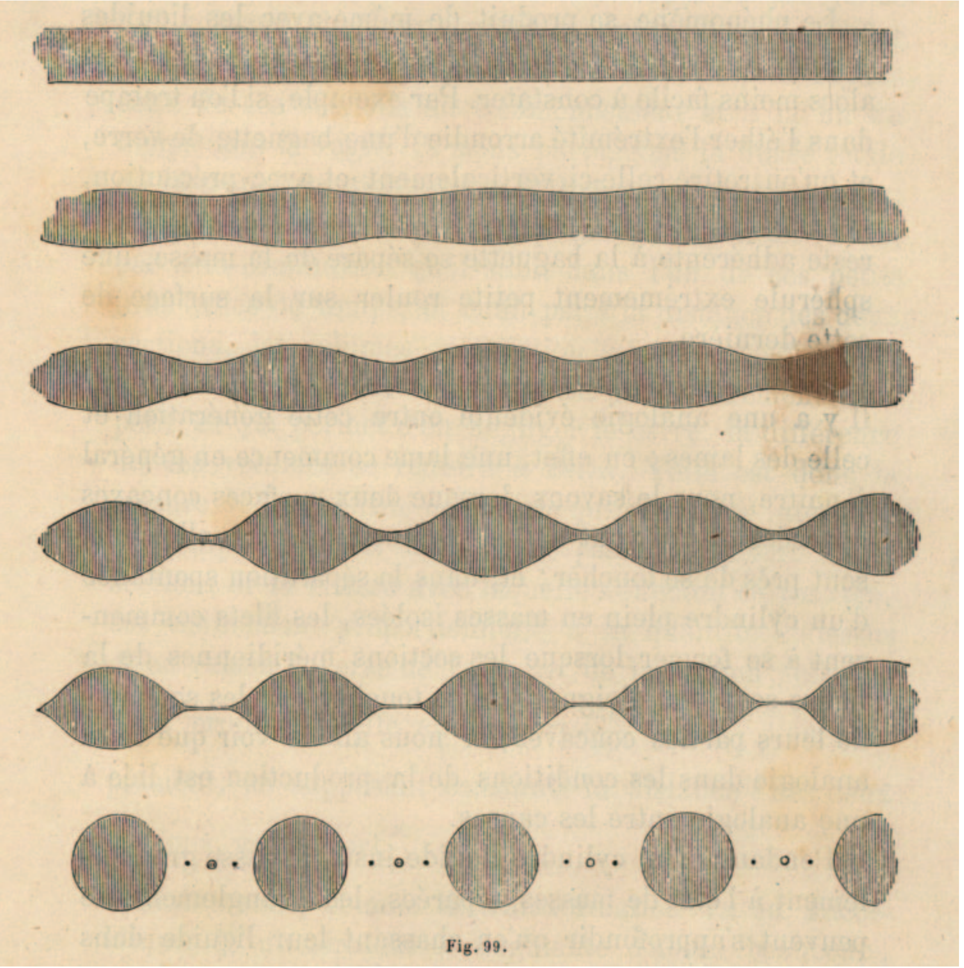
A.M. Worthington
Series II, Milk into Water (100 cm fall)
From *A Study of Splashes*
1908

suitable for optical investigation. Only turbid, semi-opaque materials could yield knowledge of actual visual experience.

Goethe did not specifically mention milk and Worthington did not reference Goethe, but it was not merely by chance that Worthington's assessment of milk as the visible middle term between mercury's glare and water's transparency corresponded precisely with Goethe's values. Milk satisfied the theoretical conditions for scientific observation established by physiological optics, but more importantly, it was the very antithesis of water. Its use marked a different conception of vision and of the body itself. Milk was the material repudiation of the transparency in which Idealism saw its most persuasive model of intellectual clarity. With its indelible taint of the body, milk contested the desire to find equivalence between things in the world and the image of things held in the mind. For the new doctrine of physiological optics, turbidity not only rendered fluids visible, it linked the object of vision – the fluid body – to the viewing subject – the embodied observer.

If Worthington did not specifically cite Goethe, it was likely because his avowed model was Joseph Plateau, the Belgian physicist who had effectively united physiological optics with fluid dynamics.[7] In 1832, while investigating the phenomenon of persistence of vision, Plateau invented the phenakistoscope. This device consisted of a rotating cylinder with evenly spaced, narrow vertical slits through which the viewer could see a sequence of pictures printed inside. The fleeting glimpses produced by the rotation of the cylinder appeared to the viewer as continuous motion. This effect relied on the retina's tendency to retain a visual impression for a split second after an image has passed out of sight, or, to put it another way, the eye's incapacity to attain perfectly instantaneous vision of rapidly changing images. Persistence of vision is, of course, the basis of the cinematic illusion of motion. The phenakistoscope anticipated the basic apparatus of cinema, and it exercised the same sort of fascination over the public in the nineteenth century that movies did in the twentieth.

In 1840, Plateau also discovered the principle of surface tension. When one of his laboratory assistants mixed oil into a solution of water and alcohol, the equal specific gravities of the two immiscible fluids left the oil suspended, whereupon it spontaneously formed a sphere. Plateau realized that the form was due to the action of a force other than gravity and reasoned that the cohesion of liquids must result from an internal molecular bond. Plateau's principle effectively explained fluid phenomena as diverse as the variability in the size and shape of drops, the meniscus formed at the edge of puddles and the behaviour of waves. In numerous subsequent experiments, he demonstrated the role of this bond in determining the forms assumed by liquids. In one of the most compelling of these experi-



Joseph Plateau
Statique expérimentale et théorique des liquids soumis auz seules forces moléculaires (Experimental and theoretical study of liquids subjected only to molecular forces)
1873

ments, he released a thin line of mercury from a narrow channel to show that it spontaneously resolved into a string of droplets. Plateau's diagram of this phenomenon became quite famous, and Worthington copied it to illustrate *A Study of Splashes*.

Plateau's studies in fluid dynamics, published in eleven dossiers from 1840 onward and republished in 1873, undoubtedly had a formative influence on Worthington, whose career occupied the precise conjunction of physiological optics and fluid dynamics defined by Plateau. Worthington used Plateau's principle, for example, to explain the spontaneous segmentation of the annulus at the top edge of the milk-drop coronet into tiny, equally spaced droplets. Even more fundamentally, his procedure for capturing the stages of a drop of milk followed the logic of the phenakistoscope. His flash of light in the darkened laboratory functioned, like the phenakistoscope's narrow slit, to isolate moments in a process and, by producing the same sort of closely spaced sequence of images, he was able to approximate the fluid phenomenon. Worthington's images need only be placed inside the phenakistoscope's drum for them to jerk back to life before our eyes.

Comparing his own accomplishments to those of his renowned exemplar in the conclusion to *A Study of Splashes*, Worthington lamented that, while he may have exposed the mechanism of the milk drop, he had not uncovered any major principles. In effect, Worthington sought to explain common phenomena of the sort experienced every day. The traces that triggered his study of the milk drop, for example, have long been readily accessible in the form of ink drops on paper.[8] Worthington also sought to explain why bubbles form on the surface of water during a rainstorm. He was concerned with phenomena that occurred too rapidly to be directly observed, but which could be known through their traces. Such phenomena play at the edge of consciousness, where the immediacy of experience gives way to theoretical knowledge. Photography, the technique of traces par excellence, suspended these rapid phenomena in time, making it possible to inspect them, reduce them to theoretical knowledge and discover their potential for practical application.

In a pattern often observed in the history of photography, Worthington's early experimental apparatus assembled all of the elements required for photography but did not produce photographs as such. This failure to develop a properly photographic practice might be blamed on his use of large and relatively slow induction batteries, but aside from any technical reasons, Worthington demonstrated some degree of indifference, even resistance to photography. He identified with a generation of scientists dedicated to proto-photographic visual techniques. Despite his obvious fascination with indexical traces, Worthington preferred to publish handcrafted illustrations, which clearly registered the presence of the mediating observer. One legacy of his anti-photographic bias is that his detailed

written account remains the clearest description of the complex formal process of the splash of a milk drop. Nevertheless, the development of shorter, quicker sparks and faster dry plates eventually compelled Worthington to automatically record what he had once so patiently observed and transcribed, and when his complete findings were published in 1908, they were accompanied by "197 Illustrations from Instantaneous Photography."

The course of publication of Worthington's studies demonstrates the lively public interest in his work. His first findings were published in the *Proceedings of the Royal Society of London* in 1876, just one year after Newall showed him the traces of mercury and water.[9] In 1882, the same journal published his study of the impact of drops on liquid surfaces. These two scientific reports formed the basis of a lecture Worthington delivered at the Royal Institution of Great Britain on May 18, 1894, which was printed in the institution's proceedings and republished in *The Smithsonian Report* for 1894. This article was published again in 1907 by the Society for the Promotion of Christian Knowledge as a small pamphlet titled *The Splash of a Drop*. Demand for the pamphlet proved sufficient that a year later, Worthington published *A Study of Splashes*, his book of scientific findings, some of which were then more than thirty years old. Even allowing for the immense public interest in scientific discoveries of the time, this transition from science to public spectacle demonstrated an extraordinary degree of popular fascination. In fact, public interest remained so steady that *A Study of Splashes* was reprinted as late as 1964, long after Harold Edgerton's images had largely supplanted Worthington's place in the popular imagination.

Harold Edgerton's work integrated photography from its very inception. Edgerton began his research career in 1926 as a graduate student in electrical engineering at the Massachusetts Institute of Technology (MIT). There, he became involved in studying the difficult problem of stabilizing power generators after sudden disturbances such as lightning strikes. Edgerton learned to synchronize the brilliant flashes of a mercury-arc rectifier with the rate of rotation of a generator's poles, which appeared to halt motion, thereby making them available for inspection. Stroboscopes were commonly used for this purpose at the time, but the asynchronies they revealed still had to be visually inspected and manually recorded. To overcome this limitation, Edgerton increased and regulated the amount of light in controlled flashes of sufficiently short duration so that a motion-picture record of the machinery's performance could be made.

Edgerton first described his invention in the May 1931 issue of the journal *Electrical*

Engineering. Soon thereafter, he entered into a formal partnership with fellow students Kenneth J. Germeshausen and Herbert E. Grier, and together they made further improvements to arrive at a stroboscopic system that produced 480 flashes per second, each with a duration of only 1/100,000 of a second. The sprocket drive had to be eliminated in order to move film rapidly through the camera, but the extremely short duration of the strobe's flashes made a mechanical shutter unnecessary. With the flash itself serving in effect as a shutter, it became possible at last to make instantaneous photographs in ordinary daylight conditions. Edgerton's techniques were soon put to use by industry to diagnose and rectify destructive vibrations in heavy equipment. Edgerton had effectively invented the modern electronic stroboscope, which eliminated the constraints imposed by electrostatic batteries that were slow to recharge. His research rendered combustible flashbulbs obsolete and ultimately prepared the way for the electronic speed flash, commercially available by the 1940s.

It was in the course of developing and testing his electronic strobe that Edgerton began to replicate Worthington's milk-drop studies, but as an electrical engineer, he had no real interest in fluid dynamics.[10] He simply accepted the use of milk as an established procedure that needed no explanation or defence and by which no allegiances were expressed or implied. Despite making hundreds of such images throughout his career, he never provided a detailed description of the milk-drop process. The flash, not the splash, motivated Edgerton. The incredible rapidity of his apparatus, which ultimately reduced flashes to 1/1,000,000 of a second and even less, finally allowed multiple exposures of a single drop to be made. Whereas Worthington had attempted to produce uniform drops, Edgerton produced regular flashes. His photographic expertise rendered the milk drop with an unsurpassed brilliance and clarity, but despite inventing superior technical means, he never produced a systematic exposition of the variation in splashes. Edgerton's pictures were demonstrations rather than experiments, and they added nothing new to the knowledge of splashes. However derivative they may have been, his spectacular images soon eclipsed Worthington's dull and laboured pictures, so that the earlier work eventually came to be known largely through its later repetition.

Whether depicting hummingbirds, bullets or gymnasts, Edgerton's photographs primarily demonstrate the dazzling intensity of the flash and the photographic apparatus itself. This indifference to subject did not mean, however, that Edgerton made his choices according to impartial scientific criteria. His practice was frankly commercial, and accorded perfectly with the entrepreneurial ethos of MIT in the 1930s.[11] Edgerton's many early pictures of sporting activities, such as tennis, baseball and golf, did not correspond to a

categorical array of examples of motion, as may have been the case with Étienne-Jules Marey or Eadweard Muybridge; they were, in fact, commissioned by the sporting goods manufacturer A.G. Spaulding.[12] Similarly, his study of the blast patterns of pellets was made for the shotgun manufacturer Winchester. His photographic studies of athletes may seem to echo those of Muybridge, but the numerous professional athletes in his pictures suggest the early application of science to the enhancement of elite-level performance. And unlike Muybridge, Edgerton strictly avoided images of common labour. He never acknowledged, for example, the time/motion studies of Fredrick Winslow Taylor and Frank and Lillian Gilbreth, even though their work preceded his own.[13] Instead of industrial workers, Edgerton preferred to photograph actors, musicians and celebrities. While working with film producer Pete Smith in 1940 at the Metro-Goldwin-Mayer studio on the Academy Award–winning short film *Quicker Than a Wink*, Edgerton made it his practice to photograph various "young hopefuls" in the studio. His portraits were praised in celebrity magazines for their candour and spontaneity, but pictures such as *Judy Garland and Mickey Rooney at MGM Studios* would now be described as having the strained, hyper-real look of simulation.

Edgerton's photographs were designed to startle and amaze the viewer with their overpowering, pyrotechnical brilliance. Because the pictures retained some of the intensity of the light by which they were made, their look reproduced the sudden shock with which they came into being. This razzle-dazzle visual effect, combined with a scientific aura and the promise of revelation, eminently qualified Edgerton's photographs for the purpose of advertising. The potential of these images for promotion was recognized from the time of Edgerton, Germeshausen and Grier's earliest commercial contracts for photographic studies. Some of the hundreds of pictures the partnership produced for Spaulding were exhibited in the window of its New York store as early as 1934. On June 19, 1935, Edgerton met with Alfred C. Strasser of Batten, Barton, Durstine and Osborn Inc. to discuss making or using spark pictures as advertisements.[14] It took just four years from the first scientific publication of Edgerton's pictures for America's leading advertising agency to recognize stroboscopic photography's extraordinary capacity to dramatize commodities by making their preparation appear effortless and their consumption gleeful. Edgerton's images of ginger ale and soda water are not scientific studies of fluid dynamics; they are, instead, trials for advertisements. These images needed only to be emblazoned with brand names to make them suitable as advertisements in the new photographic magazines of the 1930s.

The reception of Edgerton's work followed the same trajectory as that of Worthington's but, occurring twenty-five years later, the transition from scientific to popular publication took place much more quickly. The first of Edgerton's milk-drop images were

Harold Edgerton
Ginger Ale
c. 1933
COURTESY HAROLD AND ESTHER EDGERTON FOUNDATION AND PALM PRESS, INC., CONCORD, MA

Harold Edgerton
Soda Spritzer
1933
COURTESY HAROLD AND ESTHER EDGERTON FOUNDATION AND PALM PRESS, INC., CONCORD, MA

published in the 1932 issue of *Technology Review*, which was edited by James R. Killian, Jr., who later became Edgerton's co-author, promoter and eventually the president of MIT. In 1933, Edgerton contacted the British Royal Photographic Society to request details of William Henry Fox Talbot's patent for a high-speed photographic device, and this led to the frequent inclusion of Edgerton's photographs in the society's subsequent annual exhibitions.[15] By 1939, Edgerton's pictures had been compiled and published as *Flash!: Seeing the Unseen by Ultra High-Speed Photography*. The book had a popular, accessible text by Killian, an appendix that provided technical details and a list of suppliers intended to aid enthusiasts to produce their own pictures. It was however, *Life*, the weekly news magazine founded in 1936 and based on a new model of photographic journalism, that first gave mass publicity to Edgerton's images. To promote *Flash*, *Life* presented a selection of the book's images in the popular "Speaking of pictures …" section of its November 20, 1939, issue.[16] The article featured multiple-exposure images of athletes and single-frame, stop-action images of sudden blows, such as a hammer smashing a light bulb and a bat striking a baseball, and concluded with a sequence of eight photographs showing a milk drop falling into a cup of milk. This was the first mass exposure of the milk-drop image and it was later credited with having "created a small sensation."[17]

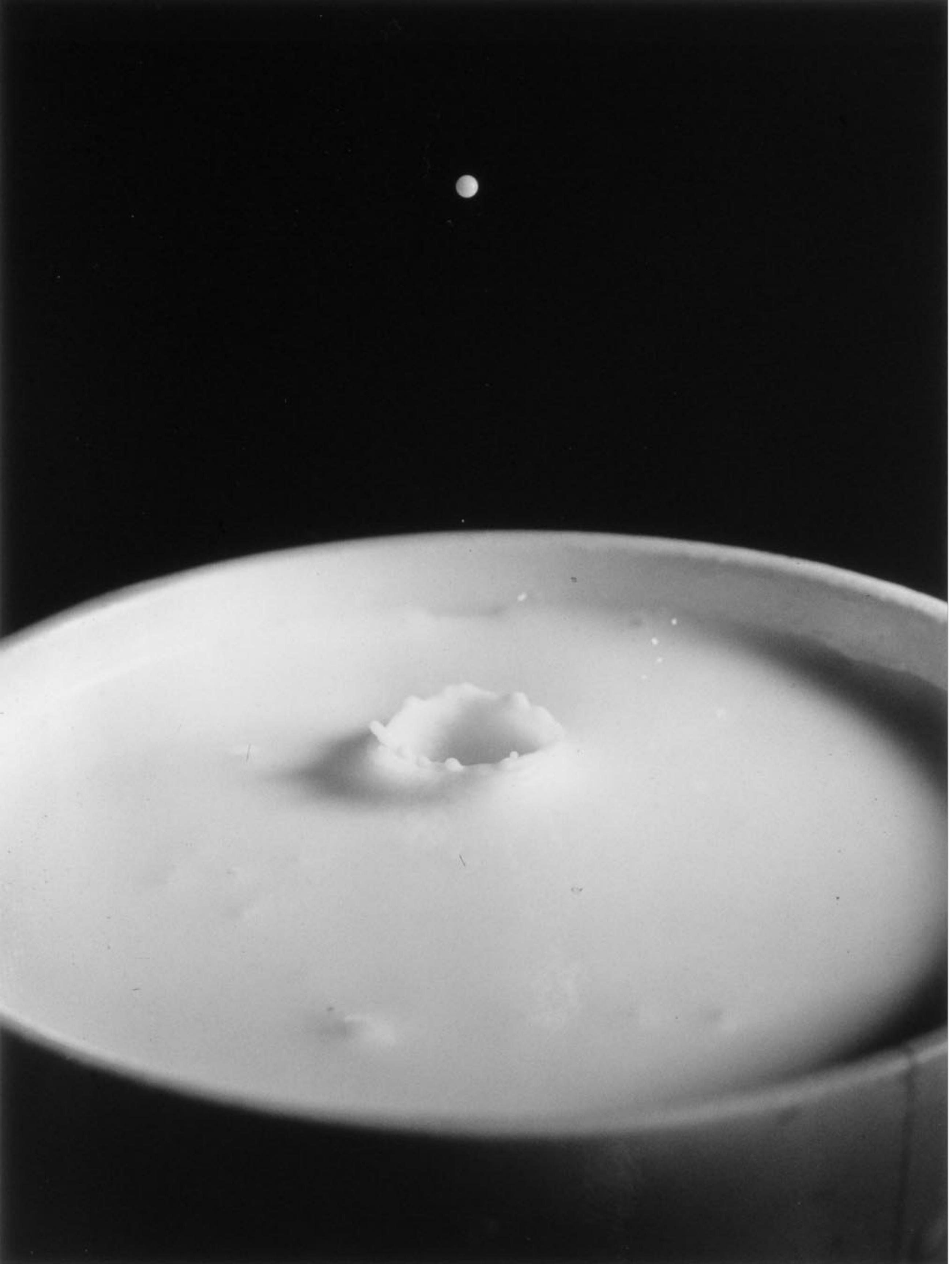
Although *Life* published Edgerton's photographs at least three more times in the next three years, his relationship with the magazine was largely mediated by the photographer Gjon Mili. A graduate of electrical engineering at MIT like Edgerton, Mili worked for ten years as a lighting researcher for Westinghouse Corporation. The two met when Mili was invited to speak alongside Edgerton at a symposium on lighting in photography held at MIT in March 1937. Mili reported that his first encounter with Edgerton's photographs left him shaken, but within a few weeks, Edgerton, Germeshausen and Grier had furnished him with electronic flashes and, a few months later, he presented the results to *Life*. In the fall of 1938, *Life* published six of Mili's stop-action sports photo essays, and these novel images can undoubtedly be credited with a role in defining the bold, entertaining look of the insouciant new magazine. Mili quickly established a photographic studio in Manhattan that essentially operated as a branch of Edgerton's enterprise, where he used Edgerton's strobe technology to supply *Life* with sports scenes, dance pictures and celebrity portraits. Determined to overcome what he saw as a restriction – the necessarily small subjects in Edgerton's photographs – Mili opened a new studio, which occupied an entire floor of the derelict American Art Gallery Building, at 6 East 23 Street. Fifty-five feet square, this space allowed ample room to shoot subjects in motion, and a thirty-three-foot-high ceiling provided the exceptional height required for low camera placement and acute backlighting. "These

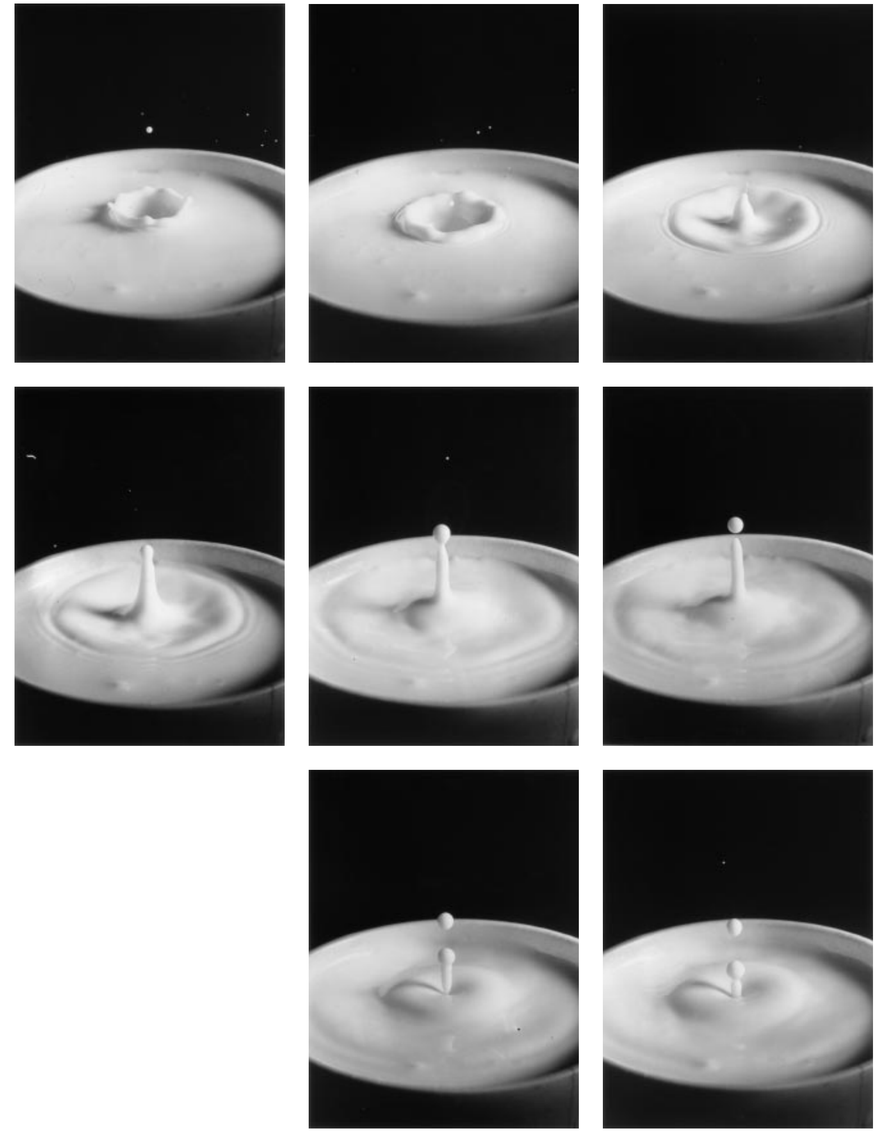
technical aspects," Mili noted, "became the mainstays of my style."[18]

At the same time as Edgerton's photographs were appearing in both technical and popular publications, his work was also being enthusiastically received at the Museum of Modern Art in New York. MoMA's inaugural photography show, curated by Beaumont Newhall in 1937, presented six of Edgerton's images as exemplary of scientific photography: *Cup of coffee breaking*, *Water flowing from a faucet*, *Hammer smashing an electric light bulb*, *Foot kicking a football*, *Club striking a golf ball* and *Splashing of a drop of milk into a saucer of milk*. The last picture was reproduced in the exhibition catalogue, where it was jointly credited to Edgerton and his partners, Germeshausen and Grier. In subsequent editions of *History of Photography*, which Newhall largely derived from this catalogue, another, more current image of a milk drop was substituted for the original and credited to Edgerton alone.

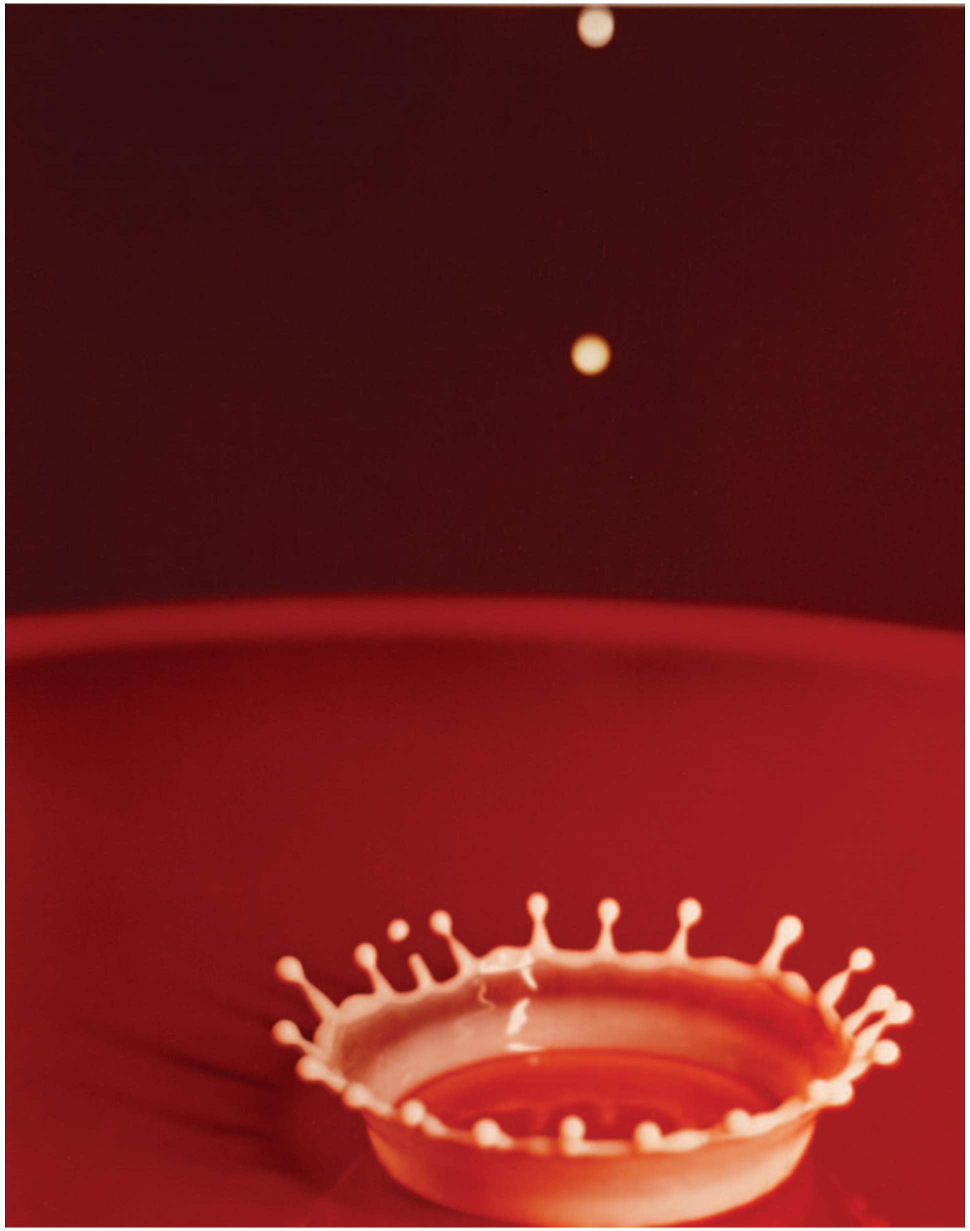
Edward Steichen, the photographer who became the next director of MoMA's photography department, was also enthusiastic about Edgerton's work. "How well I remember my excitement," he commented, "on seeing the succession of exposures of the one stroboscopic light photograph of a man swinging at a golf ball. It not only opened a new vista from the scientific standpoint, but they [sic] were also a new art form."[19] In 1949, Steichen organized the exhibition *The Exact Instant: Events and Faces in 100 Years of News Photography*, which explicitly acknowledged the impact of Edgerton's stroboscope on sports and news photography. The show also included a four-metre-high and nine-metre-wide mural of Edgerton's pictures of an atomic explosion microseconds after detonation, thereby linking the conception as well as the title of the show to recent world events.

In 1967, Steichen's successor, John Szarkowski, included Edgerton's photographs in an exhibition of scientific photographs titled *Once Invisible*. This show demonstrated photography's role in revealing phenomena that escaped or exceeded the eye's capacity to observe. Of course, Killian had already declared "seeing the unseen" to be Edgerton's achievement when *Flash* was first published in 1939. On the occasion of this show, Szarkowski reflected on MoMA's long association with Edgerton, "whose pictures have hung on our Museum's walls almost as consistently as Picasso's have."[20] He even claimed that "the coronet of the milk drop, the swing of Don Budge, the foot of Wes Fesler – these and others must be as familiar to many of our visitors as the Guernica."[21] Indeed, by this time, the formerly invisible had reached a high level of visual saturation and, in the case of Edgerton, the museum itself had played no small part in making it so.





Harold Edgerton
Milk Drop Splash Series
c. 1935
COURTESY HAROLD AND ESTHER EDGERTON FOUNDATION AND PALM PRESS, INC., CONCORD, MA



Through its promotion by MoMA, Edgerton's work became caught up in the debate about photography's status as art and was held up as the definitive example of the Modernist ideal of the instantaneity of vision. Edgerton's consistent disavowal of artistic intention – he often protested, "Don't make me out to be an artist. I am an engineer. I am after the facts. Only the facts."[22] – made him a powerful antagonist in the debate. Consider, for instance, the difference between Steichen's notion of "the exact instant" and the idea articulated by Henri Cartier-Bresson in his 1952 book, *The Decisive Moment*. Cartier-Bresson famously defined the decisive moment as "the simultaneous recognition, in a fraction of a second, of the significance of an event as well as the precise organization of forms which gives that event its proper expression."[23] This formula presumed a fundamental affinity between the instantaneous function of the photographic mechanism and the concept of automatism advanced by the Surrealists, with whom Cartier-Bresson had been affiliated since 1931. Although his photographic automatism might be said to restrict or compress artistic action to the smallest possible compass of judgment, almost collapsing composition into an ability simply to see, it did not abandon aesthetic judgment to the rule of technology. Cartier-Bresson's automatism was essentially responsive and interpretive, and acknowledged the psychic import of witnessing events. Steichen's "exact instant," on the other hand, was wholly identified with the mechanical apparatus. Scientific exactitude, seen in an extreme form in Edgerton's atomic bomb explosion photographs, precluded all spontaneity and time for reflection, eliminating even the possibility of consciously making decisions.[24] Steichen's avid appreciation of Edgerton's images reflected not only his acceptance of the instrumentalization of photography but also its militarization, in which both men had participated during the war.[25]

Szarkowski's linking of Edgerton's images and Picasso's *Guernica* was undoubtedly intended to aggravate the rivalry between photography and painting, especially since *Guernica* was conceived in part as a demonstration of modern painting's capacity to depict a sudden assault. But the flattering comparison of Edgerton's tenure at MoMA to Piccaso's obscures a more apposite comparison that might be drawn between Edgerton and Jackson Pollock, whose novel mural-sized paintings were first presented at the museum in 1947.

The two men shared a fundamental interest in the splash or drip as the marker of absolute immediacy, although their conceptions of immediacy differed. Pollock's interest in the drip grew out of Surrealist paradigms of automatic writing. Around 1939–40, Pollock became involved with a small circle of New York artists who were experimenting with Surrealist automatism, and he formulated a notion of the painter as a "more or less mechanical transcriber of impulses that welled up from a realm over which [the artist] had little conscious control."[26] Pollock radicalized the implications of Surrealist automatism by purging

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Harold Edgerton
Milk Drop Coronet
1957
COURTESY HAROLD AND ESTHER EDGERTON FOUNDATION AND PALM PRESS, INC., CONCORD, MA

Harold Edgerton
Spilt Milk
1933
COURTESY HAROLD AND ESTHER EDGERTON
FOUNDATION AND PALM PRESS, INC., CONCORD, MA

it of its outdated dream images and thus liberated a gestural, unreflective approach to making art that was later codified as Action Painting.[27]

The affinity between Pollock's gestural splashes and Cartier-Bresson's idea of the decisive moment is obvious, yet Pollock's valorization of absolute spontaneity verged on Edgerton's abdication of aesthetic intention. Action Painting's reduction of immediacy to a method was not only historically concurrent with Edgerton's reduction of exposures to 1/1,000,000 of a second; its cultivation of drops and splashes as the signifying traces of the artist's gestures resembled the drops and splashes that Edgerton had exposed and publicized. But such a convergence was unthinkable. Edgerton's unreflective, purely automatic technique lay outside the bounds of Surrealist orthodoxy. Pollock still believed he could communicate unconscious thought directly through form. Needless to say, this putative immediate legibility offered considerable potential for mystification. At the very least, the milk splash, a symbol of modern technology's conquest of infinitesimal time, shared with Action Painting's gestural splashes a modern form of iconicity – both were nearly universally recognizable, but their actual meaning remained stubbornly obscure.

Edgerton's use of milk in studies of splashes also manifested an uncanny physical link with the material and ideological foundations of Pollock's painting. Thomas Hart Benton, Pollock's teacher at the Art Student's League in the 1930s, had promoted casein tempera based on milk powder as the ideal medium with which to make the large-scale murals he advocated.[28] Pollock, who was inclined toward alchemical and atavistic interpretations of the act of painting, would likely have been impressed by the transformation of milk into paint. If the interlaced web of white drips in Pollock's *Composition*, 1948 resembles milk splashes, it is at least in part because it was almost certainly made with milk-based paint. Benton inspired Pollock not only to experiment with tempera, but also to work at a larger scale. The mural form had been collectively developed as a vehicle for social engagement during the Progressive Era, but World War II vanquished the hope which underlay these practices and ideals. The form survived in Pollock's practice, but its social and political intentions did not.[29] Pollock must have been acutely aware of the loss of this legitimizing public role as he went on to produce his large-scale abstract murals as items of haute decor for art patrons such as Peggy Guggenheim. At the same time, Pollock abandoned tempera and took up industrial oil paint. These shifts signalled the end of Pollock's liberal identification and a more general defeat for the progressive aspirations cherished by artists of the 1930s. In compensation, the artist was alleged to be free to directly express his relation to the primal force of being through abstract fluid shapes and gestural traces.

By imitating Worthington's use of milk, Edgerton unwittingly inherited a legacy of the

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Jackson Pollack
Milk Drop Coronet
1957
COURTESY HAROLD AND ESTHER EDGERTON FOUNDATION AND PALM PRESS, INC., CONCORD, MA

polemics of physiological visuality. The incongruous presence of "such a variable substance as milk" in the midst of the scientific apparatus could be read as a stubborn and circuitous trace of the body. The milk-splash picture can be interpreted as an allegory of the fate of the body in modernity, which may account for the expressive power of images that Edgerton insisted were "just about the facts."

A Romance with Liquids: The Milk Splash in Californian Pop Art

The milk-splash scene hovered equivocally between painting and photography for as long as Abstract Expressionism dominated American art, but it sprang back into play the moment that Pop Art disavowed Abstract Expressionism's paradigm of subjectivity reified. The Pop movement aimed to reassert painting's authority by reclaiming pictorial representation. This intention seemed at first to contradict basic narratives of modernity that credited photography with superseding painting as picture making, but Pop Art's purpose was not to depict objects per se; it was, rather, to take photographic representation itself as its object. Contemporary "artistic" photography, which sought legitimacy as high art by imitating painting, was thus of no interest to this movement. Instead, Pop imitated the commercial, scientific and industrial forms of photography – the look of non-art, of design and advertising.[30] While Pop Art launched a new style in painting, there emerged alongside it, somewhat unexpectedly, a novel, cinematic form of photography that transformed the Abstract Expressionist "act" into a performance for the camera. The splash functioned as a kind of test case for an examination of the relations between painting and photography. The milk splash was instrumental in overcoming the hegemony of Action Painting, but it also memorialized painting's loss of authority and, by extension, a more general loss of confidence in the very possibility of painting at all.

The milk splash entered the discourse of contemporary art in California in the early 1960s and maintained some relationship to the artistic discourses of the West Coast throughout its development. It is revealing, for example, that Ed Ruscha, addressing the designation of Californian artists as Pop in the early 1960s, summed it up in this way: "Joe [Goode] had milk bottles in his work, so he was a Pop artist. It was an easy term to fling around."[31] The reasons for the particular intensity of Pop on the West Coast are likely impossible to elucidate fully, but the exhibition *New Paintings of Common Objects*, curated by Walter Hopps in September 1962 at the Pasadena Art Museum, is generally considered to be Pop's first institutional manifestation there. The show's programmatic title boldly repudiated Abstract Expressionism's strict renunciation of images and declared its interest in what was to come "After Abstract Expressionism" (to cite the question in the form Clement Greenberg gave it in the title of an article that same year).[32]

The artists included in *New Paintings of Common Objects* were Jim Dine, Robert