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When Old Technologies Were New: Thinking About Communication in the Late Nineteenth Century

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When Old Technologies Were New: Thinking About Communication in the Late Nineteenth Century

Disciplines

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1

Inventing the Expert

Technological Literacy as Social Currency

The poem is a standardised one, in that it is passed on in a particular context; by selected people and in a special style, people are encouraged to listen to and then recite the myth and a premium or reward is given to those who can do this well.

—Jack Goody, *The Domestication of the Savage Mind*

“Any opinion mankind has held that has not been through the crucible of science is probably wrong.”

—A[mos] E. Dolbear, “The Science Problems of the Twentieth Century,” *Popular Science Monthly*, 1905

Electrical professionals were the ambitious catalysts of an industrial shift from steam to electricity taking place in the United States and Western Europe at the end of the nineteenth century. According to Thomas P. Hughes, Alfred Chandler, and others, that shift was made possible by key inventions in power, transportation, and communication, and by managerial innovations based on them that helped re-scale traditional systems of production and distribution.¹ The retooling of American industry fostered a new class of managers of machines and techniques; prominent among them were electrical professionals. The transformation in which these professionals participated was no class revolution, as David Noble has pointed out.² Their job was to engineer, promote, improve, maintain, and repair the emerging technical infrastructure in the image of an existing distribution of power. Their ranks included scientists, whose attention was directed to increasingly esoteric phenomena requiring ever more specialized intellectual tools and formal training, electrical engineers, and other “elec-

tricians" forging their own new identity from an older one of practical tinkerer and craft worker. Servingmaid to both groups were cadres of operatives from machine tenders to telegraph operators, striving to attach themselves as firmly as possible to this new and highly visible priesthood.

Electrical experts before 1900 were acutely conscious of their lack of status in American society relative to other professional groups.³ The American Institute for Electrical Engineers (AIEE), founded early in 1884, was the last of the major engineering societies to be organized in the nineteenth century.⁴ Professional societies had already been organized by civil engineers in 1852, mining engineers in 1871, and mechanical engineers in 1880. The prestige of other groups in the engineering fraternity, especially civil and mechanical engineers, came less from membership in professional societies, however, than from other circumstances. Their practitioners hailed from the upper and middle strata of society, were often products of classical education, and had developed distinctive professional cultures of their own well before the formation of their national organizations. This gave them an established and even aristocratic niche in society.⁵

None of this was true for electrical engineering, which had emerged only in the decade before the founding of the AIEE, and which by the time of its organization had achieved no clear consensus about the meaning of the term *electrical engineer*. The broader title *electrician* was equally vague.⁶ It appeared as a distinct census category for the first time in 1860, but despite a flourishing telegraph industry, only 12 practitioners were reported. Not until 1900 were electricians mentioned separately again, when 50,717 workers were so classified.⁷

Before 1900, as Robert Rosenberg has written, the electrical work force comprised a motley crew from machine tenders to motor designers and from physicists to telegraph operators, all sharing in some fashion the title *electrician*.⁸ Anyone interested in electricity might claim it, and many did. "It is doubtful whether any man present over thirty years old selected any application of electricity, with the exception of the telegraph, as a means of livelihood in the sense that a youth would select a trade or . . . professional avocation," one of those professionals reminded his colleagues at the first annual meeting of the Electric Club in New York in 1887.⁹ His exception for telegraphy was not much of an exception, since telegraph operators enjoyed scant occupational prestige compared with other electrical professionals.

A number of trade and technical journals were witness to the oc-

cupational and status anxieties of electricians. The first general weekly electrical paper for professionals in the United States was *Electrical Review*, founded in 1883. *Electrical World*, perhaps the major electrical industry journal in the United States in the late nineteenth century, claimed the largest circulation and boasted more than seventeen thousand readers by 1895. These and other journals like *American Electrician*, *Electrical Engineering*, *Western Electrician*, and, to a lesser degree, popular science journals like *Scientific American* kept readers abreast of the latest in electrical innovations and scientific findings bearing on their craft, promoted and recorded professional meetings and activities, and commented on affairs of industry and politics that affected the electrical profession. In contrast to the loftier AIEE *Transactions*, these journals addressed not only academic and practicing scientists and engineers, but also foremen, superintendents, designers, managers, entrepreneurs, and other workers in the field of commercial electrical application. Without exception, these journals subscribed to the argument that electrical experts were entitled to greater social position and respect, a quest officially framed as the pursuit of proper standards and career experiences for training future electrical workers.

Scattered throughout the technical reports and documents that constituted the primary focus of this literature was a secondary content of social news, editorial comments, and short anecdotal articles that provided a less earnestly self-conscious arena of discussion. Its ostensive subject matter was the movement of an expanding and varied culture of electricity through the larger society. It included excerpts from the lay press, material quoted incestuously back and forth from other journals—a widely acknowledged and generally accepted practice—and tales attributed to every imaginable source. The casual tone and location of this material, at the interstices of the strait-laced technical and professional documents which announced that electricians were busily engaged in their calling, made it ideal for expressions of the concerns closest to their hearts.

The industry in which these workers labored, and to which their concerns were directed, was significant and growing. At the beginning of 1890 one journal estimated that \$600 million had been invested in the electrical industry of the United States, 250,000 people depended on it for their livelihood, one million miles of telegraph wire had been strung (“enough to circle the globe 40 times,” crowed one expansionist metaphor), and 1,055,500 telephone messages from 300,000 instruments were daily buzzing over 170,000 miles.¹⁰

Electrical Textuality

Brian Stock has given us the term *textual communities* to describe groups that rally around authoritative texts and their designated interpreters.¹¹ Stock's work addresses certain realignments of medieval discourse, in particular what he regards as an original divergence between popular and high culture. His notion provides a useful starting point for considering other textual communities, their spokespersons and interpreters, and their relationships to less lettered communities. In the late nineteenth century, aspiring electricians placed scientific textuality and certified interpreters of scientific texts at the center of their claim to public authority, and attempted to persuade those less technically lettered of the validity of that strategy.

The notion of scientific textuality appeared over and over in discussions of professional standards. The editors of the *Electrical Review* praised the young American Institute of Electrical Engineers for the "large number of valuable papers touching upon almost every branch of the electrical industries," and expressed concern that the level of discussion at meetings of that and other societies, including the New York Electric Club and the older New York Electrical Society, was rarely up to the level of the papers themselves. They urged technical societies to bear in mind "that the proceedings are read and studied by electricians the world over."¹² Documentary procedures were so central to electrical engineering practice and research that it is not inaccurate to use the term *technological literacy* to describe a range of professional competencies that at their core valued skill in interpreting technical documents. Electrical engineers and researchers fully intended that these literate skills and the theoretical knowledge they embodied replace the skills of the tinkerer and craft mechanic, skills governed by an authority of the body that arrives at truth from the direct experience of the senses.

Broadly speaking, four communities accepted the expert authority of electricians and their texts in the late nineteenth century, or at least were addressed by electricians as if they did. Together these communities were organized around a presumptively shared, but distinctively practiced, epistemology of texts and interpretive procedures that were sanctioned by certified authorities arranged in roughly concentric circles of expertise. First was the select readership of theoretical and entrepreneurial electricians addressed by every kind of professional and technical literature. Professional societies were important to this tex-

tual community as well, since most of their meetings were referenced to texts around which the mutual interests of their members revolved. A second textual community collected around the literature of popular science that aped conventions of expert presentation, and sometimes the mantle of professional and scientific authority as well. This was the group, explained the authoritative British *Electrician*,

whose earnest efforts give a far greater publicity to our notes and to many of our articles than we ever contemplated. These people are more accustomed to wield the paste and scissors than the pen, and we presume it is due to their lack of familiarity with the latter auxiliary that they so seldom mention the title of the paper to which they are indebted for their matter.¹³

Suspiciously monitored by the professional press for sensational tendencies, this community aimed primarily at a popular audience of enthusiasts. The circle of interpreters it accepted as legitimate was larger, looser, and less differentiated than in the more strictly accountable professional press.

A third community was constituted in the flow of information, characteristically in one direction, from electrical experts as accredited interpreters directly to lay audiences, generally of the middle class. It made itself heard in the oral channels of lecture and lyceum, and in articles written for middle-class literary journals like *Fortnightly Review*. This was the audience idealized in a description of a standing-room-only crowd at the Royal Institution on the occasion of a lecture on wireless telegraphy by Guglielmo Marconi:

As usual, the assembly was a mixed one, from our neighbour who regretted he had not had time to read up the subject in the "Encyclopaedia Britannica" beforehand, to the scientist who came with the hope of hearing the announcement of a new discovery. The audience also included a large proportion of the fairer sex, a number of whom were old *habituées*.¹⁴

These exchanges were disseminated to a still larger audience by the popular press, which often reported on these occasions, but rarely in a manner satisfactory to expert eyes. To the dismay of electrically literate elites, the popular press embraced colorful charlatans as enthusiastically as it did certified experts. This popular press and its electrically unlettered audience constituted a fourth textual community. From time to time the professional electrical press offered the gatekeepers of the popular press suggestions for improvement. "Although we have never been enthusiastic advocates of science for the multitude," wrote

the *Electrician* in 1882, "we would certainly make an exception in favour of newspaper editors. In the interests of the public, for whom the journalist professes to live, he might, one would think, include a smattering of science in his professional training."¹⁵

Of special interest is Stock's account of the challenge to religious orthodoxy mounted by heretical and reforming communities that took the principle of textual authority to heart, but applied its logic in new and unanticipated ways. Debates over competing interpretations of sacred text brought the communities sponsoring them into conflict. Their disagreements were rarely about the priority of textual authority, or even about broad principles of legitimate interpretation. Their differences concerned substantive points of interpretation and the doctrinal implications of these differences, not least among them disagreement about the valid sources of religious authority in this world.¹⁶ If the community of electrical professionals had less at stake than the medieval church, it too was challenged by the very groups it hoped to convince of its unassailable textual authority, and this for the simple reason that it had made electricity too fascinating a topic for popular culture to leave alone.

A recurring theme in the study of literacies past and present is how skills and techniques for performing particular literate practices are transferred from communities of adepts to less skilled communities. What is not so easily transferred is the specific cultural setting and world view that gives significance to these practices from the point of view of the bequeathers.¹⁷ This is part of the historical irony by which medieval religious elites were beset by the very groups they had intended to control. Borrowing elite rules of interpretation, these less powerful groups constructed a textual exegesis shaped to their specific needs and experiences of the world. Wherever their interpretations were resisted by established textual communities, believers in textual authority took on, often fiercely, those who had taught them the importance of the principle. Confronting a similar if less intense challenge, late-nineteenth-century electricians stood guard over popular efforts to interpret electrical phenomena in ways that seemed to undermine the credibility of scientific experts. Though generally convinced of both the magic efficacy of electricity and the authority of the magicians who manipulated it, popular interpreters drew their own conclusions when it suited them.

But this is the limit of the analogy. Where Stock's concern is with a world in which reverence for textual authority inspired those who were disbarred from membership in elite textual communities to invent

a *popular* textual culture, our concern is with the effort of electrical professionals to invent themselves as an *elite* in the late nineteenth century. To this end, much of the literature of electrical mission was occupied with sorting and labeling insiders and outsiders in electrical culture. Technological literacy, in the sense defined here, was critical evidence for such distinctions. The proper naming of persons, gadgets, and concepts in their electrical contexts and relations was among the most important performative indicators of technological literacy, even though contemporaries coined no distinct term for this skill. What it meant to possess the skill of electrical naming and understanding was worked out in thousands of examples in the literature, all of which explored codes of meaning attached to electricity in society. Absent this contemporary effort to take the *social* measure of technological literacy, specific technical skills and performance criteria could have no real existence or application.

Occasionally, those outside the boundaries of textual demarcation fashioned by experts refused to defer to those limits or recognize the social and professional privileges attached to them. When this happened, deception of the less by the more literate was considered an acceptable and even necessary option to keep these boundaries secure. The professional literature exhibited scant interest in whatever ethical questions might be involved in deceptive manipulations to achieve power over the less expertly informed. Most of the time, such maneuvers were not even explicitly defended, since knowing when and how to execute them was a marker of group solidarity, the more so the more restricted and exclusive the level of electrical literacy.

Insiders and Outsiders

Much of the electrical literature described above and a significant portion of the technical literature it supplemented explored social relations between electrical insiders and outsiders around textual concerns. Electricians were wont to indulge a powerful impulse to identify aliens and enemies, those suspect in electrical culture and perhaps dangerous to it, in terms of their textual competence. Outsiders were defined as those who were uneasy and unfamiliar with technical procedures and attitudes, especially literate ones. By a supplemental logic of explicit social control, any additional marginality of race, class, gender, or lifestyle was taken as confirming alien status. The effort to identify outsiders by textual cues naturally raised the reverse issue, namely,

who had legitimate claim to the title *electrical expert*, and by what literate deeds they could be recognized and certified in the expert arena and in society at large. The literature of electrical mission also occupied itself with the problem of what legitimacy to confer upon an admiring public's efforts to interpret the world of electrical science and engineering, especially when the conclusions it reached ranged far afield of textually disciplined expert notions, and especially when experts' own goals were to harness public adulation to improve their own social and professional standing while keeping public admirers at arm's length. One official boundary at which electrical insiders and outsiders met was negotiated in a currency of promises given by insiders to outsiders, that is, by experts to publics, and equally in expectations held by laymen concerning their right to share in an electric prosperity made possible by public recognition and indulgence of expert ingenuity. Expert and popular literature alike monitored the rhetoric of reciprocity, watchful for any breach in the vague but binding bargain between experts and their publics in behalf of electrical progress. Experts, for their part, frequently took their erratic publics to task, as often for believing too little as for believing too much.

Electrical experts attended to several gross indices of technological literacy. An ad for an "Experienced Electrical Engineer" in one journal sought an aspirant "well up in Electro-Mechanics, good at experimenting and technical reports." Documentary skill was thus cited as a fundamental professional qualification, and being "well up" on electromechanics implied an ability to follow the latest technical literature. "Only one person out of every two thousand in this country reads the electrical journals," *Electrical World* estimated in 1889, surmising as to what the size of the community of electrical literates might be.¹⁸ The *Electrician* portrayed a fictional proprietor praising his newly hired engineer for both his electromechanical skill and the command of literate procedure that flowed from his specialized textual knowledge.

"How does your electrical engineer go on?"

"Oh, very well, we never know what a break down is since he came, and if we want to make any alterations or to put up any new apparatus . . . he brings me the order to sign, or gives his estimate, and that is all I know till I see the thing working."¹⁹

Claims to expertise on the basis of textual credentials could be challenged if the claimant were clearly a social outsider, since textual cues were expected to signify appropriate social circumstances. "A

dirty-looking young man once called upon us," the London *Telegraphist* wrote, "handing a well-thumbed type-printed card, bearing the unwashed one's name, followed by the word *Electrician*."²⁰ The young man had presented textual evidence worthy of consideration, but nothing else was consistent. His appearance made his claim suspect, and his name did not connect him to a network of familiar insiders. The verdict of these signs was confirmed in the final test, which revealed the young man's conversation to be technically improficient. He was an electrician by textual pretense alone, utterly lacking the extratextual finish assumed to accompany authentic technological literacy.

Even laymen were expected to possess some literate skills for coping with electrical technology. Those who were socially positioned to know this assumed inventive poses if their skills were not up to par. A "quite respectable-looking young woman" asked the receiving operator to write down her telegraph message for her, since she could not do it herself with her gloves on. Her ruse implied a minimum standard of literacy expected of an enlightened citizenry for coexisting with the practical aspects of electricity, and clearly associated with other visible signs of class. This story also portrayed telegraph operators as a highly literate lot, admirably sensitive to these class cues by virtue of their occupation, and possessors of an admirable humanity that provided a showcase for technical prowess:

It is quite a common thing for people, both men and women, to ask us to do their writing for them. I guess anyone would be astonished to find out how many people there are who are hardly able to spell their own name, much less write a legible letter or telegraphic message. These are principally English people of the working classes, who have only been in this country a short time. Nearly all born Americans can write. They tell me that in England the laboring people are very seldom able to read and write, especially in the mining and manufacturing districts. . . . They will pretend . . . they have sprained their wrists, or have their gloves on, or can't write with our pens, and we have to look serious, while all the time we see through their dodges perfectly.²¹

Stigmatizing the Unempowered: Rural, Female, Nonwhite

The professed goal of authoritative discourse in electrical journals and at conventions was to debate technical problems and to discuss whatever social and professional concerns might bear on them. Electricians

did not hesitate, however, to extend their concerns beyond the boundaries of professional culture, though they did not consider their own preserve equally permeable to opinion from without. To electricians, other social groups were faintly contemptible, definitely so if their members ventured into unfamiliar expert territory.

Criteria for distinguishing electrical insiders and outsiders were clearest in jokes of internal cohesion that provided light features and filler in the electrical press. They poked fun at how outsiders attempted to navigate codes and procedures electrical insiders took for granted. The usual targets of this humor were black, foreign, rural, or female, despised groups in the system of caste that experts shared with the larger society. Persons of rank and privilege were capable of earning the hostility of electricians, but never appeared quite so ridiculous as those who provided a readier target for social scorn. An official of the Edison General Electric Company recalled that he and Thomas Edison had once called on one of New York's "biggest" millionaires to discuss installing electric lights in the millionaire's mansion. During the conversation, the millionaire asked whether Edison could install an electric motor to run the steam engine that operated his passenger elevator.²² This was a joke, but a mild one. Its narrator was only bemused by what "the outside world knows about electrical matters"; comments about less exalted groups were more likely to elicit complaints about the futility of expecting marginal groups to understand and appreciate what electricity could offer. In their efforts to reorganize a social hierarchy with no definitely settled place for them, experts sometimes measured themselves against those whose power they expected to decline in a world of new forms and correspondingly new structures of influence. The trade journal *Lightning* pilloried diplomatic verbosity, a traditional signifier of aristocratic social class and high political authority, as incongruous in the telegraphic domain, into which diplomacy had begun to pass from the more dignified arena of oral and written exchange:

What a magnificent thing it would be for the Post Office if everyone telegraphed at the same length as certain Emperors and Princes. "William" contrived to get 112 words into a simple message to Bismarck to the effect: "Only just heard of your illness. Come and put up with me"; and Bismarck broke his record by telegraphing in 206 words the reply: "Thanks. Sorry it cannot be managed."²³

Still, jokes in the electrical press were aimed mostly at those with little social power, occupying either the conditions of misery that elec-

trical progress was supposed to alleviate or positions that would have to move aside to make room for electrical success. In asides and anecdotes, electrical experts thus defined themselves as much by the groups from which they chose to disassociate themselves as by those with whom they sought alliance. The *Albuquerque Journal* narrated the story of Royal Wilson, a black man elevated, by the sudden illness of the headwaiter in the hotel where he worked, to his boss's post. When it was time to extinguish the electric lights in the dining room, Wilson, a man cast loose from his social moorings, found himself in a state of "painful uncertainty." He decided, explained the *Journal* with malicious irony, "that the simplest way out of a difficulty is always the best."²⁴ Leaning precariously from a chair perched on a table, he blew "until his eyes bulged out and the sweat trickled in rivulets from his features." This image was a familiar racial stereotype, and these were the desperate gestures of one to whom a technology based on something besides muscle power was an impenetrable mystery.

Not knowing how to turn off the lights was a familiar comic theme. A cartoon in an illustrated paper showed Uncle Hayseed in a New York hotel inverting his large, rude boot over the lamp after many futile attempts to blow it out.²⁵ In another story, a puzzled rancher at a Seattle hotel finally succeeded in uncoiling the wire from which the lamp in his room hung, so that he could stuff it into a bureau drawer to extinguish it.²⁶ Humor at the expense of powerless groups established a social floor above which electricians felt comfortably smug. The professional journal-reading community could bask in the social assurance of their own society pages, since their journals were read by a small, mutually acquainted community.

Other stories contrasted rural credulity with urban sophistication, and satirized practitioners of mechanical technology who seemed unable to accommodate electricity:

The telephone is a puzzling mystery to the rural mind that tackles it for the first time. For instance, a countryman approached a telephone man in Boston the other day with the following interrogation: "Now, mister, what makes the thing work? Thar's yer wire and thar's that 'er trumpet and all that, but ain't thar suthin' aside o' that? Whar's the steam, the *push* to the thing? What makes the talk go 'lang so? *What greases the derned thing?*"²⁷

The joke is on the bumpkin who clings to his anachronistic mechanical model of technology in a world where reasonable people know better. His status as an outsider is manifest in this error. To underline that

status unmistakably, his ungrammatical dialect appears in pointed contrast to an elite facility with genteel language and expression, and it is implied that electrical experts, as readers of the story, belong to this more desirable group.

The outsider as stock rural character appeared in the *Sacramento Record-Union* as a "raw California granger" in a story about the social mischief of technological ignorance. The story is presented by an omniscient narrator who occupies a logically impossible vantage point for observing the mutual frustration of granger and expert without either's knowing the full set of story events. The story is a moral fable of social relations borrowing the dramatic force of a putatively factual account. A reluctant granger found it necessary to use the telephone. He approached it "timidly," eyed it "cautiously," and, taking a pencil, began to write on a piece of paper.

He then rolled up the paper and tried to push it in the aperture in the transmitter. Failing in his attempt with his finger, he took his lead pencil and jammed it in, destroying the vibrating plate. With an air of satisfaction he took his seat and awaited a reply. After about ten minutes he became discouraged, and thinking he perhaps had not sent the message on the right line, he wrote another and jammed it into the hand telephone, and to make sure work, rammed it home as he would a ball in a rifle.²⁸

The puzzled granger departed after another half-hour wait, and a secretary entered the room. He discovered the telephone "stuffed full of manuscript and ruined." When the instrument was dismantled and all messages had been removed, they were all found to read: "Bakker and Hammeltonn—Send me to the Pavillion a six inch long munkey rench. Yurs Trully J. E."

The granger signifies an economic order attached to the land and wedded to inelegantly mechanical procedures unsuited to the complexities of electricity. The granger is doubly illiterate, and this makes him dangerously destructive in a technically sophisticated world. Not only are his actions premised on an incorrect analogy between written literacy and the telephone; he is not even proficient in the written literacy on which his actions are modeled. He is also a threat to property, though the electrical order is ultimately victorious, since he must pay for the damage he causes. The proprietor of the telephone fences it off with a "Beware of the Dog" sign to deceive functional literates who, like the granger, lack the critical capacity, associated with more sophisticated literate skill, to question what they read. By an unspoken

principle that informs all this literature, the technologically marginal are deemed deserving of deception at the hands of those with greater skill.

Along with textual competence, other gross indicators of technological literacy included skill in operating electrical machinery and, always, sensitivity to the social conditions and constraints surrounding the exercise of those skills. Unhesitating appreciation of the virtues of new electrical technologies and the experts who oversaw them completed the list. In the realm of electric communication, this last condition implied an absolute belief in its uniqueness, and the refusal to entertain any notion that electric communication merely extended or speeded up oral and written communication, or was an equivalent substitute. By its very nature, in other words, it was not subject to existing social rules. It was truly new, and rules for using it owed nothing to the past, but only to engineers bent on creating the future. It was a short step from perceptions of electrical communication as a phenomenon outside the realm of personal or cultural values to the conclusion that expert-prescribed instructions for its use were not the mutable product of human custom, but given in nature itself.

To agree with these facts as electricians understood them was to embrace a model for prosecuting electrical communication with brevity and efficiency. Obedience to it distinguished those whose "correct" perceptions encompassed a larger, more sophisticated world of technology from those whose imaginations played on smaller, less impressive stages. Typical was the story of a baker's assistant whose wife was gravely ill, and who seized on the telephone as just the thing to persuade his sister-in-law to come home at once. He rushed to his former employer's establishment and asked to use the instrument there. This detail emphasized the main point, the social distance between the technologically initiated and uninitiated. Permission granted, the butt of electrical amusement stepped up to the telephone. "Then without ringing up the central station and getting connection, without taking down the ear tube, he just halloosed into the hole: 'Kitty, come home! Mary's sick!' and vanished before anybody could stop him."²⁹ It developed that Kitty could not be reached by telephone where she worked, but such had been her brother-in-law's faith in the telephone that he thought "all he had to do was to speak into the instrument and it would carry the message anywhere he desired."

Electricians were amused at the miraculous powers vested in devices for electrical communication by the technologically naïve. These powers displayed the features of the oral and written models they were

based on, few of the unique capacities of electrical communication, and additional magical capabilities that to experts were inconceivable for *any* mode of communication. A popular misconception was that telegraph and telephone messages were written down and physically transported over the wire. In the earliest days of telegraphy, “even fairly educated people believed that the paper passed along inside the wire,” reminisced a British railwayman in 1890.³⁰ Now, he implied, only the most socially marginal could make this error.

Some enthusiasts imagined that electrical communication was mysteriously enhanced oral discourse in which speakers and listeners were seen as well as heard, just as if their conversation were face-to-face. In one story, an office boy in a business house in Aberdeen, a “raw country youth” speaking the patois of humble station, was minding the telephone in his master’s absence.

When first called upon to answer the bell, in reply to the usual query, “Are you there?” he nodded assent. Again the question came, and still again, and each time the boy gave an answering nod. When the question came for the fourth time, however, the boy, losing his temper, roared through the telephone:

“Man, a’ ye blin’? I’ve been noddin’ me heid aff for t’ last hauf ’oor!”³¹

Featured in many stories was the frustration of the technologically unempowered, expressed as anger, fright, or other loss of personal control. These displays contrasted with the cool bearing of the professional, whose perfect awareness was accompanied by an equally flawless emotional control that suggested social and moral superiority. Uncontrolled emotion was displayed by men who were victims of their own technological ignorance, who had somehow shirked their responsibility to be technologically informed.

The Special Case of Women

Women’s ignorance, on the other hand, was ignorance even of the extent of their electrical incapacity.

A gentleman, talking with a young lady, admitted that he had failed to keep abreast of the scientific progress of the age. “For instance,” said he, “I don’t understand how the incandescent light, now so extensively used, is procured.” “Oh, it is very simple,” said the lady, with the air of one who knows it all. “You just turn a button over the lamp, and the lights appear at once.”³²

Technical ignorance as a form of worldly ignorance was a virtue of “good” women, as they invariably were in the professional literature, where encounters with “bad” women were not discussed. Unlike men, women in the stories related by professional journals rarely learned from their mistakes in using technology, or corrected their misconceptions. They were sheltered from all such practical demands by an old and sturdy code of chivalry that required the protection of their ignorance by men. Beneath this habit of indulgence was the more important and even insistent point that women’s use of men’s technology would come to no good end. In keeping with the general portrait of women as impotent, even their most exasperating errors usually had little more consequence than inconvenience to themselves, of which they were varyingly aware, and some slightly larger measure of frustration and inconvenience for their male protectors.

In the picture painted by electrical journals, the model of electric communication that came naturally to women and led them astray was the loquacious oral sociability of their everyday lives. Talkative women and their frivolous electrical conversations about inconsequential personal subjects were contrasted with the efficient, task-oriented, worldly talk of business and professional men. A hypothetical telephone conversation between two women in the *Electrical Review* of 1887 demonstrated the incomprehensibility of the telephone to a feminine construction of the world. The conversation began this way:

Mrs. Wary (at the telephone)—“Hello, hello, Exchange.” After waiting some time without a reply, Mrs. Wary, in more vigorous tones, pipes out “hello.” Still no reply, whereupon Mrs. Wary softly murmurs so that the telephone will not hear her, “Well, I declare, if I don’t believe I forgot to ring. How stupid.” Which was a fact. Mrs. Wary then rings with a vigor and persistence without doubt intended to make up for her previous omissions, and is answered by the exchange.

“Connect me with number—number” (in an aside) “bless me but I’ve forgotten the number,” (she so informs the exchange, but is finally put in communication with her friend, Mrs. Prim, when the following conversation ensues):

Mrs. Prim—“Is that you, Mrs. Wary?”

Mrs. Wary—“Why, of course, it is. How did you happen to call me up, I was just going to call you up. Isn’t it nice.”³³

The women discuss the good looks of several local pastors and gossip about fashion and dressmaking. To experts their conversation is trivial and uninformative, and could be as easily managed face-to-face. At

the end of the conversation their failure to understand the urgent and serious nature of telephone talk is especially clear.

Mrs. Prim—" . . . But what a nice talk we've had. It's a wonder that the horrid girl at the exchange has not shut us off before this time."

Mrs. Wary—"So it is. I've forgotten now what I called you up for, but I guess it's of no consequence, so good-bye."

Women appeared as the parasitic consumers of men's labor in most stories of their electrical ignorance. Many of these stories turned on wives and girlfriends instructed to send telegrams or make telephone calls to reassure those charged with their care of their safe arrival at distant destinations. Predictably, these women failed to understand electrical messages the way their male protectors did, as scarce and expensive commodities. To women, electrical talk was a delightfully extravagant extension of face-to-face intimacy, almost a free good. Men found themselves caught by their obligation to a traditional code in which women were not supposed to understand the stern masculine world of electrical knowledge, while men were supposed to live by its rules. Men were forced either to choose the displeasure of the women they loved or to pay profligate sums incurred by wives, girlfriends, and sisters for lengthy telegrams and phone calls. Chivalry bade them choose the second alternative, and this financial sacrifice, characteristic of modern knighthood, was appreciated least of all by the women for whom it was made.

In contrast to men, women valued conversation that was redundant, frivolous, playful, and abundant. Such excess bespoke an affectionate devotion to their partners, manifested in a generous willingness to communicate. In return, they wanted their male partners to speak to them the same way. For women, instrumental information about the world outside the personal relationship that was the real subject of any electrical conversation was irrelevant. Women regarded the brief, efficient transmissions prized by men as an evasion of the relationship that they assumed it was the point of any communicative exchange to cement.

Men, by contrast, wanted control of all communication conducted through the technology that belonged to them. Rules of expertise that invested the knowledgeable with power over the less knowledgeable transformed stories of women's electrical ineptitude into homilies that justified men's control of women's communication. *Chambers's Journal* published a story from the "infancy" of the telegraph about one

elderly lady's conviction that telegraphy should follow the rules of propriety familiar to her from a lifetime of nontelegraphic communication. The telegraphist at the counter of London Central Station, "to whom it really occurred," received from this lady a sealed, addressed envelope containing the message she wished to send. She was indignant when the clerk opened the envelope, even when he explained that he could not send the message without seeing it. "'Then,' replied the female, in evident ire, 'do you suppose I'm going to let all you fellows read my private affairs? I won't send it at all;'" and therewith she bounced out of the office in high dudgeon."³⁴

From a male perspective, the usual puzzles of communication between the sexes were exacerbated by technological codes that bound men but that women did not respect. Put another way, male control of female communication was justified by women's ignorance, and should have guaranteed it as well. But women often frustrated it anyway. Annie Bifkins Blank, newly wedded and visiting her mother outside Philadelphia, composed and sent her first telegram to her husband, ten dollars collect:

Frog Center, Pa., 2 p.m.—George Washington Blank, 43 Blank Street, Philadelphia—My Dear George: I have just arrived safely without any accident at all; not the slightest. The train slowed up at Jinks crossing and whistled, but I don't think anything serious was the matter. It made my heart jump to think how you would feel if anything had been the matter, you know, but there wasn't, not a thing, so far as I could find out. I got to thinking of you and might have been carried past my station if Cousin Will, the one you used to be so jealous about, you know, hadn't been on the train. He is visiting at mother's, and is handsomer than ever. He says he hates you, but of course, that's only fun, you know. I forgot to say that my trunk came through all right. It was no trouble at all. Cousin Will took my check and arranged to have it (the trunk, you know) hauled up to the house. It will have to be taken around by the mill because the other road is blocked up, you know; but, you know, that will only take a few minutes longer than by the other road—the one that is blocked up, I mean. Well, I must close this dispatch, because telegrams have to be short, you know.

Your loving wife,

Annie Bifkins Blank³⁵

A similar story in the *New Orleans Times-Democrat* chronicled a broken engagement that resulted from a telephonic misunderstanding. It was told, as most of these stories were, from the masculine point of view:

"I was in Atlanta a few weeks ago and called up my fiancee in Macon to let her know when to expect me. The service costs 50 cents for three minutes, and I calculated I could deliver my message in about 14 seconds. But after I gave the dear girl the date she insisted on holding me while she told about a lawn fête that some of the young people were getting up for the next day. I wriggled and writhed, and after she had imparted \$2.50 worth of details I broke in and told her that somebody else wanted to use the 'phone. 'O no, they don't,' she replied, 'the operator here says you may have it as long as you wish,' and on flowed the legend of the lawn. She told me how all the girls were going to be dressed, what they had cooked for lunch, and how Annie Jones had refused to go with Billy Smith, because it was rumored that Billy played cards on Sunday. I groaned. I had been stuck for about \$7, and time was flying at the rate of 16 2/3 cents a minute. 'What's the matter?' she asked anxiously: 'you don't seem interested.' 'Yes, I am,' I said, with perfect truth: 'I am weighing every syllable.' 'Then repeat what I have been saying,' she ordered; 'go all over it and don't miss a word.' That was too much. I yelled: 'Ring off!' and banged the receiver on the hook. Next day I got a package from Macon, returning the engagement solitaire. There was a sarcastic little note in which she said she thought my suggestion about the ring was excellent and had acted upon it at once. Plague take long-distance 'phones! I never want to see one again in my life."³⁶

If women of fallen reputation did not exist in the electrical press, women of uncertain reputation did. Not by accident, most of them held jobs in which they operated new technology. Women were most acceptable in the labor force as austere heroines in the pioneer mold, or as devoted servants of indulgent male overseers. Otherwise, they appeared as intruders of dubious ability and fragile reputation. Either they were obedient and servile, no threat to the male world in which they moved, or they skirted the very edge of sexual propriety, a condition that released the men around them from responsibility for their welfare.

An article that instructed readers about how to recognize women telegraph operators out in the Wild West, the symbolic boundary of civilization, where the pressures of savagery against the social virtues represented by women were strongest, typified stories of women workers with selfless and saintly characters:

Far out on the western plains, wherever there is a road station, almost invariably the traveler sees a pretty lace or muslin curtain at the window, a bird cage hanging up aloft and some flowering plants on the narrow sill, or a vine trained up over the red door . . . and if he looks

out as the train stops he will be nearly sure to see a bright, neatly dressed, white-aproned young woman come to the door and stand gazing out at the train and watching the passengers with a half-pleased, half-sorry air. This is the local telegraph operator, who has taken up her lonely life out here on the alkali desert amid the sage brush, and whose only glimpse of the world she has left behind her is this brief acquaintance with the trains which pass and re-pass two or three times during the day. These are true types . . . of our brave American girl.³⁷

The woman who, unlike, renounced the world or chose to remain isolated in her profession distanced herself from ordinary talkative women, and also did not interfere with men.

Equally virtuous was the woman who joined the electrical work force on account of reversed circumstances, who had something better in mind for herself but was the victim of a fate beyond her control, a situation ripe for rescue by men. A common theme in popular magazine fiction was the lone woman forced by circumstances, met bravely and with cheerful pluck, to make her way as a telephone or telegraph operator. At this labor she captured the heart of a good man who wooed her from that unsheltered and risky occupation to become his wife. Mention was often made of her aspirations to a more dignified station, though she seemed powerless to achieve it herself. "But surely," a Western Union manager in an 1897 short story advised a young woman who had applied for work to support herself and her widowed mother, "with your accomplishments you do not need to be a telegraphist." His applicant, a lady of the better class, replied, "My accomplishments, although expensive to buy, are not very saleable on the market."³⁸

Women entered the technical world at the sufferance of men. Over and over it was made clear that they were not the help they should have been. A characteristic anecdote in the *Somerville* (Massachusetts) *Journal* concerned an imaginary conversation between Mr. and Mrs. Brown on the subject of telephone operators, the most visible female workers in the electrical industry. Why, asked Mrs. Brown, predictably the less well informed of the two, were telephone operators usually women? Mr. Brown answered:

The managers of the telephone companies were aware that no class of employees works so faithfully as those who were in love with their labor, and they knew that ladies would be fond of the work in telephone offices.

"What is the work in a telephone office?" Mrs. Brown inquired further.

"Talking," answered Mr. Brown, and the conversation came to an end.³⁹

According to male testimony, women workers could not cast off the orality to which they were inclined and which made them unfit for responsible work in serious environments, though their failings were tolerated with more or less good humor by the men around them. "With a telephone and a wife a man ought to hear all that's going on," joked the *Danbury News* in England.⁴⁰

"Telephone girls in Chicago look black over an order to dress in uniforms of that sable color," said the Judge.

"No wonder they object to black. Yeller would be more appropriate for a telephone girl's uniform," replied the Major.⁴¹

The exchange room of the Hudson River Telephone Company was where, the *Albany Journal* exclaimed, "15 girls chew gum and chatter all day long. What noise they make!"⁴² The oral behavior of these women was the only topic of note, despite their manifest skills as exchange operators performing a range of social and mechanical tasks. Chief among them was speaking to subscribers, accusations of frivolous speech to the contrary. These workers seemed to be doing what women did best and what, judging from the way they were presented, was the only thing they could do in any case—talk. Such stories confined women's skills to an oral arena that at no point encroached on the male prerogative of technological literacy.

The power of the female telegraph operator was also carefully circumscribed. "She will sometimes have about her a number of subordinates of the opposite sex in the form of callow youths and messenger boys," explained the *New York World*, "over whom she queens it with a right royal will and an air of authority that is charming to behold." So long as it was charming. The *World* could indulge the female operator in her command of males who were not yet men, but drew the line at exhibitions of genuine power. "Generally these young women are very pleasant and obliging; only occasionally will one come across a terror, whose very look will freeze him to the marrow."⁴³

A contemporary portrait of the telephone girl described her as "pretty—of course she is—she dresses with nice taste." On account of her lovely smile, she did not deserve the wrath of the "old fossil" she had inadvertently connected to an undertaker when he asked to speak to someone at the bank. This story, and many like it, cloaked the verdict that the telephone girl did her job badly in compliments to her femininity. And why not, since her job skills were less important

than the persuasiveness of her feminine charm. Unable to be taken seriously for her technical skills or her “curious” political comments (which were not, it seemed, her own conclusions, but gleanings of overheard conversations), what she did know derived as usual from her special oral skills:

She can tell you if she wants to on what night last week young Smith’s baby was taken sick with the colic, and how the worthy *pater* could not be found, but was finally discovered with a congenial party indulging in the fascinating game of draw-poker. But she won’t tell you this if she is a sensible girl—which she is.⁴⁴

Put to proper use, her skills guaranteed the social order desired by males. An exception was the domain of male language, where the telephone girl was an impediment to the male fraternity. If she were unable immediately to discharge an impatient request, “the man who is in a hurry swears softly to himself, forgetting that he is near the transmitter.” Such transgressions resulted often enough in fines, or, if the culprit persisted, the withdrawal of the instrument by the phone company.⁴⁵ Male expectations of both linguistic freedom and efficiency yielded to the delicate sensibilities of women, whose technical clumsiness was the physical equivalent of moral unworldliness.

The telephone girl was generally not so fragile, and more often depicted as a woman of ambiguous social status. Though frequently in need of protection from predatory males, she was also bound to be at their mercy by the service nature of her work. On the other hand, she was independently employed, saucy in her pursuit of the slightly racy recreations of the young and unobligated, and possessor of a free-floating social identity that was particularly suspicious in women. In short, she was in need of control. Her voice, symbol of both her work and her gender, was the handiest extension of her for that purpose. “A gentleman of fine ear, who uses the telephone frequently, suggests to us that it would be a good thing to give the exchange operators a few lessons in elocution, so that they might reply to calls with less nasality, shrillness and snappiness of utterance,” cautioned *Electrical World* in 1885, doubting that the class of women employed could speak correctly, or up to the standards of middle-class subscribers.⁴⁶ Such lessons might have the additionally desirable moral effect of enticing vulnerable operators from that “special detestation . . . the attractive skating rink.”

If working women managed not to transfer inappropriate oral models to electrical communication or to make ignorant or careless mistakes

as telegraph and telephone operators, their decision to enter the world of electrical technology was sure to disappoint them in some other way—unless they were rescued in time to return to their appropriate role outside it. In the early nineties, a platonic friendship between a telegraph operator stationed at Banning, California, and another at the small desert outpost of Yuma, Arizona, blossomed into a romance when the Yuma operator fell ill and the Banning operator arrived by train to nurse him back to health with traditional female skills. “I, like a fool, had always taken it for granted that she was a man,” the male half of the drama and the voice of the story explained. Marriage followed, and the Yuma operator’s comment: “The Southern Pacific has lost an operator, but I calculate that I am ahead on the deal.”⁴⁷ Loss of love was an occupational hazard for less fortunate women. An English version of the French play *La Demoiselle du Téléphone* turned on the fantasy of “a telephone girl in the execution of her duties over-hearing her lover making an appointment with a music hall ‘artiste.’”⁴⁸

The drama of women’s place on the stage of men’s technology was constructed and reconstructed as consistently in electrical journals as elsewhere in society. Much of the romantic poetry featured as light filler in electrical journals metaphorically identified women with technological objects, both of them properly under male control. Graceful tributes flattered women to assert male dominance, in marked contrast to cruder displays of verbal or physical force that kept in line other underclasses, less likely to cohabit with men and requiring a different strategy of control. Called upon at a Minneapolis meeting of the National Telephone Association to acknowledge the ladies escorted by the male membership, W. H. Eustis, a prominent Minnesota lawyer, telegraphic entrepreneur, politician, and philanthropist, lavishly praised “woman the perfect telephone, the gift of gods to man.” Both woman and the telephone were “inventions” second only to man himself. Sent down to please man, both woman and the telephone were mistaken for toys and turned out to be necessities. Just as a man filed a caveat and then a patent on his invention, “So when a man becomes interested in one of the fairest of American belles he becomes ‘engaged’ or ‘files his caveat,’ and ‘serves notice’ on all the rest of the fellows to ‘hands off.’ By and by the priest gives him his ‘patent’ and then he thinks he is all right for life.”⁴⁹

Endless stories of women’s unpreparedness and incapacity in a world of technical expertise time and again demonstrated the reassuring conclusion that women would always depend on male prowess to

conquer the world for them, however irritating their ignorance as the price of male mastery. The achievement by women of technological power, however modest, was shown repeatedly to have gone astray. Electrical journals depicted a stable sexual social structure in an otherwise uncertain, competitive world in which expert men might expect to bear the more difficult burden, but also the greater privilege of power, for a long time to come.

Endless variations on women's capacity to disorder a mode of communication thought to be ordered by an ineluctable natural law that males observed and enforced did have complementary comic relief in stories about nonexpert males who were befuddled by electric communication. Unlike expert men, they had no special information to communicate by telephone. Unlike women, they had no reserves of small talk on which to draw. *Tit-Bits* printed a story in 1897 about two male friends who found the telephone puzzlingly superfluous:

"Halloa Fletch! Do you hear me?"

"Yes."

"This is Sid. Thought I'd call you up."

"Glad to hear from you, Sid. How are you?"

"First-rate. How's things?"

"Calooshus. What's new?"

"Oh, nothing especially. Hadn't anything to do, you know, and thought I'd call you up."

(Pause.)

"Yes." (Another pause.) "Everything going on about as usual in the old town?"

"Yes, about as usual." (Pause.) "Awfully warm up here to-day. What kind of weather are you having?"

"Fine. Splendid weather."

(Pause.)

"Get the letter I wrote to you the other day?"

"Why, yes. Don't you remember I answered it?"

"So you did. I forgot." (Pause.) "Do you have any trouble hearing me?"

"Not a bit. Can you hear what I say?"

"Oh, yes." (Pause.)

"Well, how are you getting along?"

"First-rate. Anything—er—new going on?"

"No. Things are about as usual. It's—h'm—beastly warm here. Weather's fine where you are, is it?"

"Splendid."

(Pause.)

“Well, I must be going now. Awfully glad to have had a chance to talk to you, old fellow.”

“Glad you called me up.”

“Good-bye!”

“Good-bye!!”⁵⁰

Electrical Deception and Coercion

A proud and public component of professional identity was the integrity of the electrician who served no master but truth. Earnest stories of exceptional personal and professional honesty abounded in electrical journals. This important theme was rarely challenged, for intentional deception by professionals charged with responsibility for complex technical systems could imperil both human safety and public trust in the expert knowledge on which that safety rested. The belief that orderly nature would exact swift and unerring retribution from any electrician who ignorantly misjudged or arrogantly misrepresented his expertise was thought to guarantee professional probity. Electricians disciplined by science, it was claimed, could not be misled by personal or political motives. On the contrary, the lofty standards of their profession endowed them with general moral authority in human affairs. In 1898 E. G. Prout expounded on this theme to the newest graduates of Stevens Institute of Technology as they prepared to tackle the world's tasks:

For some generations . . . natural depravity has been left to ministers, lawyers, editors, teachers, the mothers of families, to anyone, in fact, but the engineer; and this is where society makes a mistake. The best corrector of human depravity is the engineer. . . . Nature, calm and unrelenting, always stands looking at him. No other man in the world has such stern and unceasing discipline, and so it comes about that no other man is so safe a moral guide as the engineer, with his passion for truth and his faculty of thinking straight.⁵¹

Though experts appealed to the purity of professional integrity to justify their claim to public trust, they did not feel bound to exercise that integrity in their relations with stigmatized groups. Nor were they concerned about the contradiction this posed to their claims of scrupulous professional honesty. Unselfconsciously reported instances of deception and intimidation were treated as humorous and even praiseworthy when practiced by experts on outsiders, but were outrageous and intolerable impertinences when exercised in the opposite direction.