3. Techniques of Transmission: Wire Service Photography and the Digital Image

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Beginning in the 1920s, wire photography services decisively reshaped modern visual culture by using a type of photo-electric scanning technology similar to a fax machine to separate visual information from its material support, transmitting it through telecommunications infrastructure. These news organizations used an international business and telecommunications network to make visual information travel via radio waves and telephone wires as fast as text had been able to since the advent of telegraphy. Wire photography's history reveals that from the early twentieth century onward, radio and telephone were not just textual and aural media but visual media as well, and that there is a longer history to the image as data before the so-called "digital age." In fact, wire photography deployed both "analog" and "digital" techniques to facilitate the mobility of images, translating pictures into electromagnetic waves and then reconstituting that data as news pictures at their destination. Many aspects of "digital" images or the "digital era," I suggest, are not due to any underlying ontology of the digital, but rather to the fact that such images are translated and transported through telecommunications infrastructure, a feature they share with nominally "analog" wire photos.

In recent years, a number of scholars have worked to expand our view of photography with an eye to the way it is tied into infrastructural systems (Hill 2019; Gürsel 2016). In addition, more work has begun to show that well before wire photography, the medium was always bound up with transportation and communication (Leonardi and Natale 2018; Batchen 2006). Attention to infrastructure can help move us beyond discussions about photography's ontology as a medium and toward a notion of photography as an "apparatus" that extends beyond the camera, film, print, or photographer to the larger social, spatial, and temporal contexts and structures in which these are viewed and received (Solomon-Godeau 2007, 268–269). For example, the artist, researcher, and documentarian Susan Schuppli has argued that Nick Ut's iconic 1972 photo of Thi Kim Phuc running, naked and burned by napalm, was not simply the result of a fortuitously-timed click of the camera shutter. Crucially, it was also produced through the extended human and technical network that transmitted the picture by radio from Saigon back to the US.

Schuppli calls for scholars to excavate the technical procedures that underlie iconic photographs such as Ut's, since they tend to appear "seemingly unencumbered by the complex procedures out of which they emerged—a view now heightened by the immediacy of digital image production" (2014, 146–147). Detailing such procedures of data translation, transmission, and dissemination helps to disturb notions of photography's indexical and apparently unmediated "eye witnessing" power. It also reveals how the photographic image emerges out of an expanded field of entangled social relations, networks, and technical infrastructures.

Wire photography's logistical network included both human and technical interventions in the image. These interventions involved digital and analog, indexical and iconic, and autographic as well as allographic operations (Goodman 1968, 113–122, 159–164).[1] Digital and analog modes of representation are not fixed but complementary and dialectical. Crucially for this essay, "the mutual, reversible translation between the two formats is essential to their practical uses" (Mitchell 2015, 57). This was certainly true for wire photography, which translated between analog and digital formats repeatedly in order to produce, transmit, and display visual data. It was at once an apparatus, an electrical signal, the communications infrastructure upon which that signal depended, and a number of different possible material substrates for the display of the transmitted image, from daily newspapers to gelatin-silver prints and to higher quality magazine publications. It was also various practices for reworking that signal by hand using ink and pen once it had been recorded on the photographic substrate.

A better understanding of wire photography therefore contributes to a growing body of scholarship that is reevaluating the role of indexicality in the construction of photographic "facts." Communications scholars Robert Hariman and John Lucaites have argued that digitization is helping us to see analog photography anew, and making an older discourse that characterized photography as a discrete medium by its indexicality seem exhausted (2016, 10–11). New accounts of photographic indexicality no longer treat it as an ontologized feature of the medium but as an open-ended, and above all historical framework for talking and thinking about photographs (Bear 2018). Photographic indexicality is not the same thing as simple communicative transparency, for it always depends on a historically situated viewer who interprets the indexical sign, and, in the case of news photography, a public sphere in which the picture circulates and this interpretation takes place (Paulsen 2013; Azoulay 2008; Gervais 2016; Hariman and Lucaites 2016). Moving beyond optical recording technologies to take account of how visual records are transported across space can enrich our understanding of the objects that constitute fields such as visual studies and photography studies (Schwartz 2017, 104).

In a number of ways, the history of wire photography both clarifies and complicates the emergence of a visual regime that we now associate with computer-processed digital images. Long before microprocessors, handheld mobile devices,

and fiber-optic cable, the cultural concerns around wire photography evinced many of the themes that characterize more contemporary critical discourse on visual culture in the wake of digital image processing. For instance, artist and theorist Hito Steyerl has called attention to the "poor image" as a ubiquitous part of the Internet's visual landscape (2009, 1). While Steyerl focuses on how digital images degrade as a result of recirculation and compression, wire photography also hurtled "poor images" around the world at high velocity during press photography's analog era. Until certain technical challenges were overcome, wire and radio photography transmission processes blurred edges and caused middle tones to drop out of the photographic image. On the receiving end, newsroom artists often had to step in to retouch the image with pen, ink, and brush, in order to salvage visual information that was distorted in transmission. Their analog or autographic reworking was often clearly visible in the halftone dot matrix reproduced in the newspaper.

In this silver gelatin print of an Associated Press (AP) picture transmission from May 7, 1932 (Fig. 3.1), for example, the wire service art department's ink and pen work are clearly visible. Seven figures are set against a dark-gray ground completely void of visual detail—it has been inked over so that the background did not clutter the transmission and distract from the main action. The figures' facial features have been bolstered with an ink pen in order to add contrast for the halftone reproduction process. The digits of their hands and the edges of their figures have been likewise sharpened. Yet, in other parts of the image—the gendarme's jacket and medals, the suit of the figure on the far right, the faces of the three men in the top-left—pixelization resulting from the "Bartlane" transmission process via undersea cable to NewYork is still discernible. The picture caption supplied by the AP and pasted to the verso informs the reader that this is a "Bartlane picture rushed from Paris to London, then transmitted by cable to New York," showing police and attendants carrying President Paul Doumer out of the Rothschild Foundation mansion, where he had just been mortally wounded by a "Russian fanatic." In case they could not see for themselves, it includes a note for newspaper editors informing them that "this picture has been slightly retouched."

This print was thus made initially by a photographic process in Paris, likely flown to London, transmitted via undersea cable using a digital process, printed and retouched in the AP's New York art department, then sent out over the AP's North American wire photo network through an analog scanning process. After reaching newspaper editors, it might be retouched again and then put through the halftone matrix for reproduction on newsprint. Like other wire photos, it traveled and took shape through a series of translations or compression and decompression techniques between analog (film, print, raster scan) and digital (telegraph punch tape, halftone matrix) forms. In picturing the moment that Doumer's limp form was carried out of the mansion and into public view, it is also an image whose very formal details make visible the many techniques by which it was transported

beyond the moment of its production to a global public, along the paths traversed by planes, undersea cables, and telephone wires.

Figure 3.1: AP photo produced by "Bartlane" transmission process, depicting the immediate aftermath of President Paul Doumer's assassination in 1932.

The Historical Advent of Wire Photography

If photography was always bound up with circulation and communication, wire photography's widespread adoption by the press in the early twentieth century represents the first time that large publics across the globe actually saw images that circulated as electrical information rather than solely as material objects. Following the advent of telegraphy in the nineteenth century, the duration involved in

communication ceased to be primarily a function of physical geographic distance (Carey 1989; Wenzlhuemer 2010, 24). Yet while these cables carried numerical and textual messages, images remained stubbornly tied to their material supports. Art historian Jennifer Roberts has argued that the advent of telegraphy in the nineteenth century made the visual arts conspicuously weighty and slow by comparison to words (2012, 12–35). Their materiality made pictures resistant to code and transmission.

Breakthroughs around the turn of the century such as the photovoltaic cell, however, allowed inventors to build picture telegraphy devices that could scan a picture using light instead of a mechanical stylus on chemically treated paper. The German inventor Arthur Korn produced such a model and it was even used to transmit some pictures for illustrated weekly magazines such as *L'Illustration*. Korn's device (Fig. 3.2) used a light to scan a picture attached to a rotating drum. The reflected light would be registered by a photovoltaic cell, which transmitted a current into a telegraph wire and carried it to a receiver, which would convert the signal back into light, exposing a negative attached to a synchronized rotating drum. The device could reliably transmit over considerable distances, but it was experimental and not suitable for mass production (Dussel 2012, 57; Pichler 2010). Furthermore, at that time daily newspapers were only just starting to replace sketch-drawings based on photographs with photographic reproduction using halftone matrices, and it would be about two more decades until photographs more fully displaced sketch reporting (Dussel 2012, 19; Zurier 2006, 155–156). True spot photography could only really be accomplished for local events, since transportation times by rail or steamship were too great. As Jason Hill has argued, from the beginning of wider halftone use around the turn of the century, the press had valued photography "insofar as it operated in concert with an evolving set of technologies and professional protocols, ensuring both the timely picture's initial production and the speediest translation of that image into the widest possible newsprint circulation" (2015, 193). This allowed the press to place "spot" pictures alongside the news itself when it came to local events, but very distant or transoceanic events were still hybrid combinations of halftones and artists' illustrations.

It was only in the years following the First World War that the infrastructural and organizational conditions began to be put in place to make national and international spot photography a reality. Specialized photo services such as the "Press Illustrated Service," "Pacific and Atlantic Photos," and "Wide World News Photos" began more consistently to supply American dailies with topical photographs, and expanded their operations across the Atlantic to Europe. As photo agencies increasingly developed geographically far-flung operations, as well as the organizational capacities and practices necessary to produce and distribute topical photography to newspapers quickly, the contours of a market for picture telecommunications began to take shape.

From that point on, the wired image began to bridge the gap that telegraphy had opened up between the textual and the visual. A new class of images emerged, whose visual qualities were measured, abstracted, transmitted, and reconstituted by telecommunications. Often this process involved translations between digital and analog formats in order to "compress," transport, and then visually enrich news images.

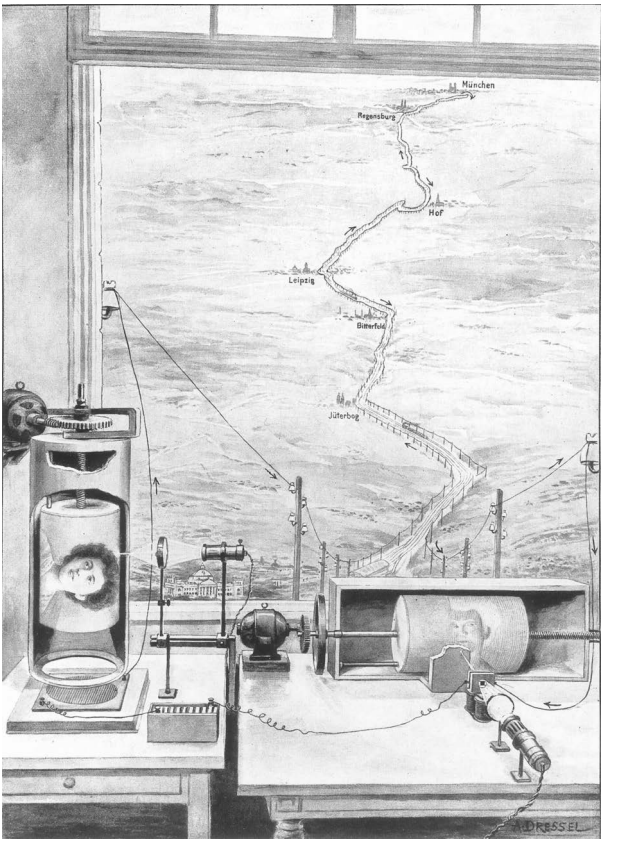

Figure 3.2: Korn device, drawing by A. Dressel, 1904.

Journalistic Objectivity and the Evidence of Circulation

Digital photography has often been accused of undermining faith in photography's ability to represent the world, because it supposedly severs chemical photography's analogic, mechanically-guaranteed link to its referent. According to this view, "analog" photography has an indexical relation to what it represents (Mitchell 1992, 56; Ritchin 2009, 16–18). Yet while digital images often appear without any visible traces of their paths through fiber-optic cables, servers, and cell towers, wire photos tended to retain visible traces of their infrastructural routes on the picture surface itself. Wire photos therefore showed more than their original referent, revealing as well the "noise" introduced by their transmission and translation through different data formats. This fact complicates simplistic narratives according to which analog photography guaranteed journalistic objectivity and public trust in news images, while digital photography risks undermining that trust. Wire photography demonstrates that the history of photography does not divide cleanly into "analog" and "digital" eras, in which purely indexical copies were followed by manipulated images, separated from their referent as a result of digitization. As W. J. T. Mitchell has argued, the digitization of images must be examined on the basis of the actual empirical particulars of its social practice, not from "a thin description of the bare technical facts" (2015, 52). Prioritizing circulation reorients our understanding of photography away from a narrow focus on image capture and toward the ways that images have been translated between data formats in order to reach their viewers. Long before the "digital era," this process involved the introduction of "noise" into the picture's relation to its referent, as well as attempts to simulate its referent by means other than optical-chemical registration.

Examining how pictures formally registered their own movements through space in British colonial America and the U.S. in the eighteenth and nineteenth centuries, Jennifer Roberts has argued that "geography inhabits pictures" (2014, 2–3). While wire photography capitalized on its ability to separate images from their material supports as analog information, its images nevertheless visually registered the effects of their bumpy rides through circuits, electrical interference, and adverse weather patterns. By the 1930s, photojournalism textbooks even instructed photographers how to shoot photos that would transmit well, losing as little visual information as possible. One textbook, for example, advised the wire service photographer to shoot in higher contrast in order to avoid middle gray tones falling out in transmission. Like Roberts' pictures, then, wire photographs formally preprocessed the distances they were designed to span.

This fact complicated wire photos' relationship to journalistic objectivity, which, as Michael Schudson has argued, was being fully articulated during the 1920s at exactly the moment when the press began adapting wire photography on a large scale (2001, 160–162). In the nineteenth century, the commonly held

belief in photography's documentary capacity was already bound up with the evolving norm of journalistic objectivity, and photographic realism became a favored metaphor for describing journalistically crafted facts (Schiller 1982, 92; Muhlmann 2008, 13–14; Schudson 1978, 5–6). The widespread adoption of the halftone photo-mechanical reproduction process in the early twentieth century, with its ability to reproduce pictorial statements seemingly "without syntax," only hardened the association between photography and journalism's objectivity ideal.[2] The gradual adoption of the halftone boosted arguments for photography's epistemic virtue as an objective recording mechanism, against engravings' claims to superior interpretative powers (Raetzsch 2015, 301–306).

Accordingly, wire photography would appear no more than a logical next step in the way that journalism deployed photography to produce ostensibly objective representations while obscuring the subjective viewpoints and political interests of those who shape (and own) the news. As a "mechanical" transmission process, wire photography would seem to support the myth that news photos are unbiased copies of nature rather than motivated visual arguments that must be handled by human individuals and institutions. Communications scholar Barbie Zelizer has demonstrated that within daily newspaper journalism, wire photography faced a "discourse of resistance" from text-focused editors through at least the 1930s. Journalists discursively "disembodied" photographic technology, shoring up their professional status by casting news photography generally and wire photography in particular as merely an automatic, technology-driven, and artless supplement to real text-based news work (1995, 78–92).

Yet wire photographs were hardly mechanically-produced indexical documents that provided a transparent, window-like view onto world events. As I have already shown, they were put through various processes both analog and digital, and worked on by both machines and human hands. Given the halftone's importance in constructing journalistic objectivity, it would seem obvious that muddy, interference-streaked, and visibly retouched wire photos might trouble such a visual regime. Understanding this medium therefore extends much further into the twentieth century the long process of adjustment and hybridization during which the press deployed both hand illustration and photomechanical engraving processes to illustrate the news. Examining the slow adoption of the halftone in the French illustrated press during the last two decades of the nineteenth century, Thierry Gervais demonstrates that the process was one of "slow assimilation of photography into the illustrative process," in which illustrators produced "hybrid images" that were "halfway between artistic creation . . . and information" (2017, 86–91). Even into the early twentieth century, illustration practices did not disappear along with the engraver's studio. News images' credibility, Gervais argues, has always relied not just on photographic indexicality but also on a historically situated visual rhetoric that responds to both readers' changing beliefs in the truthfulness of images and their

viewing pleasure (2017, 92–97). Just as illustrators had long done, newsroom artists, even into the 1950s, continued to alter wire photos in order to salvage, simplify, and dramatize the image's visual information.

Rather than a bug, therefore, the wire photo's visual impoverishment could be a feature. Precisely because this "first impression" was hazy and indistinct, it simultaneously made something else visible: the infrastructural and logistical effort that undergirded photojournalism and reshaped global spatial relations. Wire photography was not simply a window through which audiences expected to see seemingly unmediated evidence of hitherto distant places and events within a new temporal horizon, although that was one of its most important tasks. As the "interface" at which people perceived and contemplated distant events by way of telecommunications infrastructure, wire photography provoked meditation on the condition of connectedness itself. In this sense, wire photography was part of a "vernacular modernism" that responded to and reflected upon the experience of modernity, particularly the condition of being connected by vast and invisible planetary infrastructural systems (Hansen 1999, 59). For Marshall McLuhan, the real "message" of any medium "is the change of scale or pace or pattern that it introduces into human affairs" ([1964] 1994, 8). Wire photography reorganized the senses by technically extending vision across space in a new way, transforming not only the visual culture of the news, but also the everyday experience of time and space.

The Infrastructural Mediation of Time and Space

As the communications scholar James Carey argued, the most important impact of telegraphy was that for the first time it separated communication from transportation, and messages from the physical movement of objects (Carey 1989). Dematerialization freed visual information from the Newtonian laws that governed it when it travelled as an object (Wenzlhuemer 2007, 349–350). "Dematerialization" here simply refers to the fact that telecommunications infrastructure, while material, does not itself move in order to convey information but instead provides a new kind of path along which information travels. Infrastructure's materiality functions differently than the materiality of objects. The radio antennas, undersea cables, and electromagnetic waves that transported wired images were not themselves visible. They were only "echoed" in the traces that the transmission process left in the finished print or halftone, or the newsroom artist's efforts to hide those traces with pen, ink, and brush. Wire photography demands a shift of focus from the photographic object itself to the infrastructural ground that gives rise to particular objects.

Wire photographs' connotative meaning was strongly associated with the collapse of geographic distance brought about by new travel and communications

technologies. While they certainly produced meaning by way of icon-based communication, wire photographs also spoke to something more than their denotative content by making visible the infrastructural network that stretched across national, imperial, and regional boundaries. Wire photography's speed sutured viewers to a new geography and temporality, experienced as a simultaneously occurring global present. In this sense, what these pictures "meant" was less important than what they *did*, or the conditions they set for apprehending the world. As John Durham Peters has argued, media are not just devices for sending messages and information, they are also crucially "agencies of order," which constitute worlds by arranging the relations between things, time, and space (2015, 1). Media can be thought of productively as making *being* rather than *meaning*, as environments and habitats, or as ensembles of natural elements and human artifice that enable certain forms of life (Peters 2015, 3). In the long run, Peters argues, media have been more about the logistical infrastructures that order and constitute civilizations, cosmologies, and spatiotemporal schema. Digital media, with their many forms of communication and pervasive envelopment of daily life within media environments, have made it easier to see the twentieth century equation of media with communication and meaning as an aberration from the historical norm (2015, 5–7).

While contemporary observers often remarked that wire photography "annihilated" space and time, it would be more accurate to say that it produced a new kind of space and pace for those it connected. As it circulated and found a temporary home in various media, from silver-gelatin prints to offset posters to newsprint, the wired image sutured time to space in a new way, bringing the very far away closer in a condensed period of time. Such pictures gave audiences a measurement of time and space, and a sense of how the two were in flux at that historical juncture. As global historian Roland Wenzlhuemer has argued, space is essentially relative and always produced by relations between objects in a given system (2010, 19–47). While McLuhan famously argued that electric media were in the process of "abolishing both space and time" and creating a "global village," time and space cannot actually be annihilated ([1964] 1994, 3–5). Instead, communications infrastructure creates new spatial relations by articulating and connecting places, people, and things into new constellations. While wire photography seemed to "annihilate" space and time, it would be more accurate to say that it rearranged them, bringing media hubs such as New York, London, Berlin, and Tokyo closer together, while pushing areas outside the geography traced by its network relatively further away. This point is worth keeping in mind with regard to the contemporary so-called "digital divide," or the structural inequalities in access to digital communication technologies. While space and time remained foundational frameworks for experience, wire photography changed the ways they were given to sensation and perception, offering an interface that communicated about new spatial relations.[3]

As artifacts, wire photographs concretized and formalized the rapid shrinking of distances. Modern life depended in fundamental ways on an extensive infrastructure that remained below the threshold of visibility, and it was to the problem of this very threshold that wire photography was often addressed. Like media itself, infrastructure's typical mode is to withdraw from view, and it is frequently concealed by design (Peters 2015, 34–36). In general, today's digital infrastructure tends to catch our attention only when it breaks down. During the decades around the early to mid-twentieth century, however, fast images made telecommunications visible by registering traces of their transmission, and became part of a media ecology that helped spectators adjust to conditions of global connectedness. Pictures, which had taken weeks to travel across oceans by steamer, could now be transmitted and printed in daily newspapers. Social acceleration and the collapse of distance were at play connotatively in the experience of seeing and interpreting wire photos. In this respect, wire photography reached far beyond the indexical and evidentiary function credited to press photography during this period, when, it has been suggested, photographs were added to newspapers in order to shore up declining faith in textual reporting's objectivity (Schwartz, 1999).

Toward a Deeper History of the Digital Image

When Charles Lindbergh landed at Le Bourget airport on May 21st 1927 (Fig. 3.3), the Pacific and Atlantic Photos agency rushed to transmit pictures of his arrival back to New York via undersea cable. Far from a sharp photographic image, many of its finer gray tones having fallen out as a result of the transmission process. The pixels resulting from the process in which the image was built up through a "digital" telegraphic punch tape are visible in this gelatin silver print. Yet its poor quality possessed a certain value for picture editors and spectators on the other side of the Atlantic, because it signified that this image was the very first to arrive. The "noise" introduced into the photo as a result of its transmission could become meaningful content. Specifically, the Lindbergh wire photo features a productive interplay between its denotative content—the flyer who has bridged space—and connotations of speed and acceleration accentuated by their formal lack of photographic sharpness and tonality. As a metaphor, the pilot visualized and materialized how wire photography services used telecommunications infrastructure to stitch, bind, and link distant places into a simultaneously unfolding present. In the interwar period, such images were visible proof of a new cultural geography produced via infrastructure. Wire photos were not just "reflections" of a prior political and industrial geography, but were productive of that geography as the point at which individuals perceived and contemplated it.

Figure 3.3: Lindbergh meeting French aviator, inventor, and engineer Louis Blériot, who had made the first flight across the English Channel in 1909. Photo transmitted using the Bartlane method by Pacific and Atlantic Photos.

The image was transmitted using the "Bartlane" process, a transmission technique by which a picture's tones were converted into a punched strip of telegraph paper for transmission and reconstitution into another picture. The case of the Bartlane image transmission system illustrates a longer history of the "digital" image, which was woven into image circulation and the visual culture of the news in the twentieth century. In 1918, H. G. Bartholomew, one of the editors of the London *Daily Mail*, and M.D. McFarlane, who had served in the British air force during the First World War, together began to develop the technology. They made transatlantic tests in 1920 during the International Yacht Race and in 1921 for the Jack Dempsey-Georges Carpentier boxing match in New Jersey (Coopersmith 2015, 49–51). Lord Northcliffe's *Daily Mirror*, which had a circulation of more than a million copies per day at that time, published the resulting pictures, but judged the system unsuitable for permanent commercial application. In 1924, the process garnered interest from the McKormick-Patterson newspaper syndicate's *New York Daily News* and *Chicago Tribune*, which supported further tests, and built a regular service between London, New York, and Chicago. In London, Bartholomew was in charge of European operations, while McFarlane ran operations in New York for Pacific and Atlantic Photos, the McKormick-Patterson syndicate's photo service.

At first, the translation of tonal values had to be made manually in a series of alphabetized values to be relayed into an image on the receiving end. However,

by 1924 the two engineers had worked out a system in which pictures could be automatically scanned and turned into punched tape (Fig. 3.4), transmitted, and then automatically reconstituted on the other end of the connection. Quality improved gradually, and by 1926 the system was in regular use. First, a photograph would be printed five times from the same negative onto small metal sheets with tonal variations. The metal prints were then placed on a series of rotating cylinders, each of which was traced by a needle with a current running through it. The needle was connected electrically to a tape perforator, which would punch holes in a telegraph tape according to the amount of current running through the needle from the metal plate. The plate's surface area conducted more or less electricity according to the light and shade of the image printed on it. The perforated tape would then be delivered by messenger to Western Union and transmitted as an ordinary cable message across the Atlantic. On the other end, the tape was taken to a Bartlane device and run through the reproduction apparatus, inside which a light was projected through the holes in the tape as it rapidly unspooled, registering on a photographic film and building up the image with pixels.

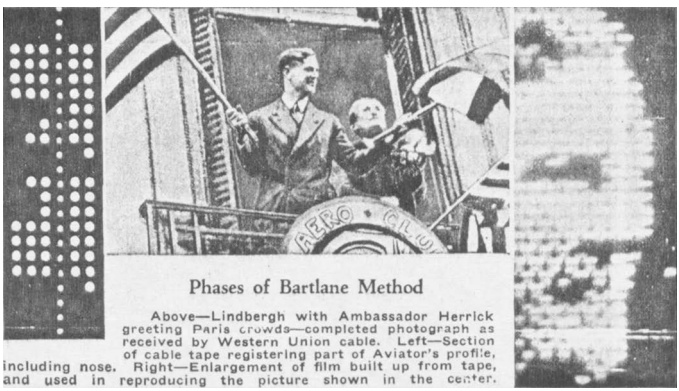

Figure 3.4: "How Photographs of Lindbergh Were Sent by Cable," July, 1927, *Dots and Dashes*, Vol. III, No. 7.

The Bartlane process underwent continual technical improvements and its use expanded in the interwar period. Yet, as "radiophoto" raster scanning and transmission improved, particularly during World War Two, Bartlane was eventually eclipsed by this "analog" image transmission technique. By the end of the war, the major wire photography services largely used synchronized radiophoto devices for overseas picture transmission. Bartlane's importance as a precursor to the computerized digital image, however, has not gone completely unappreciated. In their 1992 textbook *Digital Image Processing*, which has since gone through many editions,

Rafael Gonzalez and Richard Woods began by acknowledging that "one of the first applications of digital images was in the newspaper industry, when pictures were first sent by submarine cable between London and New York" (2002, 3). The Bartlane transmission system, they explained, had already formulated the basic mathematical definition for a digital image. That system defined the image as having two-dimensional *x* and *y* planes along with a certain number of discrete coordinate points, each having a definite amplitude value of gray-scale intensity. The two authors cited an article by McFarlane entitled "Digital Pictures Fifty Years Ago," from a 1972 issue of the *Proceedings of the IEEE* on digital picture processing. "Seated in a comfortable armchair watching live television from the moon," McFarlane had written, "it is hard to realize that in the early 1920s it took the better part of a week or more to get news pictures across the Atlantic" (1972, 768). The Bartlane system, he explained, had reduced this transmission period to mere hours by automatically translating a picture's tonal values into a digital record tape and reconverting that information into a picture.

At the same time, while the Bartlane system used digital images, it did not technically constitute digital image processing, which requires operations performed by a digital computer. The first computers powerful enough to carry out meaningful image processing tasks appeared in the early 1960s. Gonzalez and Wood trace this development primarily to the space program, and particularly to the Jet Propulsion Laboratory's use of computers to improve images transmitted from space probe missions beginning in 1959 (2002, 5). Yet even here, there is a connection to wire service photography. In a letter to McFarlane preserved in his archive, W. H. Pickering, who headed the JPL from 1954 until 1976, wrote:

> "Dear Mac,
> . . . It is indeed interesting to realize that many of the techniques you were using have been reapplied with modern instrumentation capabilities. If you ever get up to Pasadena, give me a call. I would be delighted to have you come out to the Laboratory to see some of our Mariner photographs."[4]

The two knew each other well, since McFarlane had worked for a number of electrical engineering firms in Southern California and at the California Institute of Technology in the 1950s, and Pickering had read McFarlane's article on the Bartlane process as a precursor to digital image processing in the *IEEE*. On July 14, 1965, Mariner 4 had taken twenty-one images of Mars, transmitting them digitally back to Earth at 33.3 bits per second.

The Bartlane method's real importance lay in the fact that it broke up the picture plane into discrete points with alphanumerical values tied to tonal values, and, crucially, that it did so in order to transport the image via telecommunications infrastructure, bringing photographically-informed pictures of faraway events to spectators within a new time scale. It had nothing to do with destroying chemical

photography's indexical link to the real, or with any attempt at forgery or manipulation. As the *Dots and Dashes* article on the Lindbergh photos insisted, these pictures were "actual photographs" transmitted over the Atlantic cables. Instead, Bartlane constituted a method of "compressing" the image into a more transportable format, one that could be built up again into a richer, denser, analog picture format on the receiving end, with the help of newsroom artists and their autographic techniques. As W. J. T. Mitchell has suggested, digital techniques have less to do with fakery than with the "optimization" of images, "crunching them down for screening or transmitting over the Internet, fattening them up in .tiff format to produce highly saturated color prints." Visually "poor" digital images might actually possess their own kind of realism, Mitchell argues, since they demonstrate a certain candor about the operations performed on them in order to enhance their functionality (2015, 50–51). The Bartlane method broke up images into a code in order to transport them more easily, while retaining some of the reality effects of chemical photography. Importantly, it did so in a specific historical, social, and institutional context: the wire photography services that produced, transported, and authenticated these images garnered public trust through the creation of, and adherence to certain journalistic norms that became increasingly formalized over time.

In addition, if the space program pioneered digital image processing, then wire photography services first made it an infrastructural reality for large numbers of people, long before personal computing or widespread Internet access. In the same year that the Mariner mission sent back digital images of Mars, the AP installed digital image processing technology into its global wire photography network for the first time. Rather than a way to capture, transmit, or store data, however, this digital image-processing unit automatically interfaced analog data coming from abroad with the North American domestic system and vice versa. Because international wire photo data standards were lower than those for the domestic U.S. system, prior to the digital interface's installation, photos had to be converted by making a hard copy on a receiver set in the incoming format, then retransmitting them in the correct outgoing format. This slowed down processing speed and degraded image quality.[5] The digital interface was thus a kind of "infrastructural patch," which made it possible to circulate pictures between continents without chemical-optical handling to translate between analog data formats.

Digital image processing, therefore, entered wire photography initially as a *network management solution* for the logistical problems that cropped up once the demands placed on the network had reached a volume that made its mode of transmitting visual information a drag on operations. Digital image processing's entry into wire service photography had nothing to do with manipulating images. Rather, it was another way of accelerating the processing and circulation of news images, continuing a development that had long been underway and taken both "digital" and "analog" forms. Digitalization crept into the infrastructural network step by

step rather than all at once, but its horizon was the vision of an increasingly frictionless image circulation system.

The digitization of various wire photography network processes not only helped circulate photos faster by cutting out laborious and time-consuming darkroom work, it also allowed pictures to move through the network more efficiently by smoothing logistical logjams. Once digital processes had entered certain key steps in the network, it was easy to envision the potential savings in time and labor that would result from its extension to new infrastructural links. In the early 1970s, the AP installed digital tape recorders to store photos coming off the computer interface, as part of the overall move away from intermediate handling of negatives, prints, and retransmissions. The wire service also began working with an MIT lab on computerized image editing and storage, and planned to roll out computer picture processing in regional hubs as the telephone companies extended digital transmission lines. The AP's Laserphoto brochure explained that the new system was the same method "used to refine pictures transmitted from the moon to earth."[6] The new system allowed editors to store limited numbers of photos on a hard drive, and to display them on a video monitor in order to select, discard, edit, transmit, or store them for later automatic dispatch. These computers also included basic graphic manipulation and editing functions that would normally be carried out in darkrooms, such as enlarging, cropping, ninety-degree rotation, tonal-curve alteration, and caption editing. United Press International (UPI) called its version of this early form of Photoshop "Digital Darkroom," while the AP called theirs "Electronic Darkroom," although of course the reference to a "darkroom" was an anachronistic remediation of an earlier form.

Crucially, the new system allowed editors to generate a queue for transmission over the network. This solved one of the analog wire photo network's major logistical and scheduling challenges. Previously, pictures had needed to be transmitted simultaneously over the whole network, or regional network branches. Newspaper editors received verbal descriptions of the picture over the telephone, and then had to either opt to receive or refuse it, sight-unseen. The new system allowed images to be stored, queued, and displayed for photo editors before they were transmitted. The queue, which included priority transmission lists and background lists, meant that picture transmission prioritization could be automated. Urgent spot photos could automatically take precedence without disrupting the whole schedule. The computer automatically converted the picture from analog data into digital data that it stored in its memory, available to be called up and manipulated on the video screen, then reconverted it into analog data to be sent out over the wire or radio networks to subscribers.

Conclusion

Understanding wire photography demonstrates that the "digital" and the "analog" do not constitute the basis for neat historical periodization. The two modes of representation blend into one another and are both ways of compartmentalizing, presenting, and symbolizing. Wire photography involved various techniques for translating between these two modes in order to package news images as telecommunications information, coax them back into picture form, and reproduce them on newsprint. In the ostensibly indexical synchronized scanning wire photo, visual "noise" was frequently introduced into the resulting image, lending an additional element to the picture that affected its meaning by putting its content into play with its infrastructural route. Meanwhile, contemporary digital images often represent their referents much more clearly, without any perceptible noise or corruption at all. This certainly ought to give pause to simple distinctions between analog and digital photography on the basis of their "direct" and "indirect" relationships to the referent. Discussions of digital or analog photography ought not to focus on a narrowly technical description of image capture, but consider questions of circulation, formatting, and perception. By putting images into circulation through a telecommunications network, wire photography laid the groundwork for conceptualizing the aesthetic as information, long before computer-aided digital image processing. In the end, it may be that the image as an effect of telecommunications infrastructure is a more important historical transformation than any particular digital processing technique.

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Notes

1 In *Languages of Art*, the American philosopher Nelson Goodman distinguished digital and analog systems, as well as allographic and autographic art forms. Goodman considered "digital" and "analog" to be somewhat misleading terms, and preferred to distinguish digital symbol systems as "differentiated" and

analog systems as "dense." Allographic arts were singular objects with claims to originality and thus susceptible to forgery, such as paintings, while autographic arts consisted in the production of a notational system, such as a literary text or a musical score, which could be reproduced exactly without any risk of forgery. Digital images, in this sense, seem "allographic," while the analog retouching done by newsroom artists would be an "autographic" form of mark making.

2 For William Ivins Jr., the longtime prints curator at the MET, looking back on the history of prints and visual communication from the mid-twentieth century, the halftone's revolutionary significance was that it implied "no preliminary syntactical analysis of the thing seen into lines and dots, and the ruled lines and dots of the process had fallen below the threshold of normal vision. Such lines and dots as were to be seen in the report had been provided by the thing seen and were not those of any syntactical analysis. . . . At last men had discovered a way to make visual reports in printer's ink without syntax, and without the distorting analyses of form that syntax necessitated" ([1953] 1969, 128).

3 As Wenzlhuemer puts it, "Our intellectual understanding of space can work only through the object . . . it is the object itself that allows us to intellectually handle the confounding abundance of spaces. It is the focal point at which spaces touch. And accordingly, the objects are the interfaces through which different spaces can interact with each other, impact on each other and influence our perception or concept of space." (2010, 29)

4 Pickering to McFarlane, August 2, 1972. AG23:1, McFarlane Papers, Volkerding Center for Creative Photography.

5 "Remodeled Wirephoto Gets Console," The AP World, Summer 1971. "Wirephoto's interface—the computer which translates the 70 rpm transmissions from abroad into 100 rpm signals for domestic distribution, and vice-versa—has been piped into the console. . . . The interface . . . provides automatic transmissions between foreign and domestic networks. . . . Without this device, quality would be lost through chemical processing and retransmitting and as much as 20 minutes delay could be experienced."

6 "Laserphoto—What does Digital Transmission mean?" 1973. AP Corporate Archives.