

Copyright
by
Paul Alton Gansky
2016

The Dissertation Committee for Paul Alton Gansky certifies that this is the approved version of the following dissertation:

III Communication: Designing Media, Preventing Risks, and Defining Responsibility

Committee:

Shanti Kumar, Supervisor

Randy Lewis, Co-Supervisor

Brett Caraway

Caroline Frick

Sharon Strover

**III Communication: Designing Media, Preventing Risks, and Defining
Responsibility**

by

Paul Alton Gansky, B.A., M.A.

Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

May 2016

Acknowledgements

This dissertation was the most challenging undertaking I have yet encountered. There is no way to sugarcoat the bewilderment, melancholy, and plain old fear that I routinely felt as I typed, scribbled, and dashed through libraries, archives, and databases in a quest to comprehend the worlds of healthcare, industrial design, and communications media. I owe my dissertation's completion to the incredible advice and unfailing good humor of my two dissertation advisors, Shanti Kumar and Randy Lewis, and my stellar committee members Brett Caraway, Caroline Frick, and Sharon Strover. Collectively, these scholars allowed me to pursue a rather exploratory project (to put it mildly). They helped me to focus my many intellectual tangents, strengthen my writing, and create a cohesive historical investigation into the byzantine, intersecting worlds of healthcare, communications media, and industrial design. I thank each of you for accompanying me in this process. You'll never know how much it meant to talk with each of you, and receive your notes of encouragement.

The Graduate School at the University of Texas at Austin provided the necessary funding to make this dissertation a reality. Through a generous Dean's Named Fellowship that arrived at just the right time, I was able to concentrate my energies on revising and finishing the dissertation. While the university provided the bulk of financial support, I am also deeply indebted to Glenn and Paula Foore, proprietors of Springdale Farm in Austin, TX, who took me on as the world's most

unlikely farmhand. They allowed me to eat incredibly well, and provided a sanctuary away from the often-overwhelming writing process, reminding me that life existed well beyond graduate school. Every time I look at the first paragraph to Chapter 3 of this dissertation, I think about a fried duck egg sandwich that made those words come together.

Two outstanding archivists also made this dissertation a possibility. I credit Bill Caughlin at the AT&T Archives and History Center in San Antonio, Texas for persuading me to study the material design of telephone handsets. His impeccable presentation of AT&T's internal documents, prototypes, photographs, films, and delightful errata proved to me that pay phones in particular deserved a comprehensive historical survey. Jody Georgeson at the Telecommunications History Group in Denver, Colorado also warrants praise. She provided numerous key documents upon which my project depends, always managing to locate a crucial product catalog from 1912 or working note from 1973 that I needed. She also embraced this project during its troubled infancy when it consisted vaguely of an interest in the "hygiene and sterilization of phones" and "bad weather," as my first email to her attests.

Three final individuals were intimately involved in the writing of this dissertation, and they proved to be its lifeblood. My brother Andrew Gansky transformed into no less than a curly-headed Virgil as I careened into the depths of research several years ago. At every fiery circle that I reached intellectually, emotionally, and psychologically in the process, Andrew was there. It's difficult to

properly convey the lifetime we spent enduring the sweltering Austin heat, both looking grimly philosophical and a little rangy, hashing out new strategies to tackle this seemingly endless project.

My parents Alton and Amy Gansky deserve the highest honors, however. Their belief in this project was unfailing. They read and annotated every page I wrote (multiple times), uncovered an astonishing array of news articles, television segments, books, and even cartoons on design, healthcare, and cell phones nearly every week, and they steadied me every time I thought I'd reached a precipice and could go no further. I count them fully as co-authors of this research.

III Communication: Designing Media, Preventing Risks, and Defining Responsibility

Paul Alton Gansky, PhD

The University of Texas at Austin, 2016

Supervisors: Shanti Kumar and Randy Lewis

Abstract: This dissertation investigates how health risks have historically affected the design of communications media in the United States. Concentrating upon the telephone from 1888 through 1913, and the cell phone from 1970 through 2003, I explore how these media intersected with three epidemic risks: tuberculosis in the early 1900s, coronary heart disease in the 1970s, and electrosensitivity from the 1990s through 2003. At these junctures, I examine three social groups – physicians, industrial designers, and everyday users – who attempted to influence the design of phones and determine if institutions or individual citizens would primarily prevent these health risks. This dissertation suggests that due to their socioeconomic status and professional expertise, physicians and designers were most effective in altering telephones and cell phones. They subsequently framed the prevention of health risks as the responsibility of individual users. This dissertation argues that such design decisions were shaped by strong social prejudices, specifically a desire to limit communications media use among poor and ethnic minorities in the U.S., a desire to reinforce the health of wealthy white users, and a desire to centralize authority over

the identification and treatment of disease, as well as the process of design. However, the individualization of responsibility pursued by physicians and industrial designers may have produced an unintended effect, helping to generate considerable fragmentation at the intersections where communications media, design, and health risks meet. This dissertation plumbs the ramifications of physicians' and designers' work by surveying a community of everyday media users who challenge medico-technological authority, articulating undiagnosed health risks and designing unsanctioned forms of prevention.

Table of Contents

Introduction: Risks, Media, and Responsibility.....1

BIOLOGICAL RISK

Chapter 1: The AT&T Public Telephone, Tuberculosis, and the Price of Prevention.....54

Chapter 2: The Motorola DynaTAC, Coronary Heart Disease, and the Burden of Empowerment.....93

TECHNOLOGICAL RISK

Chapter 3: Electrosensitivity, Cocoons, and Free Zones.....126

Chapter 4: Electrosensitivity, Sanctuaries, and Psychological Adventures.....165

Conclusion: Sketches for Continued Inquiry.....198

Notes.....207

Bibliography234

Introduction: Risks, Media, and Responsibility

In October 2015 I was waiting for a train in Manhattan when I spotted an advertisement of a young white man in red underwear. With his cowlicks and cartoonishly straight arms and legs, he resembled a Lego character. The childish portrayal was at odds with the questionable activity the young man was engaged in. With one hand, the man held open his underwear. With his other hand, he snapped a picture with his cell phone, intent on capturing something ailing him below the beltline. He looked completely comfortable using his phone to broadcast his unseen, intensely private discomfort.

The tagline offered an explanation. “The Doctor Will See You Now,” it quipped. A subtitle continued, “Share photos with a doctor. Get diagnosed. Confidentially, of course.” The advertisement, created by a fledging health insurance company called Oscar, connected with its immediate audience. Many New Yorkers around me chuckled at the sign. Some snapped pictures. In low voices, others mentioned signing up for the insurance, which encourages subscribers to use cell phone-based software applications or “apps” to self-monitor and prevent health risks. (At present, Oscar internally estimates that it has attracted twelve to fifteen percent of the people individually insured in the state of New York).¹

Other passersby simply stared, their faces a mixture of curiosity and quiet unease. They seemed to be wondering, *is this what healthcare in the twenty-first century looks like?*

I could not suppress my growing disgust with Oscar's ad. The brazenness of the depiction didn't bother me so much. New York ads take delirious delight in being off-color. What unsettled me was the sense of individual responsibility in Oscar's advertisement: an isolated figure in a void, caring for an intimate health issue using nothing other than a cell phone.

From my point of view, there is little humor to be found at the meeting ground between individual citizens, consumer media, and health concerns. Whenever these three subjects coalesce, I think immediately of my many friends and family members who not only struggle with chronic, debilitating illnesses and disorders, but also strive to care for themselves in a punishingly individualistic American culture. This is a culture in which a person cannot access even the most prosaic medical support without first securing health insurance, a daunting, complicated prerequisite that can dramatically affect a person's financial stability while often offsetting only a fraction of the costs for medical services.

This is also a culture in which communications media might function as a kind of last resort. Despite their high-tech sheen, these media may offer little in the way of efficiency or clarity when it comes to matters of health. Instead, they may more often provide a point of access for uninsured and underinsured people to wade through

medical information of varying quality, hoping to seek insight into how to handle health conditions. This usage of media stands in sharp contrast to the promise peddled by Oscar's ad, which touts the cell phone as a fun, easy, empowering way for individuals to receive aid from medical professionals, and thereby secure institutional support.

Remarkably, the individualistic construction of healthcare is nothing new. Indeed, this pervasive approach to health practice is so rooted in the U.S. that sporadic initiatives for a more collective, collaborative, social health system have been denigrated as unnecessary charity. Envisioning the health of citizens as an inalienable right – rather than a luxury or a commodity – sounds quaintly utopian, as does suggesting that healthcare could operate beyond market forces like Oscar health insurance, and inhabit a sphere in which citizens and medical professionals share knowledge, resources, and services in a more equitable, collaborative atmosphere.

This unremitting, unexamined tendency towards self-reliance in healthcare underpins the following project, *Ill Communication: Designing Media, Preventing Risks, and Defining Responsibility*. In my work, a series of historical narratives unfolds, each involving a combination of communications media and health risks and responsibilities. The narratives do not follow a traditional causal structure, in which the cell phone instigates an increasingly individualized approach to healthcare, for example. Rather, in each of the stories I tell nascent forms of media and emerging bodies of medical knowledge collide with fundamental gendered, racial, and economic

prejudices that reinforce the individual burden American citizens have long borne in the prevention, diagnosis, and treatment of health risks.

The enduring nature of this issue is masked in part by the continual development and introduction of media forms. Oscar health insurance, for instance, touts itself as a member of a so-called “new health economy” built around cell phones, which has mushroomed since 2009 in the United States.² At present this \$26 billion health market, alternately called “mobile healthcare,” “mhealth,” or “DIY health,” comprises well over forty thousand healthcare applications.³ These can be downloaded via cell phones and used either for free, a one-time fee, or through a paid subscription that varies between ninety-nine cents and fifteen dollars a month. (These prices do not count hardware add-ons like electronic wristbands that average one hundred to two hundred dollars).⁴

Roughly twenty percent of “apps” are “provider-focused,” meaning they supplement or replace existing medical technologies that intravenously deliver drugs to patients, for instance.⁵ The substantial majority of apps, however, are “patient-focused.”⁶ These are designed to emphasize an individual’s power to prevent biological risks before they require costly diagnosis and treatment. Forty-one percent of these apps provide personalized advice on eating and dieting.⁷ Eighteen percent promote exercise. A final eighteen percent offer informational services to help individuals self-diagnose biological risks such as coronary heart disease (or the affliction bedeviling the young man in Oscar’s advertisement).

Designed for individual consumers, cellular health apps enjoy resounding corporate approval in the U.S. In their 2014 executive summary to the healthcare industry, the Health Research Institute at PricewaterhouseCoopers, one of the “Big Four” American business consulting firms, proclaims that consumers are hungrily acquiring “high tech personal medical kits” through their phones.⁸ Such innovations, PricewaterhouseCoopers believes, will not only empower individuals to “diagnose illness, flag early signs of trouble, and allow recovery and rehabilitation to occur closer to home” (a process partly evoked in Oscar’s ad).⁹ Cell phone apps could also fundamentally redefine health responsibilities, enabling “consumers to take charge of more of their own care, even becoming co-creators of their personal health plans.”¹⁰

Users of cell phone health apps are not the only winners in this “new health economy.” If the titanic responsibility for preventing, diagnosing, and treating health risks can be transferred to individuals through communications media, PriceWaterhouseCoopers estimates that the 2.8 trillion-dollar demand for institutional health services can be effectively diminished.¹¹ The possibility of cutting costs lends cell phone-based healthcare an unmistakable appeal, particularly for business-minded publications like that of PriceWaterhouseCoopers.

PriceWaterhouseCoopers are far from the first to imagine individualizing healthcare. Nor are entry-level contenders like Oscar health insurance ahead of the curve with their sly take on this issue. Medical historian Rose Galvin argues that the individualization of health responsibilities has been a large-scale political and medical

project since at the late 1800s at least. In the U.S. this project has become evermore refined, reaching an early peak in the mid- to late-1970s. Galvin reveals that conservative medical practitioners and federal policymakers in this era believed an epidemic of immorality was afoot, typified by alcohol and illicit drug consumption, smoking, sexual promiscuity, poor diet, and lack of exercise.¹² Such “consequences of an affluent lifestyle” were allegedly devastating Americans’ health, causing unprecedented medical expenses.¹³

A medical and governmental imperative resulted, which Galvin argues coincided with the broader political economic doctrine known as neoliberalism in the U.S. The imperative encouraged citizens to regard healthcare as their personal “obligation” or “duty,” rather than something they could count on institutions providing.¹⁴ As Galvin writes, this new obligation reinforced an enduring, mythic American “image of the ‘good citizen’ as someone who actively participates in social and economic life, makes rational choices, and is independent, self-reliant and responsible.”¹⁵ Healthcare therefore became less about a medical system that diagnosed biological risks, prescribed methods of treatment, and provided facilities, technologies, and personnel for care. Healthcare instead became defined from the 1970s onward as a personal process of making “good” choices in every aspect of life, preventing illness and minimizing the need for expensive institutional support, Galvin concludes.¹⁶

Galvin offers an excellent prompt for contemplating the individualization of healthcare, an arrangement that continues to be promoted by companies such as PriceWaterhouseCoopers and Oscar. Yet her theoretical overview leaves many questions unresolved. Did social groups beyond medical practitioners and policymakers participate in this transformation of healthcare? What biological risks – or diseases – were each social group attempting to prevent? Were their motivations purely moral and financial, or were specific social prejudices at work? Additionally, what have been the consequences of persistently treating healthcare as an individualistic enterprise? And how were communications media integrated into this profoundly deep-seated way of preventing risks and sustaining wellbeing in the U.S.?

These questions guide my project. Expanding upon Galvin's inquiry, this dissertation points out that the 1970s is not the only formative era worth studying. Nor are cell phones the only communications media worth examining. In fact, since the beginning of the twentieth century a variety of media have accentuated the individualization of health responsibilities in the United States. Rather than relay this history in its entirety, my dissertation zeroes in on several emblematic case studies. Concentrating on the telephone from 1888 through 1913 and the cell phone from 1970 through 2003, I map how these media intersected with three epidemic health risks: tuberculosis in the early 1900s, coronary heart disease in the 1970s, and electrosensitivity beginning in the 1990s.

At the intersections where telephones, cell phones, and risks meet, I examine three social groups – physicians, industrial designers, and everyday users – who explicitly attempted to influence the design of phones. In so doing, each group’s objective was to shape how health responsibilities were parceled out in the U.S. Among these three groups of actors, I argue that due to physicians’ assumed medical expertise and designers’ embedded position in the communications industry, these two groups have been most effective in altering communications media design – especially at AT&T and Motorola, the largest respective manufacturers of telephones and cell phones in the world from the 1890s until roughly 1994.

In turn, physicians and industrial designers helped construct communications media that framed the prevention of tuberculosis and coronary heart disease as individual responsibilities. Their work comprises the first half of *Ill Communication*. Such individualized media, I argue, operated around strong social prejudices. In the early 1900s, physicians urged AT&T to design public telephones that would segregate different classes and ethnicities of users, and prevent wealthy whites from contracting tuberculosis. For their part, designers at Motorola in the 1970s constructed cell phones solely to persuade wealthy, white businessmen to alter their lifestyles and prevent coronary heart disease. In each case, physicians and designers helped tailor media for users whose social status and economic privilege made it feasible to “individually” care for themselves.

At the same time, physicians and industrial designers discounted the unintended health risks that many users encountered from communications media. In *Ill Communication's* second half I examine a controversial condition called “electrosensitivity.” The illness consists of symptoms ranging from migraines to chronic nausea to cancer – all allegedly caused by cell phones. In the face of this technological risk, we will see how physicians and designers invalidated the existence of electrosensitivity. They insistently defended phones as a positive force in healthcare, which will feasibly allow individuals (such as Oscar’s underwear-clad young man) to care for themselves. As a result, physicians and designers helped create a marginalized population of “irrational” media users who lack institutional acknowledgement or aid. They must resolve any unintended technological risks on their own. Self-care, as I reveal by the end of my dissertation, means designing media-free “sanctuaries.”

As I argue throughout this dissertation, therefore, individuals remain responsible for preventing biological and technological risks. This unequal set of circumstances reappears within many discrete eras including the 1910s, the 1970s, and the 1990s in the U.S. It reinforces a hierarchy of medico-technological authority between distinct social groups, and it is pursued across a range of health risks – some medically verified, others still controversial. Lastly, individualized healthcare is deeply enmeshed with the design of communications media.

While I discuss *Ill Communication* at greater length in the following pages, I want to consider scholarship on the intersection of communications media and healthcare. I first analyze preexisting work on the relationship between physicians and telephones. In two subsequent sections I examine scholarship about industrial designers, everyday users, and cell phones – three communities of people I’ve chosen to include in this dissertation due to their involvement in the act of design as well as the practice of risk prevention.¹⁷ In all three sections I foreground how each group attempted to design telephones or cell phones in order to assign responsibilities for preventing tuberculosis, coronary heart disease, and electrosensitivity.

Throughout these sections I will clarify “design” as a social process involving competing groups of people who inscribe social, industrial, and medical values into the material form of communications media. From there, I will discuss the social construction of technology methodology that structures this dissertation. Finally, I will summarize *Ill Communication*’s four chapters, reiterating the main theme of this dissertation: how an individualistic approach to healthcare intersected with the design of telephones and cell phones in the U.S.

Physicians

Communications media and individualized healthcare have not always been considered such close bedfellows. In fact, the earliest scholarship connecting media to healthcare suggests quite a different reading. As this section discusses, telephones

have historically been characterized as improving the work of physicians and increasing *collective responsibility* for healthcare. *Ill Communication* suggests another narrative developed concerning telephones, however. Drawing upon media historian Carolyn Marvin's theory that "new" media are socially constructed to reinforce preexisting prejudices, I demonstrate that physicians helped design telephones to privilege the health of wealthy whites in the early 1900s. They consequently framed the prevention of biological risks as a costly individual responsibility.

In contrast to my work, sociologist Sidney Aronson remains convinced that telephones collectively enriched medical services. This process, he argues, began with the telephone's technical emergence around 1876. By improving communications within the medical establishment, expanding physicians' scope of service geographically, and increasing their compassion for patients, the telephone strengthened a collective form of healthcare in the U.S., Aronson reasons.¹⁸ His argument, encapsulated in a pioneering study he published in 1977, still stands as one of the only sustained historical accounts that has attempted to excavate the long relationship between telephones and healthcare.

From Aronson's rather lofty perspective, as we will see, telephones seemed to help realize a recurring dream of healthcare as a practice that the medical establishment, communications media, and patients would collaborate and improve upon. Bioethics scholars Ruud Ter Meulen and Hans Maarse explain that such a fantasy of healthcare imagines that the medical establishment will use new media to

manage the biological risks citizens encounter – all without any apparent financial incentive. In this fantasy, health risks are socially constructed as “universal biological or psychophysiological entities,” rather than the result of poor personal choices or immorality.¹⁹ As anthropologist Stuart McClean argues, health risks exist in this framework beyond individual “self-control and self-mastery.”²⁰ Institutions therefore ideally adopt a “benevolent attitude” in helping people prevent, diagnose, and treat risks, Meulen and Maarse note, taking “collective responsibility for the wellbeing of the weakest and most vulnerable groups in our society.”²¹

A collective, collaborative approach to healthcare in the U.S. has been (very occasionally) attempted by easing the financial barriers to medical aid for large sections of the population. As professor of social medicine Jonathan Oberlander points out, a principal example is the federal initiative Medicare. Enacted in 1965 in the U.S., Medicare was designed to protect all tax-paying senior citizens (and eventually, it was hoped, *every* U.S. citizen) from the costs of hospitalization and physician services.²² Medicare therefore positioned the government as the primary entity responsible for connecting individual citizens to healthcare, Oberlander argues. The elderly, forty-seven percent of whom lived in poverty in the 1960s, were identified as “deserving of government help and in need through no fault of their own.”²³ Their state of health was treated as a social and state project, rather than an individual concern.

Aronson argues that a collaborative approach to healthcare was not only achieved financially in the U.S. It was technologically influenced as well, starting in

1876 through 1910, as the number of telephones in the U.S. exploded from 3,000 to well over 1,356,000.²⁴ In these first three decades, physicians used telephones to organize their medical services geographically – especially in rural locations, according to Aronson. Physicians could also exchange practical advice, elevating collective knowledge of their profession. As a country doctor included in Aronson’s survey wrote in 1888, the telephone reconfigured his partnership with another physician on these terms. “Though five miles apart, we are able so to arrange our work each morning as to obviate the necessity of going over the same ground – a distinct saving not only in horseflesh, but in time and personal fatigue. Moreover, the telephone is available for prolonged social or professional conference by day or night,” the doctor wrote.²⁵

From this evidence Aronson suggests a larger social and medical transformation was underway. The telephone permitted physicians to spatially reorient and streamline their practices, while deepening one another’s knowledge – all for the substantial benefit of a broad ‘public’ body requiring care. As Aronson’s example attests, even people isolated geographically could now receive modern medical attention. The telephone seemed to underwrite an increasingly “fair distribution” of services – reflecting a form of healthcare balanced between individual and institutional activity, as Meulen and Maarse point out.²⁶

Aronson’s work offers a medical spin on common speculations about the telephone’s social and geographic effects. As sociologist Claude Fischer states, one of the most popular theories about the telephone is its ability to alter the general

relationship between work and location by erasing the “friction of space’ – the time and cost of crossing distances.”²⁷ Fischer explains that this theoretical effect seemed to especially extend into remote areas, “allow[ing] rural people to overcome isolation” and permitting cultural advances by providing a technological “antidote to provincialism.”²⁸ I am not only interested in the lack of primary evidence for such sweeping claims, as Fischer is. I will discuss momentarily how these perceived effects of the telephone elide an unresolved concern: that the telephone was actually constructed according to physicians’ social prejudices. Rather than increase providers’ scope of care, the telephone by design reflected individualized responsibility for preventing biological risks.

As Aronson hypothesizes about the transformation of medical services, he argues that the telephone also allowed patients to remain emotionally and socially supported as they battled illnesses. According to Aronson, as early as 1885 physicians popularly viewed the telephone as a “companion for the sick and their friends in case of infectious disease” such as tuberculosis, which caused twenty-five percent of the deaths annually in the U.S. through the 1910s.²⁹ A doctor included in Aronson’s work wrote about the telephone’s influence on emotional health in detail in 1885. “All of us must have felt the heartaching anxiety of longing to hear the voice of a dear friend when either ourselves lying on, or the friend being confined to, a bed of sickness. The comfort of hearing the voice, with all its intonations, in such a case, does not need to be described in a word,” the doctor stated.³⁰

Consequently, Aronson writes that U.S. physicians sought to implement bedside telephone services in hospitals, framing the medium as a therapeutic social instrument. This development, he argues, evinces the collective responsibility physicians felt for patients' health. It suggests that physicians imagined a humane, supportive relationship between institutional healthcare, the design of telephones, and everyday people.

For instance, Aronson explains that physicians demanded that phones be designed according to the weakened abilities of tubercular patients. As the doctor stated in 1885, "It is indispensable that they [telephones] should be made as to communicate the faintest whispering sound, so as to require no sort of effort on the part of the speaker, and they should be provided with mouth-and-ear pieces so light as to admit their being held by a weak and trembling hand."³¹ By focusing on this example, Aronson casts physicians as benevolent guardians of health, and socially responsible design consultants for communications media. They tried to amend the telephone's material form to embody a medical system of outstanding attentiveness and care.

The narrative Aronson weaves is colorful. However, his selection of evidence – and his failure to interrogate the social identities of physicians – calls his argument into question. Aronson relies entirely on essays penned by doctors published in the medical journal *The Lancet* from 1876 through 1975. Although a leading forum for discussion in the medical field internationally since 1832, *The Lancet* as a single source

offers a narrow, self-serving interpretation of the historic relationship between physicians, communications media, and the prevention of biological risks.

In addition to a thin set of evidence, Aronson fails to identify *who* these many physicians were, and how their race, class, and gender – and the shifting cultural status of their profession – might have influenced how they defined, used, and helped design telephones. I pose each of these questions in the first chapter of *Ill Communication* and pursue them through a broader range of evidence: multiple medical journals, popular advice literature and pamphlets created by physicians and telephone manufacturers, as well as newspaper coverage and federal hearings concerning telephones and the prevention of tuberculosis. I arrive at a different conclusion as a result. In practice, I argue that physicians *did not* use the telephone to collectively prevent biological risks.

Drawing upon historian Paul Starr’s cultural analysis of U.S. medicine at the turn of the twentieth century, I underscore that physicians rarely sought to build a rapport with their patients that would position them as equitable collaborators in healthcare. As Starr argues, physicians in this era – especially in urban markets such as New York and Boston – attempted to build prestige for themselves and their profession. By sharply defining “professional” practitioners through accredited education and the prices charged for medical services, doctors endeavored to install a hierarchical relationship between patients and providers.³² In this context, I add that the telephone allowed doctors to exercise deep-seated class and ethnic biases,

resulting in individualized healthcare practices in the 1880s through the 1910s. Physicians institutionalized their prejudices by influencing the design of public telephones at the largest corporation in the U.S. – AT&T.

This narrative courses throughout *Ill Communication's* first chapter, which concentrates upon several esteemed medical figures in the U.S. in the early 1900s. They include breakfast cereal tycoon John Harvey Kellogg, and Irving Fisher, head of the Eugenics Research Association, an eminent medical group which attempted to scientifically prove the racial superiority of whites. These physicians created clear definitions between “healthy,” white, well-to-do users of telephones (such as themselves), and the “unhealthy” immigrant working poor whose usage of public phones allegedly spread tuberculosis – a supposition commonly defined in this era as medical “fact.” Physicians’ focus on tuberculosis, as I argue, was calculated for maximum effect since the biological risk was not only the primary cause of death nationally, but was also a virulent threat in New York City and Chicago, the two urban epicenters where telephones were concentrated in the U.S in this period.

As a testament to these physicians’ influence, AT&T bankrolled a health product as bizarre as it was individualizing. Called the Ready-to-Run Ventilating Set, this piece of design took its cues from medical advice supplied by Kellogg and Fisher, and was integrated into AT&T’s public telephone booths. An outrageously expensive contraption that only very wealthy individuals could afford, the ventilation system

apparently sanitized the air around public telephones, eradicating any germs the poor may have expelled into the air as they talked over the phone.

Investigating the Ready-to-Run Ventilating Set in Chapter 1 leads me to a much different conclusion than that proposed by Aronson. Physicians may have written about the telephone in ways that suggested its potential to create a collective system of healthcare, as Aronson suggests. Yet in practice physicians convinced the primary manufacturer of telephones in the U.S. to individualize risk prevention. Through the Ready-to-Run Ventilating Set, physicians solidified cultural assumptions about *whose* health was endangered by a biological risk, and *whose* health was worth saving through the design of a communications medium.

Chapter 1 offers a medical reading of the social dilemmas media studies scholars believe the telephone introduced. As Carolyn Marvin observes in her well-known work on the subject, “With the advent of the telephone and other new media came relatively sudden and largely unanticipated possibilities of mixing heterogeneous social worlds – a useful opportunity for some, a dreadful intrusion for others.”³³ Marvin points out that rich, white, “well-insulated communities” reacted to the perceived collapse of social distinctions by creating rules for “civilized” use.³⁴ Speaking on implicit behalf of the well-to-do, for example, popular news periodicals and electrical technology journals urged users to uphold the “cautious good manners of middle-class intimacy” when using telephones, practicing “quiet voices, clearly enunciated words, dignified presentation.”³⁵ Marvin consequently argues that the

telephone, a “permeable boundary” was socially shaped to preserve racial and economic divisions between people.³⁶

Ill Communication charts a more visceral policing of this “permeable boundary” with ramifications for the prevention of biological risks at the turn of the twentieth century. My work reveals that telephones served as a critical site where privileged social actors erected a “healthy” separation between themselves and those individuals they considered diseased based upon their ethnicity or their class. Segregation was not only achieved through the ways in which the telephone *was used*, as Marvin argues. It also became embedded in the telephone’s *material design* as mechanical ventilation. This design did not automatically protect all potential users, as we will see. Rather, AT&T’s ventilation system helped prevent disease only for individuals willing and able to pay for it.

Physicians reappear throughout each of my dissertation’s chapters. Their ability to articulate the individual costs of prevention, and validate biological and technological risks, will strongly affect the actions of industrial designers and everyday users. However, in *Ill Communication* I avoid situating physicians as the sole actors involved in designing communications media, as Aronson does. Industrial designers and everyday users each possess unique, if unequal, agency in this process, too, as I now turn to examine in the following two sections.

Industrial designers

Physicians are hardly alone in designing communications media. Nor are they alone in defining health risks, or allocating responsibility for prevention and treatment. As industrial actors with a surprising amount of medical knowledge, industrial designers play a prominent role. Contracted by some of the largest media manufacturers in the world, such as AT&T, Motorola, Sony, Samsung, and Apple, designers enjoy significant opportunities to prioritize certain risks and privilege the health of certain social groups.

They accordingly guide the construction of media on a mass scale, with concentrated authority over the features that users encounter. For contemporary “patient-focused” health apps, this may mean that designers create graphic, digital narratives that guide users through exercise programs on their cell phones, for example. In *Ill Communication*, however, I look at how designers affect users’ health through the *material features* of cell phones, such as their size, shape, and weight. Since they possess such influence over this medium, I argue that designers are key to investigating how communications media were integrated into healthcare in the U.S.

As I discovered during my research, designers tackled this marriage of media and health in problematic ways. They advocated for individual responsibility in healthcare – an approach that calls to mind the isolated, near-naked man in Oscar’s ad. And rather than ensure that communications media would prepare a diverse range of individuals to assume this health burden, designers constructed media for select

consumers. They tailored media for people already well equipped socially and financially to prevent biological risks. In *Ill Communication* designers' work surfaces in Chapters 2, concerning cell phones and coronary heart disease. Throughout this discussion, I deepen a media studies approach to designers as biased social actors who influence human health through the material construction of media.

My approach diverges from traditional work on designers. As historian Stephen Boyd Davis reveals, designers are often portrayed as artists.³⁷ Educated in fine arts programs and hired by corporations, they principally determined the “look and feel” of mass-produced products in the U.S. during the twentieth century, as Davis broadly suggests. Curator and historian Shelley Nickles adds that as “professional tastemakers,” designers traditionally gave products an aesthetic identity to attract consumers and uplift their class- and gender-inflected stylistic preferences.³⁸

Over the past two decades, the characterization of designers as corporate aesthetes underwent significant revision, with important implications for my dissertation. In their classic 1997 contribution to media studies, Paul du Gay, Stuart Hall, Linda Janes, Hugh Mackay, and Keith Negus reinterpreted designers as industrial actors with profound social influence. As the authors boldly wrote, “Design operate[s] on the very cusp of production and consumption, attempting to stitch the two spheres together.”³⁹ Their claim is born out by research they performed on the design team at the Japanese media conglomerate Sony in the late 1970s and early 1980s. Here, du Gay et al. discovered that while designers do aesthetic work, their most important work is

“inscribing” media products with “*meanings* as well as uses” (italics in original).⁴⁰ Elaborating on “meanings,” du Gay et al. argue that designers help construct an encompassing media “lifestyle,” which involves weaving products into the everyday routines, fantasies, and relationships of users. This allows media products to become an influential part of a user’s identity.⁴¹ To build a “lifestyle” designers therefore attempt to understand users emotionally, socially, psychologically, and physically, du Gay et al. note.⁴²

Art historian Christina Cogdell argues that designers affect far more than people’s identities. They affect users’ bodies as well. To do so, designers marshal considerable social, industrial, and medical power. In Cogell’s historical study, she portrays designers as white, male, wealthy, corporately funded, and explicitly interested in tweaking human biology and psychology.⁴³ Given their privilege, designers’ prejudices and preoccupations are allowed to color their work. For example, Cogdell argues that U.S. designers in the 1930s integrated blatantly biased medical findings (like eugenics research) into products for everyday users, attempting to segregate and purify different classes and races of people through consumption.⁴⁴ As she concludes, designers’ historical investment in altering human bodies suggests that designers should not be identified as corporate artists. Rather, they should be considered as prejudicial “agents of reform.”⁴⁵

Cogdell’s social analysis of designers echoes recent work in media studies, which clarifies the links between designers, media, health risks, and issues of

responsibility. Media anthropologist Natasha Dow Schüll argues, for example, that from the late 1980s through the present, industrial designers have wielded social and professional power – and remarkable expertise in human biology, physiology, and psychology – to materially construct media. These media can encourage harmful behavior among users and create chronic health effects. In Schüll’s investigation, a principal risk is addiction to digital gambling machines, which are precisely designed to create a prolonged psychological “zone” to attract and hold the attention of players. This unequal interaction between people and media can devastate users’ health in its many financial, social, psychological, emotional, and physical aspects.⁴⁶

As Schüll makes clear in interviews conducted over a decade, designers recognize their controversial influence as agents of reform. Yet they consider health responsibilities asymmetrically.⁴⁷ They believe that any health risks their products may create are up to consumers to mitigate. Schüll synthesizes designers’ perspective: “Individuals participate robustly in consumptive markets while assuming responsibility for their conduct – from the economic to the legal to the medico-psychological.”⁴⁸ Her argument suggests that contemporary designers subscribe to a similar neoliberal rationale that Galvin attributed to physicians and policymakers earlier in this introduction.

The industrial designers we will meet in *Ill Communication* hold identical convictions concerning who must manage biological and technological risks. They lend credence to Cogdell and Schüll’s arguments that design is a white, male,

medically sophisticated, corporate profession, which attempts to “reform” everyday users’ health. Such influence is inscribed into the material form of products – cell phones in my project. Reflecting Cogdell’s research, the designers in my dissertation also operate accordingly to class, racial, and gendered biases.

Designers’ many characteristics crystallize in Chapter 2, as I concentrate upon the design team at the Illinois-based communications media giant Motorola. From the early 1970s through approximately 1994 this company remained the largest single manufacturer of cell phones globally.⁴⁹ Indeed, the company’s designers helped usher in one of the most rapidly adopted communications media in the twentieth century, expanding from 340,123 users in 1983 to thirty-four million by 1995.⁵⁰ Motorola’s designers were as health-conscious as they were innovative, I reveal, basing their technological work upon their dedication to exercise. Beginning in the 1970s, they developed Motorola’s first cell phone, the DynaTAC 8000x, around assumptions that biological risks could be prevented through individual fitness habits.

Specifically, Motorola’s designers shaped the cell phone to address coronary heart disease. A risk that superseded tuberculosis as the leading cause of death in the U.S. in the twentieth century, coronary heart disease accounted for forty-one percent of deaths among white men annually in the 1950s through the 1980s.⁵¹ Motorola’s designers approached the issue under the influence of particular medical biases. They believed the disease principally affected white, wealthy “executives,” as Chapter 2

illuminates. Designers further drew upon a medicalization of coronary heart disease as a “lifestyle” problem that could be fixed by reforming an individual’s behavior.

Consequently, I illustrate how this company attempted to design a small, lightweight, portable cell phone for executives – the earliest consumer market for this medium. This portable device, designers in the 1970s believed, might free executives from stationary activity, especially “desk-bound” telephone calls. The DynaTAC would instead persuade executives to increase their physical fitness at work, incrementally but effectively preventing coronary heart disease. Like Oscar or PriceWaterhouseCoopers, Motorola’s designers envisioned cell phones as central to an individual’s “personal medical kit.”

Focusing upon Motorola’s designers reiterates several themes within *Ill Communication*. Like the physicians seen in Chapter 1, industrial designers became convinced that preventing health risks was an individual’s business. Within this healthcare perspective, designers favored the needs and abilities of highly privileged individuals – a prejudice also clearly harbored by physicians earlier in the twentieth century. Additionally mirroring physicians, the industrial designers I examine inscribed their beliefs about health risks and responsibilities into the materiality of communications media. Therefore, while I shift from telephones and tuberculosis at the dawn of the twentieth century to cell phones and coronary heart disease at the century’s midpoint, I reach a similar conclusion. Designing media to individualize healthcare is a persistent, if highly mutable project.

Although designers and physicians share many biases and medico-technological goals, these actors are not comfortable collaborators historically. As I repeatedly highlight in my project, designers challenged the authority of physicians to prevent biological and technological risks. As Chapter 2 details, Motorola's designers lambasted physicians beginning in the 1970s, and continued their criticism of the medical field into the present. They claimed that doctors had been ineffective in reducing coronary heart disease, and suggested that industrial design should be the primary site where health responsibilities were shaped for everyday users. In this case, although physicians and designers are closely aligned in their identities and perspectives, they attempt to distinguish themselves to enhance their influence over users and the construction of communications media.

Despite their alleged distinctions, I want to point out that industrial designers do not offer a substantially different approach to designing media or managing health risks. By including these actors in *Ill Communication* I therefore hope to initiate a critical conversation about the design of a "new health economy" based upon cell phones. At present, the dialogue is dominated by entities like PriceWaterhouseCoopers, who at the beginning of this introduction claimed that cell phones might supplant medical professionals' costly 2.8 trillion-dollar services. Instead, according to PriceWaterhouseCoopers, everyday users will rely on phones – and by extension rely on the seemingly supportive designers of these media. As the Institute for the Future, a Silicon Valley think tank, observed in their own executive

summary in 2013, industrial designers may become “new authorities to emerge and interact with consumers when and where they need health advice.”⁵²

I have found scant evidence that such an open, harmonious, trusting relationship between designers and users exists. Building upon Schüll’s research, I reveal that industrial designers have historically promoted individual responsibility for preventing health risks – especially technological hazards. In their design work, they also perpetuate class, gender, and racial prejudices similar to those held by physicians. Additionally, much like physicians, industrial designers avoid allowing everyday users to participate in defining risks or designing media.

I now want to introduce these users, who vacillate between marginalization and empowerment, and who will play a fundamental part in *Ill Communication* throughout Chapters 3 and 4.

Everyday users

Everyday users, the third group of social actors surveyed in my dissertation, have an especially complex relationship to biological and technological risks, the design of communications media, and the individualization of health responsibilities. In the first half of my project, everyday users (as my oblique name for them suggests) are constructs produced by physicians and designers to fit prejudicial medico-technological agendas. In Chapter 1, physicians conceive of telephone users in the early 1900s as healthy, rich, white, and predominately male, or tubercular, immigrant,

non-white, and poor. In Chapter 2, industrial designers in the 1970s envision cell phone users as white, male, professionally powerful individuals who are nonetheless vulnerable to coronary heart disease.

In each historical instance, physicians and industrial designers favor idealized groups that not so subtly reflect their own race, gender, and class. By the same token, they pigeonhole everyday users as mere consumers of readymade goods. The health of these relatively powerless people must be managed by external medical and industrial actors. Such management is manifest in the design of telephones and cell phones, which ideally persuade users to prevent health risks individually.

To balance the perspective of physicians and industrial designers, in *Ill Communication's* second half I present everyday users as more than constructs who consume media and silently shoulder the burden of healthcare. I examine a social group who beginning in the 1990s acted out multiple roles: consumers, users, sophisticated technological professionals, vernacular designers, informal medical researchers, and victims of an emergent health risk. Unlike the users conceived by physicians and industrial designers, the multifaceted people I focus upon do not simply adopt communications media to help them prevent biological risks. Instead, they identify *these media* as a health threat.

Specifically, the group of users I examine argue that cell phones emit low doses of radiation, a byproduct of the radio frequencies phones use to communicate wirelessly. As a result, these users, called electrosensitives, claim to suffer chronic

health effects including tumors, skin, joint, and eye problems, severe anxiety, and migraines. In Chapters 3 and 4 of *Ill Communication* we will see the number of sufferers swell from one high-profile case in the U.S. in 1993 to include two to sixteen percent of the current citizenry in the U.S., Western Europe, and Canada.⁵³ Coinciding with a stratospheric increase in cell phone sales (from approximately 10 million to 300 million devices worldwide), the rise of electrosensitivity encouraged me to explore the unintended consequences of using communications media, as well as the consequences of individualized healthcare.

Addressing these questions in Chapter 3, I introduce two of the most prominent electrosensitives in the U.S., David and Susan Reynard. Engineers and owners of a medical telephone service, the couple used cell phones in the late 1980s as therapeutic communication tools. The phones allowed the Reynards to stay in touch and emotionally support one another during Susan's complicated pregnancy. Although they adopted this technological "companion for the sick," as Aronson might call it, the Reynards' enthusiasm for cell phones diminished after Susan was diagnosed with brain cancer. Due to the tumor's location above her ear, the Reynards believed she had succumbed to the radiation her phone emitted. As I consequently discuss, the Reynards filed a lawsuit, hoping the cellular industry might be required to take responsibility for the health effects their phones apparently caused. To emphasize the issue of industrial liability, the Reynards suggested that mass-produced alternations in

the design of cell phones be made, such as headsets to keep cell phones away from users' heads.

Electrosensitives like the Reynards complicate discussions about the marriage of communications media and healthcare. As I reveal throughout a detailed portrayal of the Reynards and several other electrosensitive cases, these are not simply people fearful of a new medium. In fact, as I point out in Chapter 3, electrosensitives are often exactly the sorts of users envisioned as integral to the "new health economy." Similar to the cartoon figure in Oscar's advertisement, the Reynards and many other electrosensitives are white, economically privileged, and technologically adept. And like Oscar's underwear-clad figure, many electrosensitives are also early adopters of cell phones as "high tech personal medical kits." To reiterate a phrase from PriceWaterhouseCoopers, these everyday users rely upon phones to "take charge of more of their own care." This process, as I reveal, initially seems to "cocoon" the health of these users in positive physical, social, and emotional ways.

Since they do attempt to take charge of their health, however, electrosensitives believe they can identify potential health risks as cogently as any medical professional. Since they possess technological expertise, they also want to participate in the design of cell phones. Most of all, they desire a collective, collaborative approach to healthcare, in which responsibilities for preventing risks are shared between users and cell phone manufacturers like Motorola. They consequently trouble a pervasive individualistic impulse that simmers throughout *Ill Communication*. As sociologist

Neil Selwyn argues, such critical users go against “the whole notion of the information society,” which he explains “has been framed popularly in terms of individuals resorting to their ‘own devices’ both in the sense of personal agendas, strategies, interests, and interpretations, as well as in the form of technological tools to help realize them.”⁵⁴

Besides Selwyn, few media studies scholars portray electrosensitives as cell phone users worth studying. Much less are they seen as important participants in the social construction of technological risks, media design, and health responsibilities (an oversight my dissertation works to address). As Selwyn observes, these everyday users are instead “pathologized” as suffering from an “almost irrational fear and stress,” which Selwyn memorably calls “technophobia.”⁵⁵ Given their seeming irrationality, electrosensitives’ perspective about health and cell phones is often framed as unreliable or uneducated. These users and their unfounded fears must be “configured” by social, governmental, and cultural institutions into a more “fun and adventurous” relationship with media, media historian Lori Reed argues.⁵⁶ Configuration, I add, also illustrates how hierarchies of medico-technological authority are maintained between physicians, industrial designers, and users.

Cell phone scholar Gerard Goggin illuminates how electrosensitives have historically been configured. Goggin uses the Stewart Report, an official government investigation into electrosensitivity published in 2000 in the United Kingdom by the Federation of the Electronics Industry, the Minister of Public Health, Ministers in the

Department of Trade and Industry, and the Chairman of the National Radiological Protection Board. From this report, Goggin frames electrosensitivity as a brief controversy that was resolved collaboratively. “As scientists, industry, bureaucrats, and citizens discussed and debated the health effects,” Goggin writes, “the health effects issue was normalized through a combination of micro-regulatory and policy responses, reassuring scientific evidence, and behavioral and technological adaptations.”⁵⁷

Although Goggin believes a collective social conclusion to electrosensitivity occurred in the UK, his sources fall short of supporting the claim. Goggin does not include any documentation from an electrosensitive perspective. He subsequently fails to illustrate whether these controversial users actually encountered institutional support as they “discussed and debated the health effects” of cell phones with the electronics industry, the government, and medical officials in the UK. Nor does Goggin illustrate to what extent electrosensitives were allowed to participate in constructing “reassuring scientific evidence and behavioral and technological adaptations.” By implicitly silencing these seemingly “irrational” users, Goggin suggests that electrosensitives played a minor role in resolving the controversy. They were configured by a range of institutional forces, which were apparently successful in managing these users, their interactions with cell phones, and their concerns about health effects.

While conducting my own research, however, I could not find evidence affirming that electrosensitivity had in fact been resolved in the UK, or in the U.S., the principal country my dissertation examines. I arrived at a different conclusion as I paid attention to persistent accounts of technological risks, articulated in the 1990s in letters electrosensitives wrote to investigating medical committees, documentation they offered at public meetings, testimonies people like the Reynards gave during lawsuits against the cellular industry, and newsmedia interviews. Using this evidence, Chapter 3 demonstrates that electrosensitives remain marginalized by medical professionals, government agencies like the Federal Communications Commission, and cell phone manufacturers including Motorola. Sufferers therefore do not encounter institutional support in discussions and debates about the health hazards potentially posed by cell phones. Electrosensitives are instead responsible for diagnosing this unintended technological risk, and further responsible for its prevention. This means designing behavioral and technological adaptations on their own.

As a sophisticated community of users, many electrosensitives do indeed design highly individualized forms of healthcare. In Chapter 4 I survey their idiosyncratic methods for preventing technological risks, which take shape as “sanctuaries.” Built in environmentally unique, remote locations like the National Radio Quiet Zone in West Virginia, sanctuaries are customized homes carefully

designed to block the radio frequencies of cell phones. Or sanctuaries are designed as portable, insulating shields that can be worn or affixed to cell phones.

These artifacts, as I argue in Chapter 4, contradict Goggin's claim that electrosensitivity has been collectively resolved. Sanctuaries clearly illustrate how individual sufferers attempt to self-manage their health. They diagnose a health risk without professional medical, industrial, or state support, and personally forge methods to try and prevent this risk. In taking this approach, electrosensitives encourage us to reconsider the act of designing media, and think about it as a *continuous, decentralized* practice, operating recurrently within both the spheres of production and consumption. Design consequently involves a variety of non-industrial as well as industrial actors, who compete fiercely to gain control over the material forms that communications media may take.

Electrosensitives thereby offer a chance to revise the ways in which design is commonly portrayed. As my review of design literature in the previous section of my introduction illustrates, historians, critics, and media scholars tend to define design as a highly professionalized process, couched within the larger protocols of researching, developing, manufacturing, and selling mass-produced media. Although hundreds of professionals with different kinds of training and expertise are often involved in design, including "script writers, graphic artists, marketers, mathematicians, and mechanical, video, and software engineers," as Schüll observes, design is nonetheless

conceived as an insular industrial activity.⁵⁸ It certainly affects everyday users, but it does not include almost any material, creative contribution of their part.

Instead, eminent design historian Guy Julier argues that users are only allowed into the design process on a limited basis, mainly at the behest of industry professionals when they need to perform intensive research into the routines, feelings, and social relationships that comprise a user's identity and lifestyle. Following the argument set forth by du Gay et al., Julier concludes that this relationship between designers and users allows designers reinforce their social and technical authority, and "anticipate consumer expectations as well as develop future desires."⁵⁹ In Julier's framework, users can be "active" only insofar as they participate in providing designers with cultural data to inform the commercial development of "the next thing."⁶⁰

Using electrosensitives as a divergent example, I offer a very different overall portrayal of design in *Ill Communication*. I argue that far from serving as the test subjects that feed professional designers' research and work, electrosensitives can be considered as designers in their own right. As we will see in Chapter 3, they conduct their own 'consumer research' into the emotional, psychological, and physical effects they experience from cell phones. And as we will see in Chapter 4, electrosensitives blueprint, patent, and build material prototypes to reflect their particular perspectives upon health, safety, and technological risks. Ultimately, rather than hope that cell phones might be designed on a mass scale to address the controversial health condition that structures their lives, many electrosensitives go rogue. They

meticulously design and fully inhabit a lifestyle that uniquely limits the omnipresence of cell phones. Therefore, rather than operate “on the very cusp of production and consumption,” as du Gay et al. argue, the process of design operates as a decentralized, fragmented process. It is not necessarily a point at which industrial and consumptive practices are ‘stitched’ together. Instead, I suggest that industrial and non-industrial actors may work in considerable isolation from one another, pursuing different material forms of the same communications media.

If electrosensitives permit us think about design from a fresh perspective, they also encourage us to examine how people utilize feelings of illness and injury to protest the individualizing effects of communications media. Focusing upon electrosensitive reactions to the individualization of healthcare, I build upon a similar inquiry into electrosensitivity provided by business historian Shoshanna Zuboff. In her work Zuboff frames electrosensitivity as an important cultural reaction against the atomizing design and alienating implementation of media in labor practices. Studying how the introduction of computers affected U.S. users in white- and blue-collar environments, Zuboff uncovered instances of electrosensitivity occurring among clerical staff in the early 1980s. For clerks, computers represented a systemic effort to maximize productivity through the “elimination of social exchange” with co-workers and supervisors.⁶¹ Severed from social and emotional support, clerks were “driven into the confines of their individual body space,” Zuboff argues.⁶²

Responding to the individualization of their labor, clerks' "felt sense of work" began to include injury and illness. Zuboff writes, "Many of the clerks' complaints about the work became complaints about bodily suffering," marked by many of the symptoms we will see reiterated in *Ill Communication*, including eye problems, headaches, "nervous exhaustion," and "fears about microwaves."⁶³

Zuboff's research sets a precedent for studying electrosensitivity. Rather than pathologize the condition as irrational, uninformed, or medically false, she frames electrosensitivity as a cultural performance. This performance allows users to express seething mistrust with the individualizing influence media exert upon their lives. As my own research adds, electrosensitivity is not an isolated response to a specific technology. Historically, electrosensitivity is much more flexible, a performance that pertains to cell phones as well as computers, and encompasses issues with industrial design and healthcare in addition to labor.

Considering electrosensitivity as a performance also lets me analyze how industrial designers have dismissed people like David and Susan Reynard. For several industrial designers included in Chapters 3 and 4, electrosensitivity is not a valid basis for debating how communications media is designed, or a valid basis for contesting healthcare responsibilities. Instead, electrosensitivity represents nothing other than an elaborate fantasy. As Anthony Dunne and Fiona Raby, two designers who feature prominently in Chapter 4, argue, electrosensitivity is a "psychological adventure." It gives everyday users an opportunity to imaginatively tweak mass-produced media and

satisfy unconventional emotional desires. In Dunne and Raby's perspective, electrosensitivity is ultimately a personal rather than institutional issue, which will be resolved or configured on a case-by-case basis, as users design customized artifacts like sanctuaries.

Drawing upon Zuboff's work, I argue against Dunne and Raby's interpretation. I suggest towards the end of *Ill Communication* that electrosensitivity functions as a social reaction against healthcare and communications media industries, which both abdicate responsibility for technological risks. As a performance, electrosensitivity also illustrates how difficult it can be for individuals to "take charge of more of their own care," as PriceWaterhouseCoopers puts it. Like the clerks Zuboff surveys, the electrosensitives we will meet are driven into the confines of their individual body space. Suffering from exposure to cell phones, electrosensitives relocate to isolated environments. Lacking social and emotional support as a consequence, these formerly privileged cell phone users also often lack dependable financial support. Their experience is not a playful psychological adventure, or a self-actualizing health practice. Rather, their performance of illness represents the marginalizing, lived consequences of individualized healthcare. It is this experience I want to encourage us to contemplate at the junctures where communications media, health risks, and responsibilities intersect.

In sum, *Ill Communication* illuminates these many junctures across four chapters. Chapter 1 examines the work of physicians in eradicating tuberculosis

according to significant social prejudices, and the resulting effect upon the design of AT&T's public telephones at the turn of the twentieth century. Chapter 2 considers the work of industrial designers at Motorola as they endeavored to create a small, portable cell phone that would incrementally persuade users to exercise and lower the epidemic rate of coronary heart disease in the 1970s. Chapter 3 shifts away from examining the design of communications media to prevent biological risks to consider such media as a risk in and of itself. This chapter consequently illustrates how an emergent group of suffering cell phone users in the 1990s attempted to frame the state of their health as an institutional responsibility, proposing an array of protective accessories and safe public spaces designed to control the presence of cell phones in their lives. Chapter 4 considers the selective response of two prominent industrial designers to these users' plight in the 1990s and early 2000s. Here, I illuminate the mutually informing relationship between media design and the medical establishment, in which both domains work to maintain authority over the definition of health risks, and contain and centralize the process of designing media. Designers and medical professionals do so by defining any health concerns perceived by users as psychosomatic, and categorizing user-generated protective designs as fraudulent.

Methodology

Having introduced the core thesis of *Ill Communication*, I now want to discuss the methodology for my dissertation. I use the social construction of technology

(SCOT), a framework devised in the early 1980s to analyze the historical relationships between scientific research and technological development. Hewing to this lineage, I use the method to guide my investigation into the constructed nature of medical knowledge, health responsibilities, and communications media. Using this lens leads me to focus upon interactions between several groups of people, rather than the achievements of any single individual or institution. The method also informs each chapter's examination of specific historical periods, in which social definitions of tuberculosis, coronary heart disease, electrosensitivity, the telephone, and the cell phone are all open to "interpretive flexibility." Following the methodological example set by science and technology scholars Wiebe Bijker and Trevor Pinch, I additionally structure *Ill Communication* around the act of design. As I will discuss momentarily, each chapter proposes that design is a social process that allows prejudicial understandings of health risks and their prevention to take material form.

Since the time periods fluctuate chapter to chapter, the actors, risks, and media involved fluctuate as well. Indeed, my primary aim in *Ill Communication* is to suggest that a belief in individual responsibility for healthcare persisted despite these changing variables. Due to the diversity of subjects, the primary evidence for each chapter is quite distinct, ranging from presentations given at regional medical conferences in the early 1900s to television news programs broadcast nationwide in the early 1990s. In order to discuss the specific issues involved in assembling and using each set of sources, I created an "approach" section for each chapter. Dispersed

throughout the dissertation, these methodological sections explain in finer detail the exact historical evidence I collected, and how I performed my analysis. So arranged, each explanation of evidence occurs precisely before I explore the subject of each chapter, such as the intersections between industrial designers, coronary heart disease, and cell phones, for instance. The strategy gives me an opportunity to concentrate upon my overarching methodology here.

The concept of social construction offers a powerful framework for analyzing how particular “truths” – such as the medicalization of biological risks, or medical representations of the human body – are anything but ahistorical reflections of a fixed reality. Science exists in a reciprocal, evolving relationship with the needs, fantasies, and prejudices held by certain people in specific times and places. As Bijker and Pinch point out, “scientific knowledge can be, and indeed has been, shown to be thoroughly socially constituted.”⁶⁴ It is “open to more than one interpretation.”⁶⁵

If science does not operate around a single, objective, linear narrative, technological development also eludes such a reductive reading. A critical breakthrough in design – such as the decision to make cell phones portable – is far from a natural or inevitable choice. As Bijker and Pinch argue, under the social construction of technology methodology “the developmental process of a technological artifact is described as an alternation of variation and selection.”⁶⁶ Putting it another way, media and cultural historian Jonathan Sterne observes that no medium experiences teleological development. Rather, given the “contemporary

milieu” one chooses to study, a media artifact should be treated “as only one of many possible futures.”⁶⁷ The dominance or “naturalness” of a medium in a particular form can change radically depending upon how relationships evolve between a shifting cast of social participants. “Technological change is shaped by cultural change,” Sterne reminds us.⁶⁸

Whether in a scientific or technological context, interpretation, variation, and selection are “multi-directional” processes, Bijker and Pinch remark.⁶⁹ This means that the construction of science and technology historically involves numerous social groups. I structure *Ill Communication* around three groups – physicians, industrial designers, and everyday users – yet many other participants come for the fore throughout each chapter. They include municipal, state, and federal regulatory bodies, journalists, engineers, health insurers, and management consultants. These actors reinforce, influence, and question the social authority of physicians, designers, and users as they in turn compete with one another in the construction of medical knowledge, the allocation of health responsibilities, and the design of communications media.

If interpretation, variation, and selection occur under the influence of multiple social groups, these groups fulfill a wide range of functions. As Bijker and Pinch write, a social group can in fact be described in many potential ways including profession, location, shared problems or interests, skill sets, common habits, or shared practices. Since there is no single way to identify groups, considerable fluidity can occur

between them. In *Ill Communication*, users of cell phones cycle through a variety of roles, acting as medical researchers, patients, plaintiffs, and designers. Similarly, physicians and industrial designers test the elasticity of their roles, projecting themselves as media users, performing legislative work, publishing popular magazines, serving as informal advertisers, finishing engineering work, and serving as company executives. Physicians and designers also attempt to straddle one another's scientific and industrial activities.

These points of intersection generate considerable discord between groups. As I underscore throughout my project, whenever it appears that members from different social groups have comparable expertise in medical or technological knowledge, the overlap can challenge established hierarchies of authority. For instance, in Chapter 4 physicians will refute medical investigations into electrosensitivity performed by cell phone users, in which users claim “to know about their own novel symptoms in a way that [is] overlooked by orthodox science,” as sociologists Alfred Moore and Jack Stilgoe write.⁷⁰ Attempting to maintain strict boundaries between groups, physicians will call these non-professional experiments “anecdotal evidence,” lending a strong aura of legitimacy to their own socially constructed, “expert” findings.⁷¹

Therefore, although the social groups in *Ill Communication* are interrelated, they are bounded by inequalities. As Bijker and Pinch make clear, it is important to foreground how certain types of people can or cannot participate in a given scientific or technological context given their “sociocultural and political situation.”⁷²

Elaborating upon their guidelines, historian of technology Judy Wacjman encourages scholars to address questions of gender, race, and class, which she identifies as entrenched variables that establish and maintain hierarchies between social groups over time.⁷³

Ill Communication represents a synthesis of these recommendations. Throughout my four chapters I attend to the race, gender, education, and economic status of the physicians, industrial designers, and everyday users I survey. Each chapter clarifies how such factors particularly allowed physicians and designers to align with larger medical and corporate forces, such as the Eugenics Research Association, AT&T, and Motorola. The socioeconomic status of physicians and designers, I suggest, also permits them to increase their authority by collaborating with premier cultural forums such as *The New York Times*, or even owning publications such as *Good Health*, a popular medical advice magazine funded by members of the Eugenics Research Association in the early 1900s.

My approach to physicians, designers, and users allows me to address how they became interested in certain health risks, why they designed communication media in particular ways, and how they conceived of healthcare responsibilities. By way of demonstration, Chapter 1 illustrates that U.S. physicians at the turn of the twentieth century were predominately white and male. Enrolled in a newly centralized system of education and accreditation, physicians were also supported by recently founded medical communities like the American Medical Association and the Eugenics

Research Association. They consequently enjoyed increased scientific expertise, social authority in their communities, and economic privilege, as medical historian Starr argues.⁷⁴

Within the pages of *Ill Communication*, we will see how these coalescing factors allowed physicians to prioritize the threat of tuberculosis within U.S. culture. Their rising status also allowed physicians to place the liability for this epidemic disease upon groups of people beyond their racial and economic sphere. Impoverished immigrants, the urban environments they inhabited, and the artifacts they commonly used suffered the brunt of medical discrimination, vilified as communicators of this biological risk.

Due to their ascendant social position, physicians were able to institutionalize these prejudices as medical “facts.” They further embedded them in the design of communications media. As Chapter 1 details, physicians leveraged essays in medical magazines and newsmedia to influence operations at AT&T. Specifically, physicians were instrumental in getting the corporation to design a hygienic product, the Ready-to-Run Ventilating Set, which would allow wealthy whites to segregate themselves from the tuberculosis germs other classes and races allegedly left at public telephones. Consequently, I suggest that physicians played a leading role in individualizing the prevention of a widespread risk. To borrow a phrase from historian of technology Langdon Winner, they also ensured that public telephones in the U.S. would “embody specific forms of power and authority.”⁷⁵

While the social construction of technology methodology informs my analysis of social groups, it also guides my analysis of specific historical periods. Considering the selection of eras to study, Bijker and Pinch comment that the occurrence of “controversies offer a methodological advantage in the comparative ease with which they reveal the interpretive flexibility of scientific results,” as well as variation in technological developments.⁷⁶ Although they attempt to clarify what “controversies” mean and how they operate, Bijker and Pinch remain surprisingly vague on the subject. “Almost everything is negotiable: what is certain and what is not; what is technological and what is social; and who can participate in the controversy,” they write.⁷⁷ They do not offer further insight into what social conditions set the stage for controversies to occur. Nor do they suggest when such “negotiable” periods routinely appear.

To refine their argument, media historian Lisa Gitelman argues that controversies often occur in the years after the initial “invention” of a medium, yet before a widely accepted range of meanings, uses and designs are socially constructed. In a passage often quoted by media historians, Gitelman writes, “Looking into the novelty years, transitional states, and identity crises of different media stand to tell us much, both about the course of media history and the broad conditions by which media and communications are and have been shaped.”⁷⁸ As she demonstrates through a case study on the phonograph, the medium experienced a brief period of controversy in the twenty years after its invention in 1877. Designed initially as a

device for business communications, the phonograph underwent unprecedented social shaping. By the 1890s it served almost exclusively as the basis for pre-recorded music, illustrating that the medium's meanings and uses were open to interpretation.⁷⁹

Turning Gitelman's work into a methodological rubric, *Ill Communication* locates controversies about health risks and communications media in precisely such transitional years. In Chapter 1, I begin around 1888, some twelve years after the telephone's emergence in the U.S., and end around 1913 as the telephone became codified as a "public service," designed, manufactured, and operated almost entirely under a single government-regulated monopoly, AT&T. This date range also encompasses a period after the medical "discovery" of tuberculosis in 1882, yet before systematic methods of prevention developed in the U.S., according to medical historian Nancy Tomes.⁸⁰ Within the interpretive flexibility of both science and technology, physicians were able to form an unlikely marriage between telephones and tuberculosis to support their own social prejudices and individualistic leanings.

Chapter 2 follows suit. I begin examining cell phones in 1970, roughly twenty-four years after the medium's generally accepted date of invention in the U.S., and end thirteen years later around 1983. The year marks a point in the U.S. when cell phones were routinely being constructed and sold as consumer products, manufactured by at least one major company, Motorola (which also operated as a service provider). The year 1983 also marks the first dramatic increase in cell phone use in the U.S., as

Motorola's cell phone, the DynaTAC, attracted a consumer base numbering in the hundreds of thousands.

Concentrating on the transitional period between 1970 through 1983 simultaneously allows us to glimpse an unfolding medical controversy. Chapter 2 is arranged around the apex of the coronary heart disease epidemic in the U.S. The condition accounted for nearly thirty-nine percent of all adult deaths in the country annually.⁸¹ A biological risk that first received medical scrutiny in the 1910s in the U.S., coronary heart disease still eluded a generally accepted diagnosis by 1970. The causality of certain factors – including smoking, drinking, diet, stress, and a sedentary, “desk-bound” lifestyle – was not yet established. Coronary heart disease consequently lacked a regimented method of treatment or prevention until the late 1970s, as historian William Rothstein has shown.⁸² Uncertainty among medical professionals, I argue, allowed an unusual social group – industrial designers at Motorola – to participate in managing coronary heart disease and individualizing its prevention.

Although the social construction of cell phones advances considerably by the early 1980s, the “interpretive flexibility” of this medium continues across a remarkable span of years, extending at least through 2003. Putting further technological development to the side, I believe the cell phone's mutability depends upon the appearance of another medical controversy, electrosensitivity. Accordingly, Chapter 3 limns the first health-related lawsuit against the cellular industry in the U.S., filed by David and Susan Reynard in 1992. This is not necessarily the beginning of

electrosensitivity, as Zuboff's research on this technological risk in the early 1980s suggests. Nor is it the point at which electrosensitivity becomes legally, medically, industrially, or socially recognized as a causal effect of cell phone use.

I argue that 1992 through 2003 represents an intensification of the controversy. It is a period of open-ended argument about how to define health risks and health responsibilities in the U.S. In Chapter 3 the debate primarily occurs between users like the Reynards and research physicians working both within and outside of companies such as Motorola. Although these groups play principal parts in this chapter, journalists certainly participate in the social construction of electrosensitivity, as do two regulatory agencies, the Federal Trade Commission and the Federal Communications Commission. To underscore the truly international significance of the controversy in this period, Chapter 3 includes a comparative analysis of electrosensitivity in Sweden from 1997 through 2000, involving similarly affected users, and medical, governmental, and industrial actors.

Focusing upon electrosensitivity at the dawn of the twenty-first century is additionally fruitful since the years between 1992 and 2003 showcase the interpretive flexibility of the cell phone as a *designed artifact*. Chapter 4 explores the tangible aspects of the controversy in this period. As electrosensitives such as David and Susan Reynard devised material "sanctuaries" to prevent cell phones from affecting their health, they challenged how industrial designers constructed communications media. Specifically, by contesting how cell phones were built on a mass scale electrosensitives

questioned whether individual consumers could really be held accountable for any unintended technological risks. As Chapter 4 reveals, the perspectives held by electrosensitives and industrial designers on this subject prove so divisive that by the late 1990s the design of cell phones splinters into several “possible futures,” to reiterate Sterne’s argument.

My interest in the conflicting design of things in Chapter 4, as well as in every other chapter of *Ill Communication*, is strongly influenced by the methodology I’ve chosen. Studying the social construction of technology means unveiling how social controversies interact with the development of material artifacts. Commenting on a closely related approach he calls “technological politics,” historian Winner offers the following advice: “The same careful attention one would give to the rules, roles, and relationships of politics must also be given to such things as the building of highways, the creation of television networks, and the tailoring of seemingly insignificant features on new machines.”⁸³ Winner’s use of the term “tailoring” is important, since it encourages scholars to focus on the subjective decisions and work that go into constructing a technology, rather than read artifacts alone.

Adherents to the social construction of technology agree with Winner’s argument. As Bijker and Pinch’s own methodological examples reveal, “an artifact is precisely what needs to be explained.”⁸⁴ Technological development, simply put, is in part about an evolution of *stuff*. This *stuff* is shaped by people over sometimes-considerable periods of time, a process Bijker and Pinch identify as design.⁸⁵ Likewise,

in *Ill Communication* design is a critical, extended activity where social, industrial, and medical values are eventually reflected in the forms that telephones and cell phones take – down to their exact sizes, shapes, and weights.

As I discuss throughout my dissertation, no single social group can claim complete authority over the construction of these communications media. Design is a contested process we will witness occurring in a variety of expected and unexpected forums, from the research and development departments of media manufacturers to the homes of individual people to the pages of medical advice magazines. Given the decentralized nature of design, multiple versions of the same medium often take shape in a historic period. *Ill Communication* is a testament to Bijker and Pinch's cogent statement that "there is not just one possible way or one best way to design an artifact."⁸⁶

These many "possible futures" do not exist on an even playing field, however. If the social construction of technology highlights variations in the design of communication media, the method also highlights social inequalities, which allow only certain groups to participate in design. Inequalities further determine *whose* designs tend to become dominant in a particular time and place. Design is therefore thoroughly informed by the prejudices people hold – against a particular race or class, against members of a certain profession, or against people disempowered by illness. The products of design in turn help perpetuate social imbalances. As Winner dryly

observes, “One must say that the technological deck has been stacked in advance to favor certain social interests.”⁸⁷

In *Ill Communication*, the deck is unmistakably stacked. Taking Oscar’s health insurance advertisement as a crudely intimate example, social imbalances in the design of media hit where it hurts. They become apparent when individual people are asked by medical and industrial institutions to handle biological risks on their own, armed with little other than a phone. As Oscar’s ad inadvertently suggests, individuals are often unprepared for this responsibility, figuratively caught in their underwear. Social imbalances are also apparent when communications media allegedly turn against individuals, and these users struggle to find industrial or medical support for the resulting health effects. These may seem like contemporary controversies, but they descend from a lineage of discriminatory design decisions. Uncovering this lineage in its many forms is the purpose of my present work.

*A consumptive coughs up in twenty-four hours at least
200,000,000 germs.*

*What fearful dangers may lurk in a telephone which has
been used by one of these unfortunates!*

– R.S. Stanley (1904)¹

BIOLOGICAL RISK

Chapter 1: The AT&T Public Telephone, Tuberculosis, and the Price of Prevention

In the early years of the twentieth century, human health, communications media, and notions of individual responsibility began to gestate in a hot, hermetic, unlit space: the booth of the public telephone.

This might sound counterintuitive. Given its name, shouldn't the public telephone's design accommodate people's health on common, universal, *public* terms? The public telephone's emergence in the United States from 1900 to 1913 seems to support such a civic notion. In a narrative that kickstarts this chapter, the public telephone arose from disenchantment with the telephone as an exclusively priced service operated by American Telegraph and Telephone, the largest telephone provider in the country. Enraged by AT&T's prices, wealthy white users including physicians boycotted telephones in several U.S. cities. They also supported government regulation to lower and fix AT&T's rates like a public utility.

Surprised by customers' civic ideals and influence, as well as the specter of regulation, AT&T and its many subsidiary companies offered public telephones as a palliative in 1900, establishing thousands of them in major cities starting with Chicago and New York. Costing only five cents per local call, public telephones drastically

reduced service prices for wealthy whites while extending telephones to impoverished and working class urban users. “The popularity of the telephone was the result,” historian Richard John concludes.² He writes that the low-priced public telephone signaled AT&T’s transformation into a “public service,” suffused with a “social responsibility to provide the entire population with facilities” to make telephone calls.³

However, as AT&T’s public service proliferated in the 1900s, physicians redesigned the public telephone according to their health fears and social prejudices. As the following pages examine, physicians argued that AT&T’s public telephones and their unventilated No. 1 Type booths communicated tuberculosis, a severe respiratory illness and leading cause of death in this era, accounting for twenty-five percent of the fatalities in the U.S.⁴ Communication of the disease occurred, physicians speculated, when diverse classes and races of urban users shared public telephones covered with millions of tuberculosis germs. These were expelled whenever users talked, coughed, shouted, sang or otherwise “expectorated” into phones. Tuberculosis remained in the air around public telephones due to the stuffy, soundproof No. 1 Type booths. Although this medical speculation never quite attained scientific legitimacy, it had a surprisingly significant effect upon the material construction of phones, as we will see.

Marshaling social influence and medical expertise, physicians demanded that AT&T as a public service prevent tuberculosis. The company could complete this social obligation, physicians argued, by designing mechanical ventilation for their phone booths, such as an electric fan to remove tubercular “dust” built up inside.

Physicians felt ventilation would do more than prevent disease, though. Ventilation might also separate and individualize classes and races of public telephone users.

AT&T, as we will see, responded to the controversy directly. They designed physicians' prejudices into a product, the Ready-to-Run Ventilating Set. Rather than a standard feature of public telephones, AT&T sold the Ready-to-Run set as a high-priced way to remove airborne germs. It framed tuberculosis prevention as an *individual responsibility* shouldered by those who could also afford to purchase and run this electric ventilating accessory, mainly hotels that leased public telephones and provided them to rich white users.

While the Ready-to-Run set introduced a class and racial hierarchy into the public telephone's design, the product also indicated gaps in regulatory authority. As I point out below, government legislation in the early 1900s influenced AT&T's economic development of the telephone network in the U.S., but it did not specify the corporation's accountability for anything health-related. Therefore, despite the company's emerging identity as a public service for "the entire population," I argue that AT&T was permitted to ignore the health of poor, working class, nonwhite users, and put a price on the prevention of disease. This regulatory gap AT&T enjoyed was in large part predicated upon the influence of physicians, who peddled highly discriminatory, largely unfounded medical evidence about *how* tuberculosis could spread, and *who* was primarily responsible for its transmission.

Approach

Throughout this dissertation, I illustrate how biological and technological health risks intersect with the design of two ubiquitous communications media, the telephone and cell phone. Subsequently, my dissertation highlights how the design of these media individualize health responsibilities for users in the U.S. Analyzing this social construction of technology and health, my project visits three overlapping groups as they vie for control over design: medical professionals, industrial designers, and everyday users. This chapter studies physicians as they attempt to eradicate tuberculosis by changing the design of public telephones.

To investigate physicians' involvement with public telephones in the 1900s, I consulted the National Library of Medicine in Washington D.C. The library is an outstanding resource for this chapter, since the organization made a concerted effort to collect any published public health material beginning in 1869, including medical books, peer-reviewed journals, hospital reports, municipal, state, and federal hearings, investigations, and pieces of legislation, as well as medical "advice literature," which in the 1900s meant books, pamphlets, and advertising literature created to educate non-professionals about disease prevention.

I searched the library's index catalogs from 1900 to 1913 for "tuberculosis," "ventilation," "American Telephone and Telegraph," "public telephones," "pay telephones," "telephones," and "call boxes" (as phone booths were often referred to in the 1900s). This thirteen year-period spans the introduction of public telephones in

Chicago to their installation in at least eleven other major U.S. cities, totaling 300,000 phones. This period, as historian Nancy Tomes remarks, also encompasses the high tide of tuberculosis research and prevention in the medical community in this country, carried out by city and state public health boards, and organizations such as the Health and Efficiency League, whom we will encounter in this chapter.⁵ In this thirteen-year bracket, I located twenty essays in peer-reviewed medical journals, two pieces of popular advice literature about public telephones, one related investigation by the Interstate Commerce Commission, and one book and one pamphlet on designing mechanical ventilation to prevent tuberculosis around public telephones.

To approximate the public response to public telephones and tuberculosis, I input my same search terms and date range into historical databases for *The New York Times* and *Chicago Tribune* for coverage from two of the largest news publications in the two primary cities with public telephones. For a broader urban scope, I used similar databases for *The Washington Post* and *The Los Angeles Times*. Additionally, I consulted the Library of Congress and the Chicago Foreign Press Survey to recover any articles on my subject published in ethnic urban newspapers. These flourished in Chicago and New York due to an influx of thirty million immigrants from Germany, Italy, Poland, Russia, Ireland, China, Central America, and the U.S. south from 1870 to 1914.⁶ These papers were also written for populations who suffered tuberculosis at a fifty-percent greater rate than affluent whites, in large part due to unventilated domestic spaces like tenements and work spaces like telephone switchboard rooms.⁷

Compared to my medical findings, my newspaper queries yielded only four articles: one each from *The New York Times*, *The Washington Post*, *The Los Angeles Times*, and *The Milwaukee Journal*. The results suggest that physicians were foremost in diagnosing the public telephone as a communicator of tuberculosis. My results also illustrate that physicians assumed authority over the health of users by “expertly” advocating for AT&T to ventilate its No. 1 Type booths. The articles additionally suggest that the public telephone controversy primarily resonated with the wealthy urban male demographic that subscribed to these newspapers in the 1900s. As we will see repeatedly in this chapter, the public telephone controversy is selectively imagined, debated, and acted upon by whites for the benefit of other whites. Therefore, this chapter is not a story about the identification of a universally dangerous disease and its mitigation via industrial design. Rather, this is a story about social prejudices, an emergent hierarchy of medical authority, and the speculative construction of health risks. The interplay between these social elements is apparent in the design of communications media – in this case, public telephones.

Consequently, the design of ventilated telephone booths occurs at the expense of several million poor, working class, ethnic users. I highlight how these users are initially denigrated as “the little fellow” who received public telephones as part of AT&T’s public service campaign, and are further stigmatized by physicians as “careless consumptives,” or poor, uneducated, dirty inhabitants of unventilated environments.⁸

Physicians use these stereotypes to blame lower-class users for infecting public telephones with tuberculosis, and communicating the disease to healthy white users.

The medical evidence I collected from the National Library of Medicine reveals yet another prejudice, however, against AT&T. As I point out in this chapter's first section, physicians were among the earliest users and reformers of AT&T's service, joining disgruntled financiers, lawyers, commodities merchants, and railroad managers.⁹ This rich one tenth of the U.S. were instrumental in agitating to regulate AT&T's prices. My chapter reveals that physicians extended the regulatory battle once public telephones appeared. Wielding an influence enjoyed by few other groups in this dissertation, physicians successfully convinced AT&T to design ventilation into their No. 1 Type booth to prevent tuberculosis.

The achievement is double-edged. My findings highlight that physicians encouraged AT&T to segregate and individualize callers by ventilating booths so no caller "will breathe air used by other people," and contract tuberculosis. I argue that AT&T's Ready-to-Run Ventilating Set went a step further and individualized users according to class, turning the prevention of tuberculosis into a prohibitively-priced accessory. This design, I conclude, troubles AT&T's identity as a public service in the 1900s.

High prices, public service, and a “menace to health”

Tuberculosis, mechanical ventilation and public telephones triangulated due to a seemingly unrelated factor: AT&T’s prices for telephone service. This section introduces how boycotts led to proposed government regulation of the telephone as a public service. AT&T responded with public telephones in 1900, in Chicago and New York City. These poor quality phones and their unventilated booths immediately illustrated AT&T’s disregard for marginalized users. They also aroused the health fears and prejudices held by affluent whites, paving the way for physicians to intervene.

By 1888, AT&T as a company was “one of the most reviled in the land.”¹⁰ A \$16.2 million “octopus” with over 600,000 telephones nationwide, AT&T owned twenty-three of the thirty telephone companies in the U.S.¹¹ It unreservedly dominated the most lucrative markets for telephone service – Chicago, New York City, and the surrounding northeastern U.S. – through AT&T subsidiaries Chicago Telephone, Metropolitan, and the Bell Northeastern Telephone Exchange. AT&T also dominated in pricing schemes, charging affluent, white male subscribers like physicians \$150 per year for service in 1888.¹² The “rich capitalist class” who “demanded and daily depended upon” the telephone, as AT&T characterized its customers, would see their rates rise to \$240 by 1894.¹³ Courting controversy, AT&T dabbled with even more unpopular profit strategies in the 1880s and 1890s, such as “measured service” that charged subscribers for every call they made, rather than letting them pay an already high “flat rate” for unlimited calls.¹⁴

Subscribers exploded. Wielding financial, legal, political clout, their collective vitriol left AT&T shaken. The bubble burst in 1888 in Chicago, site of AT&T's subsidiary Chicago Telephone as well as 11,400 telephones and 5,000 subscribers. Half the subscribers convinced the City Council to propose a rate cap on telephone service, freezing Chicago Telephone's profits. When the company refused to acknowledge the Council's cap, every subscriber in Chicago plus an additional 500 business owners threatened to boycott.¹⁵ Topping boycotts in 1881 in Washington D.C. and Rochester, New York in 1886, the Chicago protest sensitized the AT&T empire to wealthy subscribers' power while revealing its vulnerability to regulation.

Demands for price regulation acquired a civic tenor. Simon Sterne was a principal participant. Counsel to the New York Board of Trade and Transportation, Sterne drafted state legislation against AT&T from 1888 to 1895. Drawing upon the Chicago protest, Sterne advocated for rate caps on phone service.¹⁶ However, Sterne crucially modified dissent against the "octopus." Rather than regulate to benefit only the financiers and physicians that patronized AT&T, Sterne felt regulation would pass more successfully with a broader base of support, such as from the 2.4 million immigrant, poor and working class citizens that accounted for two-thirds of New York City's population at that time.¹⁷ The telephone therefore should be a "public service," Sterne argued in an interview about his legislative work in *The New York Times* in 1895.¹⁸ His perspective suggested that the telephone, like tuberculosis, should be a

subject that “binds all the people of a community together,” as New York City Health Commissioner Cyrus Edson wrote that same year.¹⁹

Facing public service legislation in its two largest markets, New York and Chicago, AT&T and its subsidiaries delivered public telephones. Historian John argues that public telephones represented an attempt to convince lawmakers and subscribers that AT&T was meeting its “social obligation” by offering service to a range of Americans (while quietly exploring a new economic market).²⁰ Indeed, as the president of one AT&T affiliated company quipped in 1900, public telephones were designed for the “little fellow.”²¹ That year, at a price of \$1.5 million, Chicago Telephone introduced forty thousand “nickel-in-the-slot” public phones, which cost only five cents to make a single, unlimited local call.²² In New York City a few years later, Metropolitan followed Chicago Telephone’s example and installed eighty-one thousand public phones throughout Manhattan and the city’s surrounding boroughs from 1903 to 1906.²³

Extinguishing the \$150 to \$240 barrier to telephone service, AT&T’s subsidiaries also reduced spatial barriers to telephone access. By 1906 for example, one third of Chicago’s total telephones were leased to owners of poor, working class, immigrant spaces. Public phones now stood inside the front doors of boarding houses, tenements, and factories, as well as against walls in penny arcades, vaudeville theaters, drug stores, corner markets, saloons, Chinese-owned laundries, and tobacco shops.²⁴

As we will soon see, these were precisely the classed, raced, unventilated spaces targeted by physicians as harbingers of tuberculosis.

If AT&T and its subsidiaries prided themselves on gifting telephones to the “little fellow,” the little fellow’s experience of this new “public service” was appalling. Before 1915, telephones lacked amplifiers in their transmitters and receivers, or mouth- and earpieces. In addition, AT&T struggled to implement loading coils, which kept electric signals between telephones strong and transmitted voices clearly and loudly.²⁵ The technical limitations made it impossible to make a call in the teeming spaces where public telephones were installed. Herbert Casson, a managerial scientist and journalist, chastised AT&T for its poor quality public telephones in 1910. When a person tried to use the public service, Casson wrote, “They felt foolish. To do so seemed an absurd performance, especially when they had to shout at the top of their voices. Plainly, whatever convenience there might be in this new contraption was far outweighed by the loss of personal dignity.”²⁶

AT&T’s solution degraded the personal dignity of public telephone users even further. In 1910, the company began encasing its multiple thousand public telephones in the No. 1 Type booth, hastily designed and produced at Western Electric, AT&T’s massive manufacturing plant in Cicero, Illinois. A thick oak box lined with sheet steel and sealed with a heavy door, the No. 1 Type booth cost lessees \$40.²⁷ It presented users with a cramped, unlit, two-by-two-foot space to use a public telephone (roughly a quarter of the size of an average tenement room where a “little fellow” might live).

Designed to eradicate “sonic waste products” as users shouted into phones above the din of a saloon, tenement, or laundry, the No. 1 Type booth aggravated rather than soothed mounting unrest.²⁸

Specifically, the unventilated booth harbored another kind of waste product: tuberculosis. The fear was articulated in white, upper-class venues for discussion. Scarcely a year after AT&T introduced the No. 1 Type booth a letter to the editor in *The New York Times* connected tuberculosis to public telephones. Penned by “Pro Bono Publico” the August 1911 letter stated:

It is with a feeling of revulsion that I enter a public telephone booth, as the close atmosphere, the fetid odors arising from the mouthpiece (which I never find clean), the thought that hundreds are daily using the instrument, and that the last user may possibly have been a consumptive, whose lips and mouth may have touched the instrument and deposited tuberculosis germs – all conditions so insanitary and against public welfare that it is high time for physicians and spirited citizens to unite in protest against the continuance of this menace to health.²⁹

In vivid detail, the letter suggested that AT&T’s public telephones were far from the public service the company promised users beginning in 1900. Instead, the letter emphasized, the public telephone threatened users in two ways. First, it encouraged “hundreds” of people to expel tuberculosis from their mouths as they shouted into the insensitive phone. Second, the unventilated No. 1 Type booth housed and nurtured these airborne germs, allowing them to be communicated between people as they successively shared the booth’s “close atmosphere.”

Published in a newspaper for an affluent, English-speaking readership, *The New York Times* letter to the editor additionally lambasted AT&T according to class and ethnic biases that readers might share. By giving telephones to the “little fellow,” AT&T had gone too far, perverting its real “social obligation” to its rich, white subscribers (presumably including Pro Bono Publico). These privileged individuals – the “physicians and spirited citizens” the letter described – were now exposed to several million poor and working class immigrants who suffered a fifty-percent higher rate of tuberculosis in New York City. As such, the letter to the editor implied that AT&T’s public telephones transgressed “separation and classification” between diseased and healthy, sanitary and unclean, wealthy and poor, white and nonwhite, forms of segregation that Mary Douglas argues were central to public health reform in the 1900s.³⁰

Physicians grappled with identical class and ethnic prejudices as they attempted to reform the public telephone in the 1900s. As I point out in the following pages, members of the medical community even debated socially segregating public telephones to prevent tuberculosis. Yet their discrimination was complicated by their antipathy for AT&T, and their desire to see the telephone operate as a public service. Therefore, physicians would advocate for AT&T to design mechanical ventilation, segregating users by individualizing and sanitizing the “close atmosphere” around public telephones.

Physicians intervene

One of the earliest medical figures to take on AT&T's public phones was R.S. Stanley, a virtually unknown practitioner from Memphis. In 1904, he set the template for discussing segregation, ventilation, and AT&T's responsibility for preventing tuberculosis. Speaking before the Tri-State Medical Association, a consortium of physicians from Mississippi, Arkansas, and Tennessee in November 1904, Stanley remarked that he was shocked by the persistency of tuberculosis in the U.S., despite advanced medical knowledge and prevention against the respiratory disease. That one third of the U.S. continued to die from tuberculosis, Stanley argued, "must be due to some general cause operating to counteract our efforts, and I believe the telephone is the main if not the only cause. Found everywhere, but quite unsuspected, it has been a fertile hotbed of disease," Stanley concluded to the assembled physicians.³¹

Rather than rest his case upon primary research, Stanley preferred to persuade fellow physicians by appealing to their emotions, their senses, and their assumed sense of propriety. In his presentation, he gruesomely depicted how the public telephone communicated tuberculosis. Noting that the disease "brings on a hacking cough," Stanley argued that "the excitement of telephoning tends also to produce this same cough," especially when the phone's poor amplification and loud surroundings required callers to shout.³² Illustrating the waste products that public telephone conversations generated, Stanley divulged, "I have repeatedly noted that on lowering the transmitter spittle has tickled down into my mouth. Some previous caller, taller

than myself, has, in his eagerness of conversation, sputtered into the transmitter.”³³ If a consumptive used the public telephone, Stanley added, such trickling “sputum” could be loaded with tuberculosis germs.

Sputum posed a threat even after it dried into dust and adhered to the telephone. As Stanley informed his medical audience, shouting callers dislodged this dust from the phone, allowing tuberculosis to be inhaled. Any spare germs would continue hovering in AT&T’s cramped No. 1 Type booth.³⁴ In describing this scenario, Stanley linked public telephones to the then-legitimate “dust theory of disease,” popularized in the U.S. around 1893 by John Shaw Billings, mechanical ventilation engineer, creator of the National Library of Medicine, and Director of the National Board of Health.³⁵ Shaw proposed that tuberculosis was communicated when consumptives let their sputum dry on domestic objects and surfaces and turn into dust. Healthy people inhaled this tubercular dust, especially in “overcrowded, poorly ventilated apartments” populated by classes and races of people who “are not so cleanly in their habits.”³⁶ Stanley extended Shaw’s reform project against tenements, boarding houses, and other lower-class spaces to include public telephone, sites which attracted an equally dense, diverse number of people. By aligning his argument against telephones with that of a higher medical authority, Stanley’s obvious social prejudices acquired an objective, scientific gloss.

If the users of public telephones were indeed so fallible, regulation of the communications medium would be required. Stanley outlined regulation in medical

rather than legal terms, putting physicians in charge of determining who should use public telephones. He informed his audience at the Tri-State Medical Association that they should single out the “class extremely liable to consumption, as statistics show,” and discourage them from making phone calls.³⁷ Stanley argued that lower class individuals would not stop patronizing public telephones even after acquiring tuberculosis. They would put their desire to “telephone constantly” over the health of others using the same phones. In addition, Stanley observed, this uneducated class of consumptive remained “quite unaware” of just how dangerous their telephoning actually was. Since these consumptives could not help themselves and might affect others, physicians had to intervene.

Though he felt discriminating physicians could help, Stanley did not let AT&T off the hook. Since they were responsible for providing tens of thousands of public telephones to lower-class Americans, Stanley argued, the corporation would have to take responsibility for sanitizing and ventilating this public service. Stanley advised the company that they could make amends by designing new telephones “so that the parts can readily be taken to pieces and cleaned.”³⁸ This cleaning would be on the company’s dime, Stanley noted. AT&T its subsidiaries “should be called upon to send a man at regular and frequent intervals to disinfect the telephone with some suitable disinfecting fluid,” he stated.³⁹ Finally, AT&T would need to abolish its unventilated, sheet-steel lined No. 1 Type booths, “the dark boxes with doors, in which so many

stores the telephone is placed,” and figure out a less hazardous way of handling sonic waste products.⁴⁰

Stanley’s proposal is a telling reminder of AT&T’s standing with white, educated male professionals in the 1900s. As the Chicago protest of 1888 and Simon Sterne’s New York legislation from 1888 to 1897 revealed, AT&T was seen by affluent Americans as utterly irresponsible, a self-interested, profiteering “octopus” that must be legally transformed into a public service. This transformation required men of Stanley’s status to remain vigilant, since AT&T’s earliest attempt at public service – the public telephone – had proven an unexpected disaster, a health hazard passing as a form of social welfare. Therefore, Stanley castigated AT&T while he discriminated against the “class extremely liable to consumption,” and argued that the corporation bore a responsibility for preventing tuberculosis, too. By ventilating and disinfecting telephones AT&T could fulfill this new social obligation.

Stanley’s ideas reverberated beyond the Tri-State Medical Association who heard his report in 1904. In 1910, his social prejudices and concerns about telephones, tuberculosis, and ventilation were reiterated for twenty thousand subscribers of *Good Health*, a magazine that educated privileged Americans about biological risks. *Good Health* came bundled with a four to eight dollar subscription to *Good Housekeeping* and the *Woman’s Home Companion*, publications for an upper-middle class and affluent female readership.⁴¹ Like *Good Health* these two magazines featured detailed commentaries on preventing tuberculosis, albeit for a less explicitly female audience.

The magazine's writers gave the upper class tips on strengthening their daily personal hygiene, as well as ways to integrate forms of ventilation into their homes, based upon the dust theory of disease popularized by John Shaw Billings.

Exerting a remarkable influence in American health affairs, *Good Health's* publisher, the Health and Efficiency League, also ran a luxurious sanitarium in Battle Creek, Michigan, whose open-air architecture received a favorable review from Billings.⁴² In this rural retreat, the League taught the virtues of dieting, disease prevention, and plenty of fresh air to a dignified roster of 1,250 patients. These included President William Howard Taft.⁴³ A friend of the League, Taft sponsored "Tuberculosis Day" in 1911, an annual public event to raise awareness about dusty, consumptive air in "the congested quarters of cities."⁴⁴ Taft also harbored a keen dislike of telephones. Campaigning for president in 1908, Taft suffered a major public embarrassment when he was trapped and nearly suffocated in an AT&T No. 1 Type booth in Virginia.⁴⁵ Under his enthusiastic endorsement, the telephone business would enter federal regulation two years later under the Interstate Commerce Commission.⁴⁶

Like Taft, the League's two leaders believed that ventilation could prevent tuberculosis. They felt ventilation could also segregate. John Harvey Kellogg, physician and cereal manufacturer, and Irving Fisher, Yale economist public health crusader, had both survived tuberculosis, which they attributed to clean air and "devices for

ventilation.”⁴⁷ The white-suited, white-socked, white-shirted men also attributed their recovery to an avoidance of other races.

These twin beliefs structured the League’s activities, as well as those of Kellogg and Fisher’s other project, the Eugenics Research Association, sponsored by 383 members of the American financial and medical elite, with chapters in twenty-eight states.⁴⁸ As president of the association, Fisher spearheaded scientific studies through the 1920s to prove that decreasing racial and class diversity in the U.S. would eradicate communicable diseases.⁴⁹ Through joint appointments as the director of the National Conservation Commission and a chair for the American Association for the Advancement of Science, Fisher integrated his prejudicial perspective into a well-received urban sanitation report he wrote in 1908, stressing social segregation throughout cities and ventilation in upper-class domestic and working spaces.⁵⁰

In 1910, Kellogg and Fisher’s League brought their xenophobia, medical standing, and national popularity together to root out the public telephone. In an essay for *Good Heath*, the League framed AT&T’s No. 1 Type Booth as a site where different classes came into dangerous contact. Declaring “there is nothing in all our modern existence that is more potent a disease transmitter than the telephone booth,” Kellogg, Fisher, and Fletcher’s magazine hissed:

People in every walk of life, from the lowest slum to the most aristocratic mansion, make use of this necessity of twentieth century business and social life. The man who comes from a home where infectious diseases have claimed victims, and who may carry the infection with him, the tuberculous, the syphilitic, and the common

head-cold sufferer – all these and many others pass in a continuous stream in and out through the doors of the stuffy little box.⁵¹

As the quote illustrates, the League rehearsed class prejudices while extending the public telephone's transgressions to include moral and sexual impurity – two of Kellogg's pet projects – represented by the communicable venereal disease syphilis.⁵² Though they expanded the number of diseases, the League publicized an argument identical to that of Stanley in Memphis and "Pro Bono Publico" in *The New York Times*: AT&T had failed to protect "aristocratic" white subscribers as it made telephones available for five cents a pop to members of "the lowest slum." In the imaginations of Fisher and Kellogg, public phones represented diverse social sites that cultivated disease, even if the aristocracy in all probability rarely patronized the tiny No. 1 Type booths found on the ground floor of boarding houses, Chinese laundries, or saloons, preferring to use telephones in rarified spaces such as hotels, offices, or perhaps even their own homes.

Although the League reviled the poor and working class, they disliked AT&T intensely as well. Therefore, in addition to the "tuberculous, the syphilitic, and the common head-cold sufferer," the League blamed AT&T's *service* as a principal communicator of disease. As the League wrote, using a nickel-in-the-slot phone was taxing, and not only because people had to shout and strain to hear their telephone conversations. Long wait times and improperly connected calls forced users to linger "in the narrow confines of the booth," full of a "disease-laden atmosphere in which you

have been compelled to spend fifteen or twenty minutes or longer.”⁵³ Kellogg and Fisher stressed that even the most cautious users let down their guard during these extended periods, forgetting to open the door of phone booths to breathe in fresh air. As a result, users inadvertently increased their exposure to any microbes of tuberculosis and syphilis germs floating in the booth. The essay in *Good Health* explained the predicament created by AT&T the following way: “You do not notice the stifling atmosphere, for your patience with the telephone system has reached the snapping point and you are fuming with angry resentment.”⁵⁴

Subscribers were not helpless in these circumstances. AT&T could be made liable for public telephones and public health, the League promised. By 1910, when they published their *Good Health* essay, boycotts and subscriber-led legislation had resulted in control over AT&T’s prices in New York, Chicago, Massachusetts, Indiana, and San Francisco.⁵⁵ That same year, AT&T would be subject to price regulation nationally under the Interstate Commerce Commission. Evoking this lineage of successful consumer agency, Kellogg and Fisher encouraged their twenty thousand readers to speak out about the health hazard public telephones represented. “This is truly a deplorable state of affairs, but one that can be easily remedied if only agitated enough by the public,” the League wrote optimistically. “Get busy; write letters to your newspapers and health officers, and demand that conditions be bettered.”⁵⁶

Providing a guideline for dissent, the League suggested that telephone users agitate for ventilated phone booths. They should demand a very specific form of

mechanical ventilation that the League guaranteed would carry any airborne disease away from the phone's mouthpiece, and out of AT&T's confining No. 1 Type booth. First, when readers of *Good Health* wrote their newspapers and public health authorities, they should advocate for a four- or six-inch wide pipe to be inserted into the base of AT&T's booth. The pipe should run to an outside space and feature an electric fan to draw fresh air into the booth, the League wrote. To create a continuous current and pull any tuberculosis germs out of the booth, another pipe and fan should stand sentry at the top of AT&T's booth, sucking "foul air" up and out.⁵⁷ Mechanical ventilation, the League concluded, was the only way AT&T could protect its customers.

The League's reliance on ventilation – rather than segregation – to sanitize public telephones is exceptional. Typically, Kellogg and Fisher's group attacked tuberculosis by urging their white readership to abstain from poor, racially diverse spaces. For instance, in the same 1910 issue of *Good Health*, the League backed a blatantly racist ban on another "public institution," laundries, convinced that Chinese immigrants spread tuberculosis when they sprayed water from their mouths in order to clean clothes.⁵⁸ Consequently, the League informed whites to patronize only laundries in "a respectable residence district" and avoid any facilities if "you think it probable that any part of the building that is occupied by the laundry is being used for immoral purposes."⁵⁹

Yet when it came to public telephones as a common object and space, the League rerouted their prejudices into ventilation. This technological fix would put the responsibility of both health and discrimination squarely on AT&T, suggesting that as with many white, affluent American businessmen in the 1900s, Kellogg and Fisher desired to see AT&T bridled as a public service. Like Stanley, the Memphis physician, they wanted the design of public telephones to reflect that AT&T was accountable for any communication of disease between callers. Therefore, the Health and Efficiency League redirected its segregationist agenda into promoting ventilation to help control AT&T.

Dissent from the influential League registered with AT&T.⁶⁰ Yet as they took on the public telephone controversy, the corporation would exploit loopholes in ventilation standards, as well as find leeway in government regulation. As a result, AT&T would realize a way to ventilate *some* telephone booths with their expensive Ready-to-Run Ventilating Set, while disregarding the health of poor and working class telephone users. As a product, the ventilator would frame disease prevention as a consumer responsibility. This solution would be based upon how AT&T handled tuberculosis among a maligned part of their workforce – switchboard operators.

Selling the prevention of disease

By 1910, when the Health and Efficiency League published their essay, AT&T's public telephones permeated American cities. In Chicago, nickel-in-the-slot phones

constituted the majority of that city's 250,00 telephones, more than the total number of telephones in France.⁶¹ Public telephones and No. 1 Type booths made equally strong showings in New York, Philadelphia, Washington D.C., Los Angeles, San Francisco, Milwaukee, Boston, St. Louis, Cleveland, Cincinnati, and Denver.⁶² The returns for AT&T and its affiliates (including Chicago Telephone, Metropolitan, and the Bell Northeastern Telephone Exchange) were tremendous. In 1900, when the company and its affiliates deployed public telephones in cities in force, year-end profits equaled \$46.1 million. A decade later, profits had quadrupled to \$164.2 million.⁶³ All those nickels plunked into public telephones added up.

Correspondingly, charges that public telephones spread tuberculosis proliferated. By 1913, investigative reports could be read in *The Washington Post*, *The New York Times*, *The Los Angeles Times*, *The Milwaukee Journal*, and technological trade magazines like *Electrical Engineering*.⁶⁴ Each of these publications supported the medical perspective advanced by Stanley in 1904 and the Health and Efficiency League in 1910, adding to a collective recommendation that public telephone booths be ventilated.

The discussion extended overseas in 1907, when physician Francis J. Allan, ventilation expert and co-author of London's Housing of the Working Classes Act, wrote an open letter to the County Council in the esteemed *British Medical Journal*. Alerting the Council, a municipal authority over disease prevention, Allan pinpointed public telephones as a health hazard. As he wrote, "The telephone call station may be

described, in fact, as a bacteriological box in which pathogenic and other organisms are carefully nursed.”⁶⁵ Allan noted that like AT&T’s No. 1 Type booth, telephone booths in London were also designed to contain the sonic waste products of shouting into phones, as well as shutting out noisy surroundings like boarding houses. In so doing, Allan wrote that booths also locked out “external purifying agencies which seldom reach the interior.”⁶⁶ Allan advised the Council to prevent the diseases at public telephones in London by mandating mechanical ventilation.

While AT&T kept tabs on the public telephone controversy, it recognized its partial immunity to the situation in 1910. The revelation came during a labor investigation related to tuberculosis and ventilation that year. As AT&T entered the jurisdiction of the Interstate Commerce Commission, the organization surveyed working conditions at 458 AT&T-affiliated telephone exchanges in twenty-six states. Part of the investigation surveyed the health of several thousand female operators employed in switchboard rooms, nerve centers in the telephone network where local and long-distance calls were connected. Operators’ health concerned the Commission since in 1907 women initiated or participated in strikes in Texas, California, Montana, Iowa, Utah, Idaho, and Toronto.⁶⁷ Among demands for higher wages and reduced working hours, operators stipulated that AT&T must ventilate the rooms where they worked at switchboards.

Incensed about the lack of ventilation, striking operators stressed that working at switchboards exposed them to tuberculosis. Seated shoulder-to-shoulder with up to

seventy other women in a room, operators worked eight to ten hours shifts at switchboards with a marked lack of fresh air.⁶⁸ Explaining this cloistered environment, AT&T managers told the Commission that dust from open windows bedeviled switchboards by short-circuiting their electrical wiring and disconnecting telephone calls.⁶⁹ Dust affected technology as much as it affected people. As a result, operators were forced to work in unventilated rooms. They connected up to 260 calls per hour from a personal space smaller than a two-by-two foot No. 1 Type booth.

Reviewing the long hours, women's proximity to each other, and the absence of ventilation, physicians confirmed that switchboard rooms were conducive to the communication of tuberculosis. One Toronto physician told the Commission, "The worst condition there [at the switchboard] is their sitting so close together that they must inhale each other's breath. I think operators can't stand more than three years of life of such service."⁷⁰ Another physician interviewed by the Commission argued that the *switchboard itself* contributed to the communication of tuberculosis. He perceptively observed, "Girls must sit so close together and breathe against a flat surface not over 18 inches from their faces, which prevents a normal dispersion of the breath as expelled from the lungs throughout the surrounding air."⁷¹ Any tuberculosis germs therefore circulated in concentration amongst operators.

The Commission pointed out that mechanical ventilation might resolve operators' hazardous work. They mentioned the positive results of a 1907 experiment at an AT&T-affiliated Boston switchboard, undertaken by physician Charles-Edward

Armory Winslow, friend of Irving Fisher at the Health and Efficiency League and founder of Yale's Department of Public Health. Winslow's experiment was simple. He installed a galvanized iron duct in the ceiling of the switchboard room, which ran to the outside of AT&T's building. Outfitted with an electrical fan, the iron duct removed any airborne germs from the room at the exact rate at which the average adult inhaled and exhaled. Operating for two years, Winslow's system cut illness and absenteeism among operators nearly in half. It also saved the telephone company approximately \$195 per operator in lost working hours.⁷² The benefits to both operators and AT&T appeared obvious.

AT&T chose another solution. They instructed operators to prevent tuberculosis *themselves*. Under the advice of Edward J. Hall, general manager of Chicago Telephone, AT&T instituted after-work health courses to teach operators "the ordinary common rules of hygienic living," particularly "cleanliness in person and dress on the part of the individual."⁷³ A specific lesson reminded operators to take the time to ensure their clothes were free of dust before they began work at switchboards. By completing this self-disciplining task, operators ideally rid themselves of any dried tubercular sputum, and prevented infecting other women. As Hall commented, if female workers could learn "about how to take care of themselves, they can reduce sickness, just on their own account."⁷⁴

Choosing health courses over mechanical ventilation benefitted AT&T in several ways. By teaching operators to prevent tuberculosis, the company avoided the

cost of installing and maintaining Winslow's electrical ventilation system in their 458 exchanges across the U.S. In the long run, AT&T circumvented an even costlier battle – taking responsibility for workers' health in general. As the health courses emphasized, any incidence of tuberculosis at switchboards was due to women's personal neglect in hygiene, rather than a consequence of their unventilated, phone-booth-sized workspaces.

Although the Interstate Commerce Commission found switchboard rooms “very questionable,” and although they recommended mechanical ventilation in their 1910 report, they ultimately left disease prevention up to AT&T. Since the federal organization's authority over AT&T was circumscribed to the price of local and long-distance telephone service, the Commission felt it could not impose standards relating to operators' health. As the Commission's report also observed, no uniform ventilation standards even existed on a municipal, state, or federal level, making regulation difficult. Between 1907 and 1917 only fifteen states possessed any kind of ventilation law. Only four of those states – New York, Illinois, Massachusetts, and Indiana – made ventilation mandatory for working environments.⁷⁵ Within this handful of states, under-funded health boards and a lack of trained inspectors made ventilation codes difficult to enforce, historian John Duffy points out.⁷⁶

For these many reasons, the Commission refrained from intervening in operators' unventilated labor. Unimpeded, AT&T and its subsidiary telephone companies foisted the prevention of tuberculosis onto female employees, despite

evidence that the corporation's health courses were ineffective. In 1919, a University of Chicago medical researcher hired by AT&T estimated that five to twenty-seven percent of operators in Chicago annually contracted tuberculosis while at work, and another twenty-three percent contracted influenza.⁷⁷ Faced with such dangerous working conditions, operators continued to fight in vain for ventilated switchboard rooms into the 1940s, historian Venus Green argues.⁷⁸

Finished for the time being with switchboard operators, AT&T turned to the similar controversy surrounding its public telephones. Taking lessons from the Interstate Commerce Commission's investigation, AT&T and its affiliates realized they could offload tuberculosis prevention onto public telephone users just as easily as they could with operators. In a void of health regulation, therefore, AT&T would individualize and sell disease prevention with the Ready-to-Run Ventilating Set. However, like the health courses offered to operators, which represented "concern for employee wellbeing," AT&T's mechanical ventilator would shrewdly position the company as public service-oriented.⁷⁹ By appearing receptive to physicians such as Kellogg and Fisher (and their twenty thousand readers of *Good Health*), AT&T would hopefully avoid any potential boycotts or further demands for regulation.

In late 1911, AT&T subcontracted the ventilation of its No. 1 Type booths out to the B.F. Sturtevant Company of Boston, famed designer of mechanical ventilation for the U.S. Capitol building. Through Sturtevant AT&T carefully addressed the public telephone controversy. In "The Facts About Ventilation," a pamphlet Sturtevant

printed for public consumption in 1913, the company wrote that it shared physicians' concerns, agreeing that public telephones and booths contributed to the communication of tuberculosis as well as "other disease of the throat, mouth, or lungs."⁸⁰ The situation was especially dire, Sturtevant added, due to a lack of legislation. "The day will undoubtedly come when laws will compel ventilating booths for public safety," the company boldly wrote in their pamphlet, cementing their solidarity with the medical community.⁸¹

Until legislation arrived, Sturtevant promised to protect public telephone users with their Ready-to-Run Ventilating Set. It consisted of a pair of four- to six-inch galvanized iron pipes bored into the base and top of a No. 1 Type booth. Affixed to the top pipe sat a mechanical ventilator. The eighteen-pound, snail-shaped, compressed steel apparatus included an electric, motorized fan. The fan cycled fresh air into a booth as people talked, shouted and expectorated into the phone. This ensured that no one would "breathe air used by other people," which might include dust laden with tuberculosis.⁸²

The contraption almost exactly matched the mechanical ventilation system that the League advocated for in *Good Health*, suggesting the influence of Kellogg and Fisher's popular magazine. In its galvanized and electrified construction, Sturtevant's set additionally recalled Winslow's experimental ventilation system, which the physician installed to prevent tuberculosis among Boston switchboard operators. Finally, Sturtevant's ventilator embodied simmering segregationist desires. As

Sturtevant (and their contractor AT&T) implied, the Ready-to-Run would isolate and individualized users. Though they might share public telephones, “aristocrats” and the “little fellow” from “the lowest slum” would literally breathe different air.

Besides arguing that their innovation prevented tuberculosis, Sturtevant pointed out additional benefits. The Ready-to-Run set would not impinge upon the already difficult process of shouting into a phone and straining to hear a response. As two 1913 advertisements in the monthly industry trade magazine *Telephony* detailed, a diffuser over the fan would direct fresh, sanitary air away from telephone mouth- and earpieces, precluding noisy wind interference.⁸³ From the perspective of Sturtevant’s advertisements, the Ready-to-Run set surpassed disease prevention to fix other notorious problems with AT&T’s public service.

The catch was that AT&T did not make the Ready-to-Run Ventilating Set a standard part of its booths. Instead, it sold the set as an expensive accessory. At \$50 plus shipping and installation, the ventilator cost ten dollars more than the No. 1 Type booth that AT&T leased to boarding houses, tenements, saloons, and laundries.⁸⁴ In addition to the upfront bill, the Ready-to-Run set continued to cost in terms of electric service – so much so that in 1912, the magazine *Popular Mechanics* published technical advice to help those leasing public telephones cut down on their monthly electric bills, which the magazine reported were “quite an item.”⁸⁵

As these financial burdens emerged, AT&T’s resolution to the public telephone controversy became apparent. Exploiting inconsistent ventilation standards and

uncertain government regulation, the corporation and the B.F. Sturtevant Company turned the prevention of tuberculosis into a new market. Individuals could choose to participate in this market for ventilated public telephones, that is, if they could handle the initial and recurring investments. As Sturtevant's pamphlet admitted, only a few places might be able to take on this responsibility, such as the "high class hotels and clubs" that leased public telephones. An advertisement in a 1914 issue of *The Heating and Ventilating Magazine* boasted for instance that the Ritz-Carlton Hotel in New York and the Breveport Hotel in Chicago had installed Ready-to-Run sets atop their No. 1 Type booths located in their lobbies.⁸⁶

Like the health courses for switchboard operators, the Ready-to-Run set offloaded AT&T's obligation to prevent disease onto individuals. Yet it did so under the guise of a public service. On the one hand, as they offered mechanical ventilation to customers, AT&T and Sturtevant suggested that they were socially sensitive companies, open to physicians' concerns and willing to help in the fight against tuberculosis, killer of a quarter of American citizens annually. On the other hand, AT&T and Sturtevant designed and sold disease prevention as an individual responsibility, achieved by purchasing a Ready-to-Run set. Like switchboard operators who dusted themselves of any tuberculosis germs, it would be up to those leasing public telephones to buy, install, and maintain AT&T's disease preventing technology.

When it came to health, the public telephone's design was consequently divided by class and race. For affluent whites like John Harvey Kellogg and Irving

Fisher, this division might not be noticeable, since they presumably used public telephones in places that could purchase the Ready-to-Run set. For the literal millions of poor, working class, nonwhite users in the U.S. who used public telephones in laundries, saloons, boarding houses, tenements, and arcades, however, AT&T and Sturtevant's product might well remain out of reach, even though these users suffered tuberculosis at substantially higher rates. The "class extremely liable to consumption," as they were medically stereotyped, simply could not afford a safer public telephone.

Conclusion

Public telephones, tuberculosis, and mechanical ventilation. These odd bedfellows bring AT&T's "public service" identity into critical clarity. On paper, municipal, state, and federal regulatory efforts may have "transformed the telephone operating company from a specialty service for an exclusive clientele into a mass service for the entire population," as historian Richard John argues.⁸⁷ These forms of regulation, galvanized by the Chicago telephone boycott in 1888, articulated in New York legislation from 1888 to 1897, and codified on a national scale in 1910, hoped to lower AT&T's prices and extend service to a greater number of Americans. The introduction of public telephones in 1900 seemed to signal AT&T's acquiescence to these social and impending regulatory demands, particularly as nickel-in-the-slot phones were leased en masse in poor and working class environments.

However, as we have seen, AT&T's public service project also introduced a potentially serious health hazard, exacerbated by low-quality phones and constricting, poorly designed booths. The corporation's solution created even more complications. Rather than standardize a more hygienic public telephone, AT&T used regulatory gaps to distance itself from health responsibilities, while creating a new, ancillary market for a disease-preventing product, the Ready to Run Ventilating Set. Poor and working class public telephone users were not alone in being marginalized by AT&T's strategy. The company's refusal to design healthier telephone technology "for the entire population" affected a large part of the company's workforce, too, mainly female switchboard operators.

In the early 1900s, AT&T's obligation to these social constituents often remained unenforced. As Dan Schiller observes about this subject from a regulatory standpoint, "The gap between legal precept and actual practice thus remained cavernous."⁸⁸ Schiller adds that AT&T and its affiliated network of companies would continue to successfully determine service rates, ignore labor complaints, and dictate the accessibility and quality of public telephones until the formation of the Federal Communications Commission in 1934. It would take another decade of intense coordination and cooperation between that federal organization, state public utilities commissions, and labor unions to decisively fix telephone rates, improve working conditions, and offer a standard quality of service to just over fifty percent of the U.S. population.⁸⁹

Fittingly, in 1948 AT&T finally made mechanical ventilation a built-in part of its public telephone booths. The company's design contractor, Rollie Nawman, also integrated safety glass, ceramic porcelain, and aluminum surfaces into the design of AT&T's booths. The slick, coated materials attempted to prevent dust and germs from accumulating, while the glass panels on every wall of the phone booth served to let in light (the "deadly foe to bacteria," as Stanley put it in 1904). The materials Nawman chose additionally allowed the booth interior to be wiped clean of dust and germs, should AT&T choose to hire a cleaning service.⁹⁰ This ventilated, hygienic design appeared some forty years after physicians targeted public telephones, and approximately thirty years after the highest rates of tuberculosis and other communicable diseases occurred in the U.S.⁹¹

It is perhaps unsurprisingly that AT&T's response to the public telephone controversy in the 1900s aimed to maximize profit and minimize the corporation's liabilities. The contradictory role played by the medical community, however, is a much more revealing part of this case. At first, their concern for public telephone users' health appeared altruistic, grounded in scientific knowledge about the communication of tuberculosis. Their denouncement of AT&T's phones additionally suggested that this was an institutional issue akin to windowless, overcrowded tenement buildings, or the comparably cloistered switchboard rooms at AT&T's telephone exchanges. Yet the physicians we met in this chapter were also unmistakably motivated by social prejudices. Their imagined reformation of public

telephones clearly conflated disease prevention and social segregation, couched within a seemingly neutral technology, mechanical ventilation.

Their discriminatory efforts illustrate that like many other white, moneyed, early telephone adopters, physicians were deeply conflicted in their civic ideals. Although they wanted AT&T to operate as a public service, physicians and other members of the “rich capitalist class” were dismayed by the resulting inclusion of lower class and immigrant Americans into the telephone network. Consequently, influential medical figures like Kellogg and Fisher envisioned designs to contain and exclude these users, down to the dust and germs they allegedly left on telephones.

The exclusionary tactics pursued by medical professionals were certainly not limited to public telephones and tuberculosis. As Nancy Tomes argues, physicians in the 1900s consistently defined diseases in othered, marginalized terms. They consequently proposed that communicable afflictions could be resolved through the individualization and isolation of ill bodies. Therefore, “when it came time to personalize the causes of tuberculosis,” Tomes writes, physicians “often shifted the locus of blame back to the individual.”⁹² This socially constructed “individual,” Tomes concludes, was invariably “assumed to be poor, uneducated, foreign-born, or nonwhite.”⁹³

Such unresolved medical prejudices gave AT&T an opportunity to turn disease prevention into an individual, consumer responsibility – tying into the theme of this dissertation. By framing tuberculosis as class-based, physicians suggested that its

prevention could be fragmented along economic lines. By vilifying poor, ill people who continued to “telephone constantly,” physicians also framed disease prevention as a matter of personal habit and discipline. As a professional group with considerable social influence, physicians therefore directed attention away from AT&T’s abysmally designed technology, and away from advocating for an inclusively safer, sanitary public telephone. From this perspective, the Ready-to-Run Ventilating Set is as much a medical construction as it is a piece of industrial design.

The U.S. medical community will play a similarly divisive role in communications media design, witnessed in the several other distinct time periods and social contexts that we will visit in the following chapters. In the 1960s and 1970s, the setting for Chapter 2, physicians, health insurers, and emerging corporate fitness consultants will medicalize another widespread health issue – coronary heart disease – as a product of personal habits and choices. Like tuberculosis, coronary heart disease will become coded as an individual responsibility.

Medical figures in this era will also persist in framing disease prevention according to social biases, in this instance privileging white, male “executives” and their experiences with heart disease. The medical construction of this disease will inform the industrial design of the earliest cell phone sold in the U.S. As the next several pages explore, this portable phone is created by AT&T’s rival, Motorola, as an expensive, persuasive supplement, designed to improve the personal health of a select

class, race, and gender. Like the Ready-to-Run Ventilating Set, disease prevention remains hierarchically designed.

As they individualize leading health issues, members of the medical community will recurrently exert authority over legitimizing biological and technological risks. This activity will put them in the position of arbitrating between victims and corporations beyond public telephone users and AT&T. Their gatekeeping role will also prevent several risks associated with communications media from being acknowledged. As we will see in Chapters 3 and 4, medical disregard for cell phone-based health concerns will encourage the telecommunications industry to disregard them as well. Like lower-class public telephone users, people allegedly afflicted by cell phones will also be medically framed as untrustworthy. This marginalized population can be examined and diagnosed, but it will not be invited to participate in the industrial design of healthier forms of media.

With these medical currents operating in the background, I want to rack focus onto another group of actors, industrial designers, as they began to balance health risks, media, and a belief in individual responsibility in the 1970s.

The only truly important ceremony is that of exercise.
– Michel Foucault (1975)¹

BIOLOGICAL RISK

Chapter 2: The Motorola DynaTAC, Coronary Heart Disease, and the Burden of Empowerment

In 1973, the American cellular telephone manufacturer Motorola came out swinging in two battles.

The first, most well known battle was against AT&T's Advanced Mobile Phone System (AMPS). An innovation in wireless telephony introduced in 1946 and improved in 1962, AMPS consisted of radio frequency transmitters that AT&T would arrange across cities in "cells."² These cells of wireless telephone service could receive and relay calls transmitter to transmitter as callers moved through space. An ingenious design, AMPS seemed destined for great things, given AT&T's standing as the largest private industrial organization in the world, with an operating revenue of \$17.2 billion in the early 1970s and an enviable status as the "common carrier" or universal provider of telephone service in the United States.³ By 1956, without federal approval, AT&T went ahead and began relaying the cellular calls of 543 lucky users in New York City, who accessed the system through eighty-pound telephone equipment installed in their cars.⁴

Despite the strong lead, AMPS was hamstrung by a 1956 Consent Decree with the U.S. Justice Department. The antitrust settlement against AT&T dictated that if

the corporation wanted to remain the common carrier of telephone service, it must surrender its interest in cell phones, only manufacture products for its existing landline system, and publicly disclose its 8,600 patents.⁵ As AT&T agreed to the terms of the Consent Decree, its cellular prospects dimmed. Although the company continued working on AMPS into the 1980s, it fell into a “competency trap,” abandoning its cell phone technology to continue enjoying the “tremendous success of the wireline infrastructure they had created,” as John Leslie King and Joel West observe.⁶

With AT&T tied to the landline telephone, Motorola successfully entered the cell phone business in 1973. The relative underdog, with a mere 2.4 percent of AT&T’s operating budget, the Illinois-based manufacturer of portable radios, pagers, and walkie-talkies demonstrated a cellular system similar to AMPS in 1973, accessible via a portable cellular phone called the DynaTAC 8000x.⁷ Gaining a federal license to provide cellular service in 1979, Motorola sold its first DynaTAC for \$3,995 in 1983 and attracted 340,213 wealthy consumers in two years. The company secured another 681,825 customers by 1986 and 1,300,855 by 1987.⁸ As the conclusion to this first battle goes, Motorola eclipsed AT&T’s AMPS to lead the global market for portable cell phones until roughly 1994.

Motorola fought a second battle, though, and it is this much less well-known contest I want to focus upon. As this chapter explores, in the 1970s the portable DynaTAC was also designed to fight coronary heart disease among its “executive” male

business users.⁹ Martin Cooper, fitness guru and principal developer of the DynaTAC, believed that if executives could be freed from “desk-bound” telephone calls – and AT&T’s heavy, corded phones – and persuaded to walk and talk simultaneously, the modest exercise might diminish their risk of heart disease.¹⁰ Illuminated in detail below, Cooper’s portable design built upon broader corporate investment in executives’ health, determined according to gender, class, insurance and medical expenses. Cooper’s cell phone also complemented the central health activity for men in this era: physical fitness.

As Motorola battled heart disease, two factors hindered the DynaTAC. First, I reveal that in the early 1970s, Cooper and his design staff could not create a truly small, lightweight, easily portable cell phone, dampening the DynaTAC’s potential to persuade executive businessmen to exercise. Second, as Cooper fantasized about altering executives’ health behavior, he deepened a corporate conceptualization of health as an *individual achievement*. In turn, Cooper and Motorola guided the cellular industry towards a “burden of empowerment,” in which the responsibility of treating coronary heart disease is offloaded onto individual cell phone users.¹¹ This burden is increasingly apparent, I conclude, as designers in the 2000s have extended Cooper’s fantasy to help them construct persuasive fitness supplements for smartphones.

Approach

As I analyze Motorola's attempt to prevent coronary heart disease, I build upon themes of biological risk, individualization, and media design that I explored in Chapter 1. As we witnessed in that chapter, physicians in the 1900s advocated for AT&T to help prevent the communication of tuberculosis at public telephones, which could be solved by designing mechanical ventilation into phone booths. Playing off physicians' socially prejudiced conceptions about how tuberculosis spread, AT&T introduced the Ready-to-Run Ventilating Set. This expensive piece of design turned disease prevention into a product, and an individual consumer responsibility that only privileged whites might be able to afford.

Motorola's DynaTAC represents a continuing commodification and individualization of disease prevention in the U.S., as tuberculosis gave way to coronary heart disease as the leading cause of death in the middle of the twentieth century, and as AT&T's telephone network was challenged by Motorola's portable cell phone. We will see in this chapter how the treatment of biological risks becomes interwoven with personal lifestyle choices. Individual executives are encouraged first by medical professionals and then by Motorola to change their sedentary behavior and lower their susceptibility to heart disease. As in Chapter 1, I argue that this preventative project is deeply prejudiced in its design. Motorola's DynaTAC is constructed to help improve the health of white, exceedingly wealthy businessmen.

Although my focus in this chapter shifts from physicians to industrial designers, I want to emphasize that the individualization of health responsibilities around communications media remains medically constructed, too. Historian William Rothstein argues that as early as 1910 physicians believed that lifestyle choices played a determining role in coronary heart disease. Aided by health and life insurance companies, medical professionals attempted to prove this thesis by delving into complex statistical analyses of American men's "risk profiles" in the 1940s through the 1960s. They accounted for broad metrics like weight, age, race, gender, and class, as well as finer-grained personal health factors including smoking, drinking, diet, daily stress levels, and average sedentary activity – a key factor covered in this chapter. As a result, Rothstein argues that by the early 1960s the medical establishment defined coronary heart disease as an individual responsibility, emphasizing that poor personal choices allowed the disease to manifest in epidemic proportions among white, wealthy businessmen.¹²

As we will see in this chapter, the price of medical care reinforced this sense of personal responsibility, as health insurance rates for executives rose one hundred and three percent from 1960 to 1970.¹³ In addition, from 1964 to 1971, the inclusive costs of diagnosing and treating a single heart attack increased one hundred and twenty-six percent.¹⁴ As a fitness-conscious executive, Cooper at Motorola intervened in this escalating medical and financial dilemma and made it a project for the communications media industry. He did so by designing the DynaTAC as a portable

fitness supplement, imagining that the phone could persuade other executives to individually, incrementally fight heart disease.

Archival access makes writing this particular industrial history challenging. In Chapter 1, I was able to draw upon the National Library of Medicine. Its collection of books, journals, reports, pamphlets and advertising literature allowed me to render physicians as complex participants in the social construction of the telephone, possessing intense class and racial biases, a personal dislike of AT&T, and a faith in their expertise over disease prevention. Such details offered me the opportunity to contemplate how and why physicians advocated for redesigned, individualized public telephones in the 1900s.

Due to the fiercely competitive nature of the cellular industry, Motorola offers no comparable public collection to examine its industrial designers and their work. To prevent the DynaTAC from being poached by AT&T, Motorola strictly discouraged Cooper and his assisting designers from recording or publishing their work in the 1970s.¹⁵ Internal documents that do possibly exist are managed by Motorola Solutions Heritage Archives, which does not support any outside research. Despite their policy, I was able to access the company's annual reports from the Archives website.¹⁶ Spanning 1943 to 2009, these reports detail Motorola's research, design, and production strategies and budgets, Cooper's rise within the company to Vice President of its Communications Division, and discussion about the DynaTAC project in the early 1970s. One report even includes a promotional photo of the ideal executive cell phone

user envisioned by Motorola – white, square jawed, and utterly in control with the cell phone in his hand.

Cooper also retrospectively commented on the DynaTAC in interviews for newspapers, business journals, and television and radio programs in the 2000s. The interviews predictably memorialize Cooper as the “father” of the cell phone and simplify its creation, describing its construction as the sole achievement of a few innovative designers. On a more surprisingly level, though, Cooper’s interviews also position cell phone designers – both in the 1970s and in the 2000s – as authorities over coronary heart disease and its prevention. From Cooper’s perspective these male technological experts have historically helped build the health culture at communications media companies like Motorola. Subsequently, they channel their heart-healthy lifestyles into designing media that persuade consumers to take responsibility for preventing disease.

Although Cooper’s interviews frame industrial designers as altruistic, unconventional health experts, this chapter points out that they have a much less positive presence. The material I collected illustrates how Cooper and his assisting designers constructed the DynaTAC according to unspoken class and gender prejudices. Motorola, like many U.S. employers, insurers, and medical professionals in the 1960s and 1970s, concentrated on preventing disease among white, wealthy men, the executives who seemingly made the “greatest contributions to society,” as Rothstein puts it.¹⁷ As a consequence, I argue that Cooper helped instigate a health

care market that caters to a very narrow percentile of Americans at risk for coronary heart disease. His DynaTAC (and many of the smartphone fitness supplements that have followed in its wake) are feasible only for consumers fortunate enough to have the disposable income, personalized medical attention, and support at work to “individually” improve their health.

Executive health

In the earliest press release for the DynaTAC, dated April 3, 1973, Motorola’s public relations office described the first commercial cell phone in the U.S. as a universally accessible technology. Like AT&T’s national telephone infrastructure, the DynaTAC would welcome “heavy usage by a widely diverse group of people – businessmen, journalists, doctors, housewives, virtually anyone who needs or wants telephone communication in areas where conventional telephones are unavailable,” Motorola Vice President John Mitchell stated in the press release.¹⁸

Contradicting the universal rhetoric, Mitchell, Cooper, and Motorola CEO Robert Galvin privately agreed that their cell phone would sell for close to four thousand dollars per unit to recoup the one hundred and fifty million dollars Motorola earmarked for engineering, design, and production costs over the next decade.¹⁹ To cover the overhead – almost half of Motorola’s average operating revenue in the early 1970s – Motorola targeted businessmen as their primary consumers.²⁰ The company especially hoped to capture the trade of executives, an elite professional class with an

average earning power of twenty-six thousand dollars per year in the early 1970s, and an equally expensive battle with coronary heart disease.²¹ In 1971, a heart attack cost \$3,280 per person in hospital and physician fees, nearly as much as the projected retail price of the DynaTAC.²²

This section leaves Motorola to examine its executive consumers from the 1950s through the design of the DynaTAC in the 1970s. I highlight how executives' gender, wealth, exorbitant healthcare expenses, and desk-bound labor generated corporate interest in getting executives to exercise. Once we return to Motorola later in the chapter, we will see how executives' individualized fitness programs resonated with a male, fitness-obsessed culture at Motorola. Executive fitness trends subsequently urged the company's designers to make the DynaTAC portable.

Despite the attention executives received beginning in the 1950s, they comprised a fragment of the U.S. population. Only 2.4 million adults – eleven percent of the total white-collar workforce in 1956 – worked at a “manager/official” or “executive” capacity in the U.S.²³ Although this tiny group included industrial designers and engineers at Motorola, the majority of executives worked as auditors, accountants, personnel directors, program administrators, and brokers, employed in one of four industries: wholesale trade, finance, insurance, or real estate.²⁴ Almost exclusively twenty-five to fifty year old white men, executives enjoyed considerable wealth. Nearly one quarter of them made \$10,000 or more (roughly \$100,000 adjusted

for inflation), salaries that swelled thirty-two percent by the time Motorola publicly announced its cell phone in 1973.²⁵

If the finances of Motorola's executive consumers were robust, their health was endangered. The federal government expressed alarm in 1960 when the U.S. Department of Health, Education, and Welfare reported that forty-one percent or 675,610 white men aged thirty to sixty died from coronary heart disease that year.²⁶ (This did not count deaths due to related complications like hypertension or stroke, which pushed the numbers of deaths over sixty percent.) Fatalities caused by coronary heart disease continued to hover at thirty-nine percent in 1971, as Cooper dreamed up the DynaTAC.²⁷ By 1983, when Motorola released the DynaTAC for sale, thirty-five percent of adult white men were still succumbing to heart disease.²⁸

Despite the dramatic statistics for Motorola's potential consumers, heart disease-related deaths for white women and African-American men only trailed by five to eight percentage points from 1960 to 1983.²⁹ Additionally, executives were not the only white men felled by heart disease. That factor became clear during a cardiovascular study conducted from 1963 to 1967 at AT&T, Motorola's cellular rival. In the study of 103 workmen, 57 foremen, 101 supervisors, and 95 managers and executives, executives suffered forty-three percent *fewer* heart attacks than men employed at a blue-collar level in the telecommunications giant.³⁰

Yet executives' heart disease received a disproportionate majority of medical, federal, corporate, and popular attention in the 1950s through the 1970s. Health and

life insurance companies perpetuated the bias. Institutions such as the Metropolitan Life Insurance Company scrupulously tracked the health of executives due to the types of policies these men held, stipulating that when an executive died, insurers often provided death benefits that grossly outweighed the premiums executive had originally paid.³¹ To protect their financial interests insurance companies effectively concentrated private (and public) attention onto occurrences of heart disease among executives, urging employers to realize the losses incurred when a chief accountant or personnel director died.

In 1954, for example, health insurers collaborated with the American Management Association, the principal corporate consulting and training firm in New York, to advertise that heart health-related blood tests costs companies between \$55 and \$200 (\$487.75 – \$1,759 adjusted) per executive.³² By 1975, insurers continued to press the subject in *Fortune* magazine, the largest circulated business publication in the U.S. in the 1970s, stating that companies in trade, finance, and real estate lost an estimated \$700 million yearly trying to replace executives killed by heart disease.³³ Around that same year, in findings released to national newspapers *The Los Angeles Times* and *The New York Times*, the insurance industry warned that large corporations were drained of \$3 billion and 132 million workdays lost to illness and absenteeism when executives who managed to survive heart attacks recuperated.³⁴

Under public and financial pressure from health and life insurers – who raised corporate policy rates over one hundred and three percent from 1960 to 1970 – trade,

finance, and real estate firms attempted to staunch their losses by constructing “risk profiles” for “high value” employees.³⁵ Beyond stress, diet, drinking, or smoking, corporations concentrated upon executives’ desk-bound work as a foremost risk factor since it had the clearest medical correlation to atherosclerosis, an accretion of fatty plaque that hardens and narrows arteries, leading to coronary heart disease.³⁶

Consequently, the desk-bound threat became the subject of intense corporate scrutiny. Daniel D. Howard Associates, a management consulting firm in Illinois, compiled a definitive report on executive’s sedentary lives republished for public perusal in a July 1969 issue of *Time* magazine. Howard Associates extensively researched trade, real estate, and communications firms in Chicago (where Motorola held offices). The average workweek for mid- and senior-level executives, Howard Associates revealed, totaled fifty-three hours at the office, capped by ten hours finishing work at home.³⁷ Men spent virtually all of these hours immobilized behind a desk. They would be twenty-five percent more likely to develop heart disease due to their sedentary nature, Walter Alvarez, a Stanford University physician, added in his nationally syndicated newspaper column on medical trends.³⁸

Once desk-bound labor was identified as a scourge of executive’s health, physical fitness became the antidote. The trick, however, was to fold fitness into executives’ consuming work schedules. The YMCA, a private, national men’s organization, offered an early solution in 1963. Targeting finance, insurance, and real estate office in Minneapolis, Boston, Chicago, and New York, the YMCA crafted press

releases publicized with the collaboration of figures such as Mayor Richard Daley in Chicago. The publicity encouraged managers, supervisors, and executives to step away from their desks and spend lunch completing mile-long walking courses the YMCA strategically placed near executives' companies. The program, called the "Measured Mile," caught on as a way for executives to prevent coronary heart disease through modest exercise, easily scheduled into free time during workdays.³⁹

The YMCA's approach to fitness – as a male, privileged, occupational activity – became individualized as the 1960s progressed. Information technologies corporation Xerox set the groundwork. In 1967, the company hired a fitness specialist, Don Fredericks, to create exercise programs tailored to the heart health of Xerox's top forty executives. Fredericks accounted for each executive's risk profile (which included measuring their desk-bound working hours) before he prescribed a "moderate" exercise routine that might include an hour spent jogging, cycling, playing squash, or simply walking at Xerox's first gym built at the company's headquarters in Rochester, New York.⁴⁰

Fredericks' focus on desk-bound work and fitness saved several Xerox executives from heart attacks, and inspired identical fitness programs at twelve hundred U.S. corporations by 1975.⁴¹ His work additionally influenced private organizations such as Fitness Centers for America. Started by Laurence Morehouse, a University of California kinesiology professor and YMCA consultant, Fitness Centers for America also encouraged executives to balance desk-bound labor with moderate

physical exercise.⁴² Like Fredericks, Morehouse created an individual risk profile and matching fitness program for each executive. Rather than send his 350 customers to a company gym, however, Morehouse persuaded executives to complete versions of the physical conditioning exercises he designed for astronauts at NASA in the early 1960s.⁴³ (As we will soon see, Morehouse's tenure at NASA would put him in inadvertent contact with cell phone designers at Motorola).

Morehouse's temperate strategy became his company's selling point. His business partner emphasized as much in a *Los Angeles Times* profile that ran on the front page of the business section in 1975. "We don't want [executives] racing around the track," Morehouse's partner promised.⁴⁴ Instead, he said, "We want them to do what they need to do and nothing more," suggesting that at Fitness Centers for America, executives' work, exercise, and heart health would remain in equilibrium.⁴⁵

As programs emerged to address coronary heart disease among executives in the 1960s and 1970s, a distinct definition of fitness emerged as well. At men's organizations like the YMCA or Fitness Centers for America, as well as at corporations like Xerox, fitness meant routine physical activity conducted to prevent costly deaths and illnesses. Given its financial underpinnings, fitness also meant a restrained activity, improving health without necessarily disrupting executives' work.

Finally, fitness represented a deeply masculine, individual project, despite being overseen by health insurers, physicians, and corporate specialists. As fitness historian Shelly McKenzie points out, corporations rarely acknowledged that

executives' health entailed a meticulous, expensive systemic effort (one which largely excluded the other eighty-eight percent of the white-collar American workforce, not to mention several million blue-collar laborers). Instead, McKenzie argues, executives' health was framed at work and in newsmedia coverage as an *individual achievement*. Better health seemed to spring from executives' "imagination and driving energy," powered by "above-average intelligence, above-average ambitions, above-average ability, and above-average self-discipline."⁴⁶ In this case, these 2.4 million privileged executives appeared to thrive under a self-actualizing form of health care, in which fitness resembled an "individual moral responsibility, an ongoing project composed of public and private performances," as the medical historian Adele Clark writes.⁴⁷

Of course, executives' "individual" fitness performances benefitted tremendously from a network of support that would soon include Motorola and their portable cell phone, the DynaTAC.

Fitness at Motorola

While executives began exercising at corporations like Xerox in the late 1960s, Motorola's top brass ran ahead of the curve. As this section points out, a combination of physical fitness, preventative health care, and elite, competitive masculinity held sway at Motorola, particularly among the company's industrial designers. Motorola's fitness culture therefore informed the design of the DynaTAC as a portable, persuasive supplement, which would intervene in executives' unhealthy, desk-bound labor.

Fitness especially shaped the public and professional identity of Martin Cooper, principal developer of the DynaTAC. In a profile for *The Economist* magazine's technology section in 2009, Cooper framed exercise as the reason he became a "zealot for products being portable."⁴⁸ He began exercising while stationed in Hawaii for the U.S. Navy, he stated, where he transformed into a superlative scuba diver in the early 1950s. Cooper remarks that the fitness habit followed him to work at Motorola in Illinois, where he secured a position as a senior development engineer in Motorola's mobile equipment group in 1954.

Promoted to Director of Systems Operations in Motorola's Communications Division in 1972, Cooper's exercise routine attracted notoriety at the company. Unlike executives at companies like Xerox, who scheduled fitness sessions before work or during lunch, Cooper avoided being desk-bound throughout the day. The forty-four year old insisted on working and exercising simultaneously. While drafting design strategies for the DynaTAC, for example, he and his business associates often jogged as far as six miles daily.⁴⁹ Consequently, as Cooper suggested to *The Economist*, physical fitness not only kept him healthy. Exercise dictated his execution of the DynaTAC, and even enhanced his technological foresight. As *The Economist* profile concludes, thinking of Cooper as a jogger provides an "apt image for Mr. Cooper's career, during which he has repeatedly spotted what lies ahead and led others towards the creation of new industries."⁵⁰

The all-male design staff that worked under Cooper to build the DynaTAC also exercised religiously, which fed their contributions to the cell phone. Several of the staff had applied to become astronauts in the 1960s before working at Motorola.⁵¹ The application process at NASA exposed them to kinesiologist Laurence Morehouse. As a result, Motorola's design department became acquainted with Morehouse's restrained, physical fitness regimens, which he prescribed to executives through his consulting work on the YMCA's "Measured Mile" program, as well as through his own company, Fitness Centers for America. Due to their relationship with Morehouse's work, Motorola's designers would adopt a moderate perspective as they constructed the DynaTAC for exercising executives.

While fitness gave these designers insight into their wealthy male consumers, it also expressed their professional competitiveness. Lead designer Rudy Krolopp – another desk-bound averse "Motorolan" – regularly jogged around Motorola's sprawling 286-acre campus in Schaumburg, Illinois, trying to beat Cooper to daily meetings about the DynaTAC.⁵² Exercise additionally determined his pace of work on the cell phone once Cooper secured funding for the project through the 1970s. Krolopp drove his design staff to deliver their working prototype of the DynaTAC in a mere three days so that he could participate in a skiing competition in Colorado.⁵³ Like Cooper, Krolopp used exercise and his own physical health to define his professional expertise, and influence how the cell phone's design progressed at Motorola.

The fitness of Cooper, Krolopp, and the design staff suited an executive ethos at Motorola. In his biography of Motorola founder Paul Galvin, Harry Mark Petrakis argues that Galvin attended to his heart health through the traditionally white, male, upper class sport of golf.⁵⁴ He equated his physical fitness with his capacity for company leadership, “stressing that one mark of a good executive was that he keep moving.”⁵⁵ Galvin’s obsession with health and human mobility manifested itself in peculiar, individualistic fantasies. Petrakis writes that throughout Galvin’s tenure as CEO of Motorola from 1928 through 1956, the executive recurrently experienced “dreams of furiously pedaling a bicycle so that in the morning he woke weary and exhausted as if he had been racing all night long,” grafting the fate of Motorola onto his own personal stamina.⁵⁶

Galvin’s perspective extended to his employees’ health. From Motorola’s inception in 1928 until at least 1976, the company claimed that it lacked health insurance. Motorola preferred to pay out of pocket for the medical expenses of its several hundred thousand employees. Without any third party interference, Motorola could stay apprised of how much illness and absenteeism cost the company each year.⁵⁷

Motorola’s individualistic streak made it a renowned adversary to institutional healthcare. In 1971, as Cooper began dreaming of the DynaTAC, Motorola privately audited three Phoenix-area hospitals, which the company suspected had overcharged their 43,000 employees in that city by fifty-six percent the national standard.⁵⁸ The

investigation into medical expenses, released to *The Washington Post* in 1972, won Motorola praise from the U.S. President's Council on Wage and Price Stability as a sterling example of corporate accountability for employee health.⁵⁹ Like executives, whose battles against coronary heart disease and desk-bound labor were framed as individual achievements, Motorola as a company also defined health as its "individual moral responsibility."

Given Motorola's unique liability for medical expenses, the company demanded that workers preventatively maintain their health. The physical fitness policy was not limited to executives (as it was at Xerox, for example). However, it did address Motorola's overwhelmingly male workforce, defining exercise as an individualized, intensely competitive activity. In the early 1960s, CEO Robert Galvin bypassed the company bowling and softball leagues that his father Paul instituted in the late 1940s, which offered employee camaraderie through a leisurely pastime.⁶⁰ Upping the ante, the younger Galvin made it mandatory for any engineer or designer at the company to purchase a YMCA membership out of their own salary. Galvin encouraged engineers and designers like Cooper and Krolopp to make the most of their gym fees by engaging in exceptionally strenuous exercise. This included challenging employees to beat Galvin at one-on-one games of basketball.⁶¹

The performance of fitness at Motorola engendered a work culture now common among cellular-related corporations in the U.S., such as Apple (or Motorola's current parent company, Google). At these firms, "workers take on a new project for

their company – themselves,” as Silicon Valley anthropologist June Anne English-Lueck observes.⁶² Employees “work on their bodies to transform themselves into better workers” to “demonstrate their dedication to job productivity,” as well as to negotiate an increasing lack of institutional healthcare coverage, she explains.⁶³ Fitness at Motorola in the 1960s and 1970s served comparable purposes. On one level, exercising employees like Cooper and Krolopp accentuated the pace of innovation and competitive atmosphere at the company. On another level, they potentially saved Motorola expenses related to heart disease by staying physically active at work. In each instance, they individually positioned themselves as “better workers.”

However effective, fitness at Motorola created a highly biased culture of production around the DynaTAC. In this elite, insular environment, Cooper, Krolopp, and the design department not only guided the cell phone towards the most lucrative consumer demographic. They also designed for consumers whose health most resembled their own: white, middle-aged, male executives. Like the men at Motorola, executives were persuaded by employers to weave work and exercise together, cut healthcare expenses, and become “better workers” as a result. Therefore, as we will see throughout the next section, Cooper attempted to design a portable cell phone to supplement executives’ emerging fitness routines. In particular, Cooper envisioned executives freed from desk-bound labor and engaged in exercise during phone calls.

By constructing the DynaTAC for “high value” men like themselves, Motorola’s designers could also avoid assuming responsibility for the health of consumers. Unlike

cell phone users such as the elderly, the injured and physically disabled, or the deaf, who have historically been framed as a burden to cellular manufacturers, as the health and wireless technology expert Kevin Patrick argues, executives appeared to be in individual command of their health.⁶⁴ They possessed the medical and corporate resources to exercise effectively and prevent heart disease, combined with a mythic, self-actualizing desire to be “better than well.”⁶⁵ Most of all, they possessed the finances to purchase a DynaTAC, which might help them stay physically active while at work. Given these factors, Motorola’s cell phone could be designed as a *persuasive supplement* – a reflection of consumer autonomy – rather than a technology that determined its users’ health.

Although executives shared many of the gendered, personal, and professional qualities of Motorola’s fitness-fixated designers, designing the DynaTAC for their health was not a straightforward process. I now turn to examine how technical constraints in the early 1970s prevented Motorola’s phone from resembling the portable fitness instrument Cooper imagined.

Designing a portable, persuasive supplement

Around 1970, Cooper, the “zealot for products being portable,” began thinking about how the DynaTAC could supplement male executives – ideally ambitious and self-disciplined about physical exercise, and interested in diminishing their desk-bound labor. Cooper’s solution was simple. A cell phone that could be carried around

while an executive made calls at work, he believed, would supersede AT&T's standard landline telephone, the Western Electric model 500. This ubiquitous handset weighed a little over a third of a pound and was designed for a sitting user, who customarily rested their elbow against a table to support the bulky phone.⁶⁶

Cooper felt that AT&T's design contributed to the unhealthy fifty-three hours executives spent on average sitting at their desks. As Cooper recalls telling his design colleagues at Motorola, "If anything's unnatural, it's tying [executives] to a desk."⁶⁷ Consequently, a heavy cell phone would be unpopular among these physically active men, and would not present a competitive improvement over AT&T's telephone. To set itself apart, the DynaTAC needed to encourage executives to get away from their desks and sedentary work activities. As Cooper emphasized, "They don't want to talk to a desk or wall, where phones are generally placed."⁶⁸

To transform phone calls into exercise, the DynaTAC needed to be small and light enough to hold without any stationary support. Perhaps its weight and size could even be imperceptible to executives, Cooper reasoned. Along these lines, he first imagined a radically portable cell phone – the size of a snail – tucked unobtrusively behind an executive's ear, much like a hearing aid or a contemporary cellular headset.⁶⁹ This diminutive cell phone, Cooper believed, would allow an executive to get away from his desk to walk and make calls at the same time.

If it could be built, such a tiny, lightweight, portable phone would sneak physical exercise into ordinary work. Even the smallest amount of physical movement,

such as walking around an office while talking on the DynaTAC, might cumulatively improve executives' heart health. Cooper's idea thereby aligned with the YMCA's "Measured Mile" and the personal fitness routines developed by executive medical consultants Don Fredericks and Laurence Morehouse. Like these programs, Cooper's portable cell phone would give executives a chance to stay moderately physically active without disrupting their work. In fact, Cooper's idea for the DynaTAC took executive exercise a step further. He suggested that fitness could be practiced *during work* rather than at lunch or separately at a company gym, as the YMCA, Fredericks, and Morehouse advised.

Despite his fitness focus, however, Cooper refrained from designing the DynaTAC to *make* executives move. Instead, as a persuasive supplement, this portable cell phone addressed its users as autonomous individuals. These elite men, Cooper's design implied, would recognize the DynaTAC's fitness potential. They would use it responsibly to reduce the risk of heart disease. Influenced according to class and gender, Cooper's idea did not "coerce" executives into physical activity, as might have been the case for less "high value" users.⁷⁰ (Indeed, as labor and telecommunications scholar Melissa Gregg points out, industrial designers' traditional approach to lower class, ethnic, and female laborers – such as AT&T's telephone operators – regularly subjected these workers and their health to organizational and technological order, rather than present fitness as a choice.⁷¹)

Setting such disciplinary design strategies to the side, Cooper's idea for a portable cell phone treated its privileged users in more equitable, empowering terms. He intended the DynaTAC to treat executives as "collaborators in the optimization of industry profits," to borrow a phrase from Natasha Dow Schüll.⁷² The DynaTAC would persuade these men that it was easy to get away from their desks and exercise while at work. Just a little walking during phone calls – made possible with this portable cell phone – could help trim the \$3 billion corporations spent every year on heart disease-related medical expenses.

Dreaming up a snail-sized portable cell phone was only part of the battle, however. Actually designing the persuasive fitness supplement proved a frustrating experience. When Cooper initiated a design contest for the DynaTAC in 1972, he demanded that Motorola's design department "get this thing down to the size of the palm of your hand."⁷³ Not a single contestant could ultimately deliver such a portable cell phone. The winning design team, led by Krolopp, Cooper's jogging competitor, offered a prototype of the DynaTAC that measured 13 x 3 x 1½ inches and weighed two and a half pounds. Krolopp achieved the size and weight in an especially crude way: he asked a Motorola engineer to crush his prototype in a workbench vice until the parts began short-circuiting.⁷⁴ The point of compression at which the DynaTAC still functioned determined the phone's dimensions.

Cooper reluctantly gave the green light to Krolopp's prototype, feeling it would fail to encourage executives to combine phone calls and physical fitness. At two and a

half pounds, it grossly outweighed AT&T's landline handset, and its boxy dimensions did not convey the effortless portability that Cooper originally imagined. In a retrospective interview on the National Public Radio program *All Things Considered* in 2012, Cooper bitterly complained, "You couldn't hold that heavy thing up for more than twenty minutes!" suggesting that executives might still sit at their desks, or otherwise remain sedentary when they used Motorola's cell phone.⁷⁵ Krolopp expressed similar displeasure. He reflected in 2006 that he planned to make the DynaTAC wafer-thin, and weigh only a few ounces to supplement physically active executives. Yet he couldn't reduce the size of the battery, which generated much of the DynaTAC's overall heft and size.⁷⁶

Trying to recoup the spirit of fitness and freedom from desk-bound telephone calls, Cooper told designers to work on the DynaTAC's shape. Perhaps the phone's form could persuasively encourage exercise. Motorola's design staff raced to find a suitable shape, proposing that the DynaTAC could look like a banana, suggesting a healthy, portable snack.⁷⁷ Cooper scratched the idea in favor of a shape that unmistakably embodied portability, walking, and privileged masculinity. He mandated that Krolopp and his team design the DynaTAC in the shape of the "shoe phone" from the hit television spy series *Get Smart* (1965-1970).⁷⁸

Again, Krolopp's final design failed to reflect this overture to executive fitness. Krolopp informed Cooper that the DynaTAC's large, blocky battery would prevent it from resembling the sleek, complexly shaped Oxford dress shoe seen on *Get Smart*. At

most, Krolopp could adjust his original prototype to take the shape of a boot. The cell phone's earpiece could be vaguely sculpted into a heel, while the mouthpiece could be formed into a toe box.⁷⁹ Dismayed, Cooper acquiesced to the design, since the shape at least would be the simplest and most inexpensive to produce, saving some of the \$150 million Motorola was laboring to provide for the cell phone's development.

Saddled with setbacks in its design, the DynaTAC's connection to fitness remained unrealized. Instead, Motorola used Cooper's design fantasies to help advertise the DynaTAC, and tantalize executives with the persuasive fitness supplements the company would create for them in the future. In a splashy 1973 cover story on Motorola's "take-along telephone," for example, the magazine *Popular Science* informed readers that the DynaTAC was only the beginning. Motorola would soon offer much more portable cell phones. In particular, executives could look forward to a "Dick-Tracy-type wrist-phone system you may wear someday."⁸⁰

This wrist-phone would not only appeal to the white, male, wealthy consumers who primarily purchased high-end wristwatches in the U.S.⁸¹ Motorola's wrist-phone would additionally fulfill Cooper's intent to free executives from their desks, and get them to inject a moderate amount of exercise into their work. Like Dick Tracy, a kinetic, athletic, comic-book detective, executives would be able to make phone calls while being physically active. This improvement on the DynaTAC indicated Motorola's desire to exclusively supplement the health of executives.

Fitness and the DynaTAC never quite gelled in the design phase, yet the phone proved astonishingly popular, beyond even Motorola's predications. Selling well over one million copies of the phone in the U.S. by 1987, the company followed up the DynaTAC with a more readily portable, "body friendly" MicroTAC in 1989, and presided over the sale of cell phones globally until a Finnish company, Nokia, assumed the lead around 1994.⁸² In the meantime, Motorola continued to nurture Cooper's fitness fantasy, making good on its Dick Tracy "wristphone" in 2011 with MotoACTV, a combination men's watch and cell phone with a built-in heart rate monitor.⁸³ Sold for \$300, MotoACTV suggested the continuing salience of Cooper's design ideas from the 1970s, taking an unabashedly individualistic, class and gender-stratified approach to fitness and coronary heart disease.

From the DynaTAC to future fitness supplements

Although Motorola's designers in the 1970s failed to construct a cell phone as a persuasive fitness supplement, their vision certainly did not disappear. It resurfaced in the 2000s as a powerhouse, twenty-six billion-dollar part of the smartphone business.⁸⁴ I want to spend the conclusion on this emergent market, highlighting how smartphone fitness supplements rehearse the same concerns that ignited the DynaTAC's design: chronic coronary heart disease in the U.S., escalating healthcare expenses, and a prevalence of sedentary activity. Designers for smartphone fitness supplements are not so explicitly selective about which class and gender of users they

will serve. Nonetheless, they perpetuate Motorola's prejudicial work. Primarily, new fitness supplements continue to frame health as an "individual moral responsibility." These largely unregulated designs, I conclude, may create a burden of empowerment, since they make users liable for any health effects – beneficial or adverse – that may occur.

Coronary heart disease remains a fundamental factor in Americans' health risk profile. In spite of a forty-nine percent reduction of related fatalities among white and nonwhite adult men from 1980 to 2002, and a fifty-one percent decrease among women, heart disease is still the leading cause of death across the U.S. (more than cancer and stroke combined, for example).⁸⁵ In the same era, between the DynaTAC's commercial introduction in 1983 and Apple's first sale of its phenomenally popular iPhone in 2007, total healthcare costs for coronary heart disease exploded, topping \$142.5 billion in 2006 alone.⁸⁶ (Comparatively, recall that in 1975 U.S. corporations only spent \$3 billion on medical care for executives.)

When they speak of this situation, designers of smartphone fitness supplements tend to downplay the sophisticated hospital treatments such as angioplasty, complex technologies such as pacemakers, and preventative medical consultations that historically dismantled heart disease rates. Nor do many designers acknowledge that from 1980 to 2000, physical activity accounted for only *five percent* of the reduction in coronary heart disease in the U.S., versus a forty-seven percent reduction due to preventative medical therapies, as Earl Ford, a physician at the U.S.

Centers for Disease Control and Prevention, points out.⁸⁷ Instead, several designers like Cooper believe that persuasive fitness supplements – and the agency of users – can combat heart disease-based illness and deaths. By empowering individuals with smartphone supplements, these designers argue that the enormous medical expenses for coronary heart disease can be averted.

Cooper is a vocal proponent for individualized fitness supplements over institutional intervention. Evoking Motorola’s 1971 excoriation of hospitals, he lambasted physicians and medical treatment in a 2013 profile for the *San Diego Union-Tribune*. “We don’t have a healthcare system. We have a sickcare system,” he argued in the front-page interview, suggesting that medical professionals could do little for heart disease in the U.S., except exacerbate its cost.⁸⁸ On the other hand, he observed, designers of smartphone fitness supplements “are starting to anticipate when people are getting sick. If you can sense a disease is starting in somebody, every disease is actionably preventable.”⁸⁹ From Cooper’s perspective, “actionably preventable” means persuading individuals that they can take care of themselves – preferably with physical exercise and encouragement from a smartphone.

Motorola’s designer is not alone in his thinking. Individualized fitness supplements are also on the agenda of BJ Fogg, founder and director of Stanford’s Persuasive Technology Lab, an influential incubator for designing “mobile persuasion.”⁹⁰ In a collected volume on the subject, Fogg illustrates that designers have reconverted Cooper’s original fantasy about portable phones and executive

exercise.⁹¹ With the transformation and integration of cell phone service into portable touchscreen computers, or smartphones, designers have expanded into fitness software programs that users can purchase, download, and access. These “apps” realize Cooper’s idea in greater detail, “showing people how active they actually are (which is often less active than they think) and increasing their understanding and consciousness about their physical activity,” Erik Damen, an associate of the Persuasive Technology Lab, explains.⁹²

Cooper’s emphasis on individual agency remains a guiding force for the design of many of these apps. As Intel researchers and Lab affiliates Sunny Consolvo, Eric Paulos, and Ian Smith state, “We believe that individuals behaving in their own self interest when it comes to their physical activity...can benefit not only themselves but society as a whole.”⁹³ Specifically, they argue, “Over five billion dollars in heart disease costs alone could be saved if only 10% of adults in the U.S. began a regular walking program” spurred by an app.⁹⁴

Two of the most downloaded smartphone fitness supplements are designed according to these twinned themes of persuasion and individual responsibility. Runtastic, an app with eighteen million users and forty million downloads, targets two factors for coronary heart disease: inactivity and obesity.⁹⁵ It persuades users towards better heart health through a series of moderate training plans. Like the executive exercise routines created by Don Fredericks and Laurence Morehouse in the 1970s, these plans are adjustable according each individual’s risk profile. To persuade users

towards physical activity Runtastic's design gets creative; a person with headphones plugged into their smartphone will hear "Go! Go! Go!" or applause when they attain the fitness goals built into the app.⁹⁶

Another popular persuasive supplement, Azumio's Argus app, targets heart disease in its estimated forty-five million users by measuring their individual blood pressure, weight, diet, resting heart rate, and daily sedentary activity.⁹⁷ From these statistics, Argus persuades users towards exercise by setting modest, seemingly achievable goals, such as thirty minutes worth of walking or jogging per day. Like Runtastic, Argus echoes Cooper and the executive fitness culture of the 1960s and 1970s, preaching individual responsibility. As chief procurement officer Tom Xu remarks in a quote shared on the homepage of Azumio's website, "We want to hand you all the tools to understand your own health." He adds, "Only then does improvement become possible."

As persuasive smartphone supplements resurrect Martin Cooper's fantasy from the 1970s, their individualization of heart disease and fitness remains unregulated. The Food and Drug Administration, which tests the safety and efficacy of any device intended to treat or prevent disease in the U.S., lacks an "overarching software policy" for smartphone supplements.⁹⁸ Since apps like Runtastic or Argus are not replacements or accessories for preexisting, regulated medical devices, according to the FDA, they operate in an unregulated zone of "general health and wellness applications."⁹⁹ As health information technology expert Daniel Schulke states, the

FDA's ruling is deeply concerning, since fitness apps and the persuasive, "actionable information" they prescribe can cause serious injury if they are poorly designed, malfunction, or produce incorrect advice.¹⁰⁰ Schulke stresses that users cannot be expected to protect themselves from these risks, since they "generally do not have the education and experience to judge a treatment plan proposed by a [fitness] application."¹⁰¹

Consequently, the enduring fantasy of integrating cell phones, exercise and self-interest has generated a burden of empowerment. Among the one hundred and ninety million Americans who are expected to use their phones as persuasive fitness supplements by 2015, a few of them may be able to take on health as their "individual moral responsibility," given that they can combine Runtastic or Argus with personalized medical consultations and executive-level corporate healthcare.¹⁰² For the less fortunate, who may rely solely upon their phones to treat conditions like coronary heart disease, they may encounter an unpredictable terrain of unregulated medical advice and potentially dangerous technology. When they do experience injuries from cell phones, they may also face near-total scientific, industrial, and legal disregard.

I now turn to explore controversial instances of phone-related injuries beginning in the 1990s, and the exceedingly ambivalent response victims received from cell phone designers.

Radio Frequency Injury

Your phone is a power transmitting device. When the phone is in use, radio frequency with a power output level ranging from 0.6 to 3.0 watts of radio frequency energy radiates from the antenna. Avoid direct contact with the phone antenna and/or direct exposure to the radio frequency energy radiated from the antenna at high-level radiation periods.

- NEC cellular telephone user's manual¹

TECHNOLOGICAL RISK

Chapter 3: Electrosensitivity, Cocoons, and Free Zones

On January 21, 1993, CNN's *Larry King Live* televised a man's encounter with a malignant shadow.²

The shadow, a fatal brain tumor, belonged to Susan Reynard, wife of Larry King's guest David Reynard. Susan's tumor seethed where her head met the antenna of her cell phone, a NEC 9A designed in Japan by the Nippon Electric Company. To communicate wirelessly, the phone's antenna gave off ultra high frequency radio waves, which contain low doses of non-ionizing radiation. David felt that these frequencies had generated Susan's cancer as she used her phone over a two-year period.

"When I saw the first MRI," he told King, "the tumor actually appeared to be a glow from the antenna."

Possessed by the apparent correlation, David told King he would file the first health-related lawsuit in the world against the cellular industry. Broadcast on a cable channel subscribed to by sixty-two million households, David's claim sent cellular manufacturers into a tailspin.³ Stocks for Motorola, the largest producer of phones in the early 1990s, fell twenty percent that week.⁴ Within ten days, the Cellular Telecommunications Industry Association (CTIA), a United States consortium of

service providers and manufacturers, pledged a five-year, twenty-five million dollar inquiry into whether cell phones cause cancer.⁵

The Reynards' case was deemed an early specimen of "electrosensitivity," shorthand for any scientifically unexplainable health effects due to electronic technology. Phone manufacturer Motorola launched a vigorous public defense against this mysterious condition in 1993, followed by NEC, which called the Reynards' lawsuit scientifically "vague and ambiguous."⁶ Scientists were divided. Wireless engineer Theodore Rappaport, who founded the three largest wireless communication research facilities in the United States at Virginia Polytechnic, the University of Texas at Austin, and New York University, recommended epidemiological tests on radio frequencies. "In 20 to 30 years, wireless communications probably will be as pervasive as utility lines and house wiring today. We must be certain that the wireless personal communications age will be an environmentally safe age," he warned.⁷

Physicist and popular writer Robert Park disagreed. He held to a lineage of scientific disbelief in technological injuries, and singled the Reynards out as peddlers of "voodoo science."⁸ Their lawsuit seemed to Park an opportunistic move against a booming cellular industry, given its ten million subscribers in the United States and fifteen billion dollars in profits shared among Motorola, NEC, Nokia, NovAtel, Toshiba, Ericsson, Fujitsu, Mitsubishi, Uniden, Philips, IBM and AT&T.⁹

Despite the uncertain scientific basis to electrosensitive cases like the Reynards', they embody a historic shift in the linkages between health and cell

phones. If cellular designers of the 1970s and 1980s aimed to improve users' physical fitness, consumers of the late 1980s and early 1990s latched onto cell phones to satisfy multiple aspects of their wellbeing: fitness, social health, emotional stability, and physical protection. As I explore throughout the first half of this chapter, using the Reynards as my main example, cellular users attempted to "cocoon" themselves, practicing an individualized form of daily healthcare with this mobile medium.

While many electrosensitives at first felt this cocoon, an estimated 30,000 victims in the U.S. and another 19,000 in Sweden eventually experienced malignant shadows. Disabled by excruciating illnesses they believed cell phones caused, electrosensitives in both countries offered highly publicized performances of "media refusal." I examine a selection of these performances in the chapter's second part, describing how electrosensitives constructed testimonies of their condition, circulated in newspapers and television news programs in the U.S., and a public forum set up by the Swedish federal government in 2000.

In each arena, I argue, electrosensitives like the Reynards not only rejected what they felt was an unsafe technology. They resisted an encompassing individualization of health they felt cell phones contributed to. As a countermeasure, electrosensitives in both countries proposed new, protective designs – such as cellular headsets or radio frequency "free zones." Each design, I reveal, would require phone manufacturers or a network of social institutions to help "co-produce" victims' wellbeing, recasting their health as a shared responsibility.¹⁰

Electrosensitives' influence upon these governing bodies is less constructive. Instead of instigating redesigned cell phones, or free zones, cases like the Reynards' have strengthened a rebuttal – especially in conversations among cellular designers – that users are too invested in their phones, and must control their attachments to the technology. Emotional restraint will prevent feelings of injury or illness. This perspective, I argue, deepens the “burden of empowerment” in cellular design, making users primarily responsible for their own health.

Approach

My preceding pair of chapters paid attention to instances at the turn of the twentieth century, and again after the century's midpoint, when the formative design and use of communications media was influenced by the professional practices, technological fantasies, and social prejudices of medical professionals and industrial designers. This social construction of technology suggests that telephones and cell phones are as much instruments of health as they are instruments of personal and professional communication. Their health identity, I illustrated, can be glimpsed through their design, such as their portability.

The past two chapters also traced out successive redefinitions of health by two manufacturers of communications media, AT&T in the 1900s, and Motorola in the 1970s. In these two distinct periods, the communications giants designed telephones and cell phones according to individualized, commodified conceptions of health care.

In each case class, race, and gendered biases laid the groundwork for AT&T and Motorola to interpret major health risks as the responsibility of media users. Such forms of social discrimination can be read in the ways that public telephones and cell phones were designed to prevent tuberculosis and coronary heart disease, the two greatest biological risks in the U.S. throughout the first half of the twentieth century. What I have therefore charted is a concerted effort by media manufacturers to minimize their liability for consumer wellbeing, while simultaneously creating markets for exclusive, expensive health-related products, such as mechanical ventilation to sanitize public telephones or portable cell phones to supplement personal fitness routines.

The present chapter picks up this thread of individualization, and interrogates its evolution from 1993 through 2000. Here, my focus shifts in terms of the kinds of health risks involved. If Chapters 1 and 2 focused upon biological risks, this chapter turns to examine how one form of communications media – cell phones – might pose a technological hazard to health. As I move from the biological to the technological, I also reframe this social construction of technology to include the participation of a different group of social actors. If Chapters 1 and 2 gave space to “expert” physicians and industrial designers, this chapter gives equal space to non-expert American and European consumers. These individuals whom we will soon encounter are white, technologically adept, relatively early adopters of cell phones who are transformed by unexplainable illnesses into a marginalized community of media refusers. My purpose

in this chapter is to reveal how this group struggles to contest the definitions of health and risk institutionalized by physicians and designers. As we will see, these consumers use visceral personal accounts of harm to try and alter the individualization of health designed into cell phones.

At the outset of this chapter, these disenchanting users and their health concerns may seem easy to dismiss. Yet it is important to consider whether a willingness to disregard them is due in part to their social position: electrosensitives wholly lack the cloak of authority and medico-technical expertise attributed to physicians and industrial designers. Indeed, as I've discussed in the previous two chapters, few other social actors have historically been accorded such power to construct knowledge about human bodies and health risks, and determine how the wellbeing of everyday citizens might be enriched or endangered by the design of communications media. As the preceding pages demonstrate, this body of knowledge that physicians and designers create is not always above being defined as "junk science." Rather, strong social biases often color their work. As science and technology scholars Wiebe Bijker and Trevor Pinch remind us, "scientific knowledge can be, and indeed has been, shown to be thoroughly socially constituted."¹¹

With this in mind, I argue that electrosensitives are not necessarily as outrageous as they may initially appear. This is not to say that I am interested in verifying the claims they make about the effects of cell phones. Rather, I aim to examine them as a historically unique community of everyday consumers and users

who attempted to challenge the deeply entrenched spheres of medical and industrial authority, and contribute to the social construction of health risks, health responsibilities, and media design.

Approaching this community of people, I looked for where they left evidence of testimonies – a form which Judith Herman reminds us documents and explicitly evokes the trauma bodies encounter, and tries to effect institutional recognition and change in recompense.¹² My search led me first to the Reynards. The malignant shadow that clouded their relationship with cell phones instigated an unprecedented amount of journalistic activity (not to mention attracting medical, industrial, federal, and legal attention continuing into the present). In the U.S. in 1993 alone, their story generated over one hundred national and local newspaper articles, two feature-length television news reports produced by NBC and CBS, a national press conference sponsored by Motorola, a handful of essays in cellular industry trade journals, and extensive coverage for twelve similar lawsuits.¹³ As Adam Burgess notes, a cellular industry poll conducted in 1993 estimated that half of American adults knew about the Reynards' story.¹⁴ David and Susan became the poster children for electrosensitivity.

While reading and viewing their news coverage, I concentrated upon how David, speaking for his deceased wife, collaborated with journalists to build his testimony against cell phones. At news sources with a broad national audience like *The New York Times* and *Larry King Live*, as well as local publications such as *The Orlando Sentinel*, journalists repeatedly selected and emphasized details about David's

wealth, technological prowess with telecommunications, and personal interest in health. These aspects helped cast David as an authoritative, newsworthy consumer and gave his performance of media refusal credibility. Through a selection of David's quotes, journalists also helped dramatize and narrate his feelings about being cocooned by cell phones, as well as his horror at their potentially cancerous ramifications. David's *Larry King Live* appearance especially stresses the affecting qualities of his testimony, suggestive of the show's controversial reputation in the 1990s as a "softball" news source.¹⁵

David's testimony is important to the study of mobile media, since it underscores how much consumers rely upon emotional experiences to define, talk about, and institutionally negotiate the questionable healthiness of cell phones. Simultaneously, David's example offers an instructive lesson in the narrative strategies contemporary U.S. journalists employ to articulate and amplify the intersections where media, health, and feelings vividly collide.

To see how electrosensitive stories operate beyond newsmedia in America, I structure my reading of David's testimony against a sampling of testimonies from several hundred Swedish electrosensitives in 2000. Conducted in-person or through letters sent to a public forum in Stockholm, these performances of media refusal lack journalistic input. Rather, a 2,400-member electrosensitive community association in Sweden collected, curated, and published them in *Black on White: Voices and Witnesses About Electro-Hypersensitivity, the Swedish Experience*, a free book available

online since 2002. Despite the substantial contextual differences, testimonies in Sweden closely resemble David's in the U.S, as I reveal later in this chapter. These performances contest the cocoon of wellbeing that cellular designers (and many social scientists) attribute to cell phones, suggesting that phones could prove harmful in ways that seem far fetched at first. In due course, they also confront the significant consumer liability that cocoon – and its malignant shadow – may entail.

Cocoons: perspectives from design and the social sciences

To distinguish electrosensitives' malignant experiences, I want to review observational and theoretical literature from industrial design and the social sciences, which pinpoint a positive correlation between cell phones and users' wellbeing. People in a variety of countries “cocoon” with their phones, this literature suggests, through daily technological routines that manage their social, emotional, and physical health.¹⁶ The cocoon is an important concept I will return to throughout this chapter, since it characterizes the early cell phone use of many electrosensitives in the U.S. and Sweden. Additionally, its spatial and individualistic qualities critically contrast with the “free zones” that electrosensitives will later propose as protection against phones.

Richard Harper, a prominent sociologist, cellular designer, and principal researcher in media design at Microsoft, offered an early industry forecast about cocooning at the 2003 Mobile Human Computer Interaction International Symposium, the preeminent industry conference for mobile media design. In his

presentation, Harper cut to the chase, “The relationship between the use of the [cellular] device itself has become much more emotional that was hitherto the case.”¹⁷ As the user base rapidly expanded and diversified beyond male business professionals to include women, teenagers, and families at the end of the twentieth century, these consumers’ health needs changed, too – particularly in terms of achieving greater psychological and emotional stability by communicating with others.¹⁸ Harper argued that cell phones were indispensable to this endeavor. “It would appear that having a mobile [phone] is not a perk...but a prerequisite of living,” he proclaimed.¹⁹

Cell phones should develop apace. While physical fitness could remain a viable focus for designers, they could also richly influence the social and emotional wellbeing of cellular users, Harper believed. He spent the remaining twenty minutes of his presentation urging an audience of topflight cellular designers assembled from major players in the industry – Motorola, Nokia, Sony, Ericsson, Philips, IBM, and Siemens – to reconsider health at a complex intersection of feeling, sociality, and physicality. If they did so, designers stood to gain a lucrative “level of understanding of customers – existing and potential – that has not, historically at least, been known by the mobile industry.”²⁰

Harper’s design advice anticipated social science research that affirmed a strong tie between cell phones and wellbeing *overall*. Aggregating findings from China, Africa, Latin America, the U.S., and Western Europe, sociologists Manuel Castells, Mireia Fernández-Ardèvol, Jack Linchuan Qiu and Araba Sey revealed in 2007

that cellular “connectivity” improved social and emotional health; it did so by linking individuals to “a full-time intimate community” for longer and more uninterrupted periods of time than landline telephones allowed.²¹ Psychologist Sherry Turkle offered a popular elaboration of this phenomenon in 2011. Through continuous calls, texts, and emails to friends and family, her college-age subjects in the U.S. relied on cell phones to cocoon themselves emotionally. They obsessively sought out connectivity – and stability – during even the briefest brushes with melancholy, anger, loneliness, and boredom, moods they deemed unhealthy or dangerous.²² Sociologist Michael Chan replicated Turkle’s findings with a larger, more diverse age group in Hong Kong in 2013.²³

These social, emotional health routines brought about an increasingly palpable cocoon. By staying intensely connected with and through their phones, users described to researchers “snug” feelings of dwellingness and safety, which they usually attributed to homes or the “securitized iron bubble” of automobiles.²⁴ In 2004, for instance, sociologist Richard Ling reported on a gender-specific version of the cellular cocoon. While conducting research for several years in the 1990s in Norway, he observed that many women displayed and used their cell phones in spaces they felt might be dangerous, setting up a “perceived boundary of safety.”²⁵ The protective place-making practice indicated to Ling an unexpected connection between phones, emotion, and the management of physical wellbeing. (Sociologists would later refer to this specific type of cellular use in cocoon-like terms as the “security blanket” effect.)²⁶

In design forecasts and social scientific studies, what emerged alongside the cocoon was an aura of consumer autonomy. Through their cell phones, users built personal support networks to optimize social and emotional health. Through their phones, they also built an atomized sphere of physical safety in uncertain times and spaces. Cellular cocoons consequently bore an affinity with a broader culture of preventive health products in the 1990s, which the sociologist and health historian Adele Clarke remarks encouraged people to self-administer emotional and physical risks (such as depression and obesity), and feel personally in charge of their own wellbeing.²⁷

Many electrosensitives we will meet in a moment initially felt so empowered. I now look at how they framed the cocoon within their testimonies of illness and injury.

Electrosensitives, cocooned

Until Susan's cancer diagnosis in 1989, the Reynards embraced the cocoon. For this young, wealthy couple, their NEC 9A helped define their social, emotional, and physical wellbeing. In describing their experience, I highlight how the Reynards carefully positioned themselves in news coverage as responsible, conscientiously healthy consumers. This tactic, used by other electrosensitives in the U.S. and Sweden, contrasts with their unintended illnesses, suggesting that cell phones may offer only a *feeling* of control over health.

David evoked the cocoon throughout his *Larry King Live* appearance and several press interviews in 1993. He reconstructed for journalists how the cell phone at first improved the emotional life of he and his wife. David told King that he purchased the NEC 9A for \$499 as a present to Susan for her thirty-first birthday in 1987.²⁸ Susan immediately saw the phone's potential to reinforce their marriage. She called David "all the time" out of affection and to express her excitement about having their first baby. Over the phone, David recalled, the couple felt closest to each other while discussing natural births, which they thought would give them greater control over Susan's first pregnancy.

This routine proved addictive, and expensive. According to her phone's service statements, she regularly used up 180 to 200 minutes, or roughly \$175 per month.²⁹ (She talked so much that David's first indication of her tumor arose when she began slurring her speech during phone conversations.)³⁰ Other electrosensitives in the U.S. and Sweden admitted to being equally "heavy users" as they sought emotional support through their phones.³¹ Their cocoon was "always on," illustrating a regard for health "as a balancing act that requires ongoing monitoring and modulation via medico-technological interventions," as Natasha Dow Schüll notes.³²

Beyond the electrosensitive community, many consumers in general in the early 1990s relied upon cell phones for emotional stability. Reading a Motorola/Gallup poll of 650 users in early 1991, Paul Polishuk and Hui Pan commented, "More than half (54 percent) report having an improved relationship with their spouse. Seventy-three

percent of the survey sample say they have used the cellular phone to call a loved one 'just to say hello.'"³³ In 2003, designer Harper again confirmed that cell phones statistically enhanced "emotional action with partners."³⁴ In a revealing aside he added, "[Individuals] constantly call their partner/spouse, for example, even when they are in the same house."³⁵ Within a domestic cocoon, Harper suggested, people used phones to build newer, more intimate forms of shelter.

For the Reynards, their cell phone use extended a gendered dynamic of American domesticity, in which men have historically utilized media (including telephones and television) to track and "contain" their wives.³⁶ David explained that his behavior reflected a concern for Susan's health. He told King that he asked Susan to keep her phone with her at all times to update him about complications in her pregnancy, marred by *preeclampsia*, a life-threatening form of high blood pressure known to spark unexpected convulsions and coma.³⁷ She also kept her phone nearby in case of emergencies related to her *placenta previa*, a misalignment of the placenta causing severe pain and uncontrolled bleeding in late stage pregnancies.³⁸ From David's perspective, the NEC 9A helped him monitor and insulate Susan from physical risk.

Throughout his recollections, David reiterated that cell phones could cocoon people socially, emotionally, and physically. Despite the significant personal labor involved, this individualized health practice could be enjoyable and deeply rewarding, he suggested. The substantial monthly bills David and Susan footed for cellular

service, and the time they spent talking over the phone, were small prices to pay for feeling in command of their own wellbeing.

Twelve other electrosensitives whose stories emerged around 1993 in the U.S. also testified to their self-care. Like Susan (who was a passionate jogger) one of these victims uncannily embodied the physically fit user envisioned by designer Martin Cooper in the 1970s.³⁹ Twenty-eight year old Matthew Crist, who filed a lawsuit against Cooper's company, Motorola, called his brain tumor "a total shock. I'm not a vegetarian or anything, but I take care of myself. I don't even like to be around secondhand smoke."⁴⁰ Informing journalists of his exemplary health, Crist explained that he became aware of his tumor after passing out while jogging near his home.

Scrupulous fitness typified another cellular victim, Michael Walsh. Chief executive officer of Tenneco, a billion-dollar automotive parts manufacturer, and former Stanford University football star, fifty-year old Walsh suspected his brain tumor when he noticed "a little bit of limp in my left leg" while jogging.⁴¹ "It's ironic, I guess, because I've always paid such meticulous attention to my health," he told *Fortune* magazine in 1993. "I can tell you my cholesterol count. I eat well. Don't smoke. Don't drink much at all. Work out. Do about 40 minutes every morning on the Air-Dyne bike. Oh yeah, and have lots of sex," he quipped, winking at his wife who was also participating in the *Fortune* interview, clearly (if crassly) conflating his physical fitness with the healthiness of his marriage.⁴²

By describing their personal lives to journalists, electrosensitives attempted to

prove their attentiveness to health. Invested in marriages and families, victims possessed the time and the finances to purchase expensive new media and stabilize their wellbeing virtually around the clock. As part of the deal, they saw health as their personal responsibility. They constantly strove to meet this duty, whether by donning running shoes, calling loved ones for reciprocal emotional support, or monitoring potentially fatal disorders with their phones. In so doing, they represented a remarkable manifestation of Harper's belief in the health benefits of cell phone use. As he chimed in 2003, "The possibilities of human contact are inordinately rich and diverse."⁴³

However, as the testimonies of David and other electrosensitives indicate, cell phones primarily gave them a *feeling* of control over their wellbeing. Such a sense of sovereignty might not actually mean that people could manage their own health, especially during instances of serious illness or injury. In addition, feeling cocooned did not necessarily prove that cell phones were a safe technology. Their health effects remained largely undefined. I now turn to explore how electrosensitives expressed these concerns and used them to contest a broader individualization of consumer health. What emerges from David's testimony in particular is a desire for health, cell phone use, and industrial design to work in dynamic interaction.

Out of the cocoon, under a malignant shadow

If the Reynards and other electrosensitives in the U.S. in the 1990s enjoyed the cocoon of social, emotional, and physical wellbeing that cell phones offered, their sense of stability soon soured. Several of these individuals began to believe that the radio frequencies emanating from phones had given them brain tumors. This section maps how David Reynard in particular responded when his wife succumbed to her “malignant shadow.” As I illustrate, his well publicized, emotional reaction taps into a practice of “media refusal” that pertains also to television and the Internet. In these instances, individuals leverage their social and economic capital, and conduct impassioned public performances of rejection in order to control how media affects their wellbeing.

David’s case presents a unique twist to this performance, however, because it suggests that health is not necessarily up to how a person chooses to use – or not use – media. Rather, health might be constituted at the intersection where cell phones, consumers, and design decisions converge. This “co-production” of health bleeds into the next section, as I explore how many more electrosensitives in Sweden also offered emotional testimonies against cell phones, and sought to institutionally distribute responsibility for their wellbeing.

Sociologist Laura Portwood-Stacer writes that a defining characteristic of those who refuse media in the U.S. is their social, economic, and technological privilege.⁴⁴ By expressing their socioeconomic status to others, they attempt to make their

rejections of technology authoritative, and influential. David did in fact use his status against cell phones. A white man in his early thirties, he basked in the wealth generated by his booming business, the Bay Area Medical Exchange, a telephone answering service for physicians in Florida. In interviews journalists worked with David to groom his background, and make his refusal of cell phones notable by emphasizing his technological mastery.

Seated across from Larry King on his nightly news program, David introduced himself as an active ham radio operator and owner of “over a hundred thousand dollars worth of radio test equipment.” David also branded himself an inveterate tinkerer attuned to new technological possibilities. In other press interviews after *Larry King Live* he mentioned patenting inventions for his own early cell phone, as well as a device for improving gas mileage on cars.⁴⁵ He also told journalists that he built the computer and walkie-talkie routing systems for his telephone answering business from scratch.⁴⁶ As this personal information illustrates, David collaborated with journalists to create a public portrait of himself as an ingenious inventor, well equipped to investigate how a cell phone might affect his wife’s health, and perform an educated rejection of the medium.

David not only had the means, know-how, and imaginativeness of a newsworthy tinkerer. He also expressed the range of “mixed emotions” necessary to make his rejection of the cell phone publicly compelling.⁴⁷ As Antonio Casilli observes, journalists in the 1980s frequently built cautionary tales around young male tinkerers

exhilarated by new media (especially personal computers), who simultaneously worried that a close relationship with the technology might lead to “contamination, pain, and agony.”⁴⁸ David’s affections for cell phones vacillated across a similar spectrum in news interviews, suggesting the continued popularity of this particular emotional framework among journalists into the 1990s.

Fascination and horror coursed throughout David’s performance of media refusal on *Larry King* in 1993. This mixture of emotions also marked his return to the show in August 2000. During the latter interview, he stated that after Susan’s cancer diagnosis and death, he became obsessed with running technical tests on her cell phone to ascertain how its radio frequencies functioned. He informed King how he deployed his own expensive, state-of-the-art radio equipment to measure the phones’ radio frequency output. David said he distilled these measurements to understand how much radiation these radio frequencies might have introduced into Susan’s head.

Ratcheting up the tension in his story, he turned to compare his findings with radiation readings he conducted on microwave ovens. His choice of comparison played keenly to the anxieties potentially held by viewers of *Larry King Live*. By 1993, microwaves had been embroiled in nearly a decade of heated controversy in the U.S., owing to their allegedly carcinogenic effects.⁴⁹ David put Susan’s cell phone in a similar category. He told King that it gave off a high and potentially cancerous amount of radio frequencies. “Bulls-eye!” he exclaimed about his findings.

Throughout this testimony, though, David retained a perverse interest in cell phones, which befitted his inventive background and kept his rejection of the technology emotionally dynamic. “It’s a small miracle that [cell phone manufacturers] are able to make 600 milliwatts communicate as well as they do,” he finally quipped to King.

David’s performance illustrates the complex emotional behavior that can influence an individual’s refusal of media. The technical tests he undertook on his wife’s cell phone may well have been colored by the upheaval of losing Susan to cancer. David additionally presented his findings on a television program that in the early 1990s was often criticized by other journalists for broadcasting “scaremongering” stories, rather than constructing more objective reports of consumer health concerns. As physicist Park suggests when he calls David’s story “voodoo science,” this instance of media refusal was, in part, an affective conjuring act. Park concludes that David’s story is notable only inasmuch as it illustrates how much consumers rely on their feelings to define technological risks.

However, David’s resolution to his testimony also makes his case significant to discussions about media and wellbeing. Essentially, he argued that cellular health effects should be addressed *collaboratively*. Interviewed by King in 2000, for example, David wondered how NEC, the manufacturer of Susan’s phone, could alter the industrial design of their product. Perhaps they could build in “hands-free headsets,” he proposed, developing a wireless apparatus that let people continue to use their

phones without putting them near their heads. This new design, he opined, might reduce the amount of radio frequencies that entered a user's body. In turn, the redesign could reduce their chances of developing cancer.⁵⁰ David's resolution suggested that health might be something that individual consumers, cell phones, and industrial designers co-produce in interaction.

Such a systemic solution is remarkably rare within performances of media refusal. As Schüll observes, the concept of health as a co-production contradicts a contemporary American philosophy of technology, which she argues influences individual users (and refusers) of media alongside industrial designers and consumer electronics corporations in this country.⁵¹ In effect, this philosophy implies that private citizens care for their wellbeing through their selective consumption of technologies such as cell phones. Any unfortunate health effects they experience are incidental, exceptional, and ultimately due to how an individual decides to interact with these products, Schüll writes.⁵²

Given this perspective, Portwood-Stacer observes that when people in the U.S. reject media due to health concerns, they "feel best equipped to make their intervention at a personal level, at the site of their own individual behavior."⁵³ Feeling unhealthy, refusers attempt to corral incessant, habitual cell phone use, for example, by limiting when, where, and for how long they indulge calls and text messages.⁵⁴ They also self-administer similar "addictions" to television by cutting it from their leisure routines.⁵⁵ In the context of the Internet, they personally handle the social and

emotional “fast food” of the phenomenally popular social media site Facebook by deleting personal accounts.⁵⁶

Compared to these strategies, David’s story illustrates a unique hiccup in the individualization of health being performed around contemporary media, and cell phones in particular. Initially pitch-perfect representations of cocooned users, David and his wife Susan encountered the considerable limitations of thinking about health as a “personal lifestyle choice” once she developed her brain tumor.⁵⁷ As David stressed to journalists, and as his lawsuit against NEC reiterated, health might ultimately depend on how people used their phones *via the options afforded to them* by cellular manufacturers, and the specific design of their phones.

I want to stay with this sense of shared responsibility throughout the rest of this chapter. As we will see momentarily, it distinguishes an international array of health complaints against cell phones in the mid-to-late 1990s, illustrating a broader resistance to the individualization of health connected to this technology. As we will also see by the conclusion, however, emotional performances of injury and illness (such as David’s on *Larry King Live*) make proposing a co-production of health tricky. These testimonies rely upon evidence of experience that remains an unreliable basis for establishing lawsuits, winning scientific and medical support, or influencing industrial design.

Rejecting cell phones in Sweden

In 1992, when David filed his lawsuit against NEC, the U.S cellular industry boasted ten million subscribers. By 1995, that number had jumped to nearly thirty-four million.⁵⁸ By 1998, the International Telecommunication Union counted three hundred million subscribers worldwide, with over twenty percent of those subscribers residing in the U.S., and another thirty percent across Western Europe.⁵⁹ Motorola remained the top manufacturer worldwide with nearly eighteen billion dollars in sales, though two European corporations, Nokia in Finland, and Ericsson in Sweden, followed close behind (NEC in Japan ranked a distant sixth).⁶⁰

Within this meteoric global expansion of the cellular industry, electrosensitives' presence ballooned as well. Their proliferation suggested that cases such as the Reynards might represent more than the requisite cultural anxieties to a relatively new medium. By 1997, a dozen lawsuits had officially been filed in the U.S., and roughly thirty thousand people in the country claimed they suffered from electrosensitivity.⁶¹ In 2000, an estimated 5.36 million Americans reported experiencing an electrosensitive disorder.⁶² That same year, the Swedish government sponsored a public forum in Stockholm to discuss electrosensitivity, under pressure from an estimated nineteen thousand citizens also suffering from exposure to cell phones.⁶³

The forum is the subject of this section, offering a revealing comparison to David's case in the U.S. As I point out, the forum comprises a collective public

performance of media refusal, where electrosensitives repeatedly offered testimonies of the ill effects they experienced from cell phones (in addition to computer screens, fluorescent lights, televisions, photocopiers, and landline telephones). As a result, Swedish electrosensitives demanded much more than alterations in cellular design. They wanted entire public spaces expunged of cell phones and their radio frequencies.

These “free zones,” as I discuss below, present two distinct challenges to the cocoon theorized early in this chapter. First, they embody a desire for health to be institutionally constructed rather than personally practiced. Second, they indicate that for a sizeable population, their wellbeing – including physical safety, and social, emotional, and financial stability – depends upon being cocooned *away from* phones, contradicting phones’ purported ability to insulate people from danger, instability, and uncertainty. In the process, free zones return us to a central dilemma within this chapter (and dissertation in general): whether human health in an era of cell phones is an individual responsibility, or if health might be better served as a co-production.

Early in 1997, the Ministry for Industry, Employment, and Communications in Sweden took on electrosensitivity. The federal agency, which broadly manages the national adoption of information and communications technologies, ordered the Council of Work Life Research (a subset of the European Agency for Safety and Health at Work) to evaluate an uptick in disturbing reports the Ministry had received from workers around the country. Multiple thousands of individuals argued that they could not remain employed due to the severe, disabling health effects they experienced in

the presence of cell phones. The Council decided to handle the numerous, unusual complaints through a public forum, held in a rambling schoolhouse in the capital city Stockholm three years later, on March 8, 2000.⁶⁴

Advertised in major daily newspapers as a chance to “speak out” about health effects, the forum was open to any electrosensitive who wanted to attend in person.⁶⁵ There, they could testify to members of the Council, many of whom also served on the Scientific Council for Telia, then the largest cellular service provider in Sweden. If their conditions made it impossible to attend, electrosensitives could alternately contribute letters describing their history of symptoms due to radio frequencies, which the Council would include in the final report they filed with the Ministry.⁶⁶

Electrosensitives responded by filling the schoolhouse to capacity. Thirty-three representatives testified to the assembled federal and corporate officials for a full five and a half hours. Victims who could not be present for the hearing inundated the Council with four hundred and fourteen letters. These documents totaled over nine hundred pages of accounts detailing the variety and severity of disorders they felt cell phones could cause.⁶⁷

On its face, the setting could not have differed more than the context surrounding David Reynard: a federally sponsored hearing rather than an interview on a questionable TV show, a sweeping inquiry into workers’ safety versus a single consumer’s lawsuit against a product. Despite the distinctions, the strategies Swedish electrosensitives collectively pursued to reject cell phones were nearly identical to

David's own tactics. At the forum, many sufferers began their statements by talking about their technological mastery, for instance. As one electrosensitive put it, "Among us are people with 'first rate' degrees, electronics experts at the forefront of research, engineers with many years' experience with radar, radio transmitters, high-frequency apparatus, mobile telephony, computers, transformers, distribution plants, and high-frequency transmissions."⁶⁸

Victims also spoke of their significant social standing as a way to lend their illnesses credibility. Identifying victims' general background, an electrosensitive remarked that their fellow sufferers were "financially well-off, have a strong psyche, and have the support of those around them."⁶⁹ Their portrayal recalled the social, emotional, and economic fortitude that their counterparts in the U.S., like David and Susan Reynard or CEO Mike Walsh, also described enjoying. As the preliminary personal details reiterate, those who managed to "speak out" about cellular effects in Sweden possessed a remarkable degree of privilege, which they drew upon in attempts to give their rejection of phones authoritative weight.

At the heart of each testimony, however, were descriptions of cellular injuries. Bizarre, gruesome, and often tearfully articulated, these affecting performances suggested that "every individual suffering from electrosensitivity constituted a piece of evidence in itself," as the Swedish sociologist Linda Soneryd writes.⁷⁰ To transform their torturous personal experiences into proof of the health effects cell phones could unleash, electrosensitives put their bodies on display for federal and corporate

scrutiny at the 2000 forum. Ulcerating lesions frequently marred their skin.⁷¹ Many had lost their hair and wore wigs.⁷² They had difficulty speaking or standing at length, and often requested short pauses during their testimonies to sit and gather their strength before continuing. Or, due to their weakness, electrosensitives let spouses speak on their behalf, as David did for Susan in the U.S.⁷³

The performances of media refusal continued for several hours, while electrosensitives immersed Council members in graphic, firsthand accounts of how they contracted their condition through sustained contact with the radio frequencies of cell phones. Like David, who couched his rejection of phones within the tragedy of losing his wife to cancer, electrosensitives in Sweden also took an affecting, visceral approach. They tried to curry institutional recognition and support for their plight by first establishing an emotional connection with their official witnesses, and then by establishing their traumatized bodies as the central sites where cellular effects could be measured.

Electrosensitives' effect was not lost upon witnesses. Researchers Rigmor Granlund-Lind and John Lind, who compiled transcripts of letters and statements at the forum, made a note of the "ambition [of electrosensitives] to describe their handicap in as much detail as possible, for the benefit of the research group's final report."⁷⁴

Testimonies fell into two categories. Within the first grouping were the physical and physiological effects electrosensitives experienced from cell phones and

other electronic media. A few victims argued that cellular radio frequencies had either given them brain tumors – reflecting Susan Reynard’s bleak diagnosis – or caused another sort of head trauma, such as cerebral hemorrhaging.⁷⁵ The majority of electrosensitives, though, described being wracked by chronic disorders – excruciating skin and eye complications, migraines, nausea, dizziness, weakness, severe difficulties with speech and memory, and paralysis from “bursting pain” that flared in their joints, arms, and legs.⁷⁶

The litany of physical and physiological disturbances fed a second category of testimony: the social, emotional, and financial fallout electrosensitives experienced when their bodies rejected cell phones. Victims repeatedly attempted to impress upon the Council the devastation of their private and professional lives in Sweden. Commenting on this form of havoc sufferers endured, one electrosensitive put it the following way:

My meetings with electro-hypersensitive individuals have been very revolutionary for me. There has been and there still is strength, but also weakness, total solitude and enormous shame, divorces and poverty. Children leave them, husbands/wives leave them, relatives leave them, colleagues leave them. Their finances are in ruins.⁷⁷

To illustrate several of these points in depth, another electrosensitive wrote in her letter to the Council that she not only battled the crippling physical symptoms of her illness. She could maintain only the most limited social contact, and as a result lacked emotional sustenance. The omnipresence of cell phones and radio frequencies

contributed to her social withdrawal and financial instability, since the technology rendered her unable to move through personal, professional, and public spaces. Cell phones had effectively ended her life. As she concluded in despair:

My body and my psyche are completely worn out. I can't visit friends in their homes, stay at hotels, visit my family unless the environment has been treated to reduce the electromagnetic fields, free from cellular phones and generally free from radiation. I can't use a regular telephone.... I can't remain at a regular workplace due to computers, photocopiers, fluorescent lamps, mobile systems etc.... I can't go to the hospital or see my doctor due to the electric and magnetic fields that are never shielded. Nor can I go out into the Swedish nature on account of all the radio masts, mobile telephone masts etc. The list can go on forever. My reality is unreal.⁷⁸

Taken collectively, the evidence of experience articulated in Stockholm in March 2000 offered an uncanny alternate reality existing alongside the cellular cocoon, which we saw theorized earlier in this chapter by industrial designer Richard Harper, and many social scientists such as Sherry Turkle, Richard Ling, and Michael Chan. For example, instead of providing a gateway of “connectivity” leading to emotional stability and a supportive social network, cell phones demolished electrosensitives’ lives on every one of these counts. And instead of offering these workers increased autonomy over their health through a suggestively spatial “securitized bubble,” which mediated external risks, cell phones constructed a debilitating, virtual prison for electrosensitives. The omnipresent radio frequencies of phones barred victims from nearly any public or private environment. Once their symptoms forced them to reject the technology,

electrosensitives encountered further exile and isolation, rather than an individualized sense of dwellingness and wellbeing. Unable to participate in the cocoon, electrosensitives in Sweden deemed themselves “refugees.”⁷⁹

In order to recuperate their health, electrosensitives ended their testimonies at the 2000 forum by redefining their health as a co-production. However, the systemic solution they proposed differed substantially from David Reynard’s idea – the hands-free headset – that he described on *Larry King Live* in 1993. Cellular health effects were framed in Sweden as a workers’ safety issue, after all, rather than a single product safety claim. Therefore, electrosensitives in Sweden thought about their health on a collective level. They conceived of designing “free zones,” or safe, shared, radio frequency-free spaces *around* cell phones.⁸⁰ A new kind of cocoon, these zones might improve the health of an entire victimized population in the present, rather than create a safer product for consumers to selectively purchase in the future, as David envisioned.

Blueprints for free zones acquired the following dimensions. Principally, they needed to physically protect electrosensitives from cellular radio frequencies. Thinking along these lines one electrosensitive advised hospitals to construct free zones that deflected radio frequencies in waiting rooms and treatment wards.⁸¹ Without such spaces, the cell phones and related wireless electronics used by other patients and medical professionals would exacerbate the physical and physiological symptoms electrosensitives experienced.

Another participant at the forum thought more expansively about protecting the social, emotional, and financial wellbeing of sufferers. She advocated for embedding free zones throughout the Swedish public transportation network.⁸² Building specially designed, insulated compartments on trains, streetcars, and subways would facilitate three aspects crucial to electrosensitives' health. First, the zones would allow victims to continue traveling to and from work without being detrimented by cell phones. This would give electrosensitives a fighting chance of remaining gainfully employed and retaining the finances necessary to address their illness. Second, these zones would also permit victims to visit and remain supported by family and friends, protecting their social and emotional health. Third, insulated compartments on trains or buses would let electrosensitives travel to health facilities to receive treatment for their condition. Building cell phone-free cocoons into an existing public service might protect a community's wellbeing on multiple levels, this electrosensitive at the forum concluded.

To an even greater degree than David Reynard, then, electrosensitives in Sweden not only rejected cell phones for their potential toxicity. They also rejected the individualization of health taking place around (and much beyond) this technology – a paradigm that by the 1990s and early 2000s was becoming firmly entrenched in parts of Europe as well as the U.S. As we saw in Chapter 2, human health was thought about by the principal designers and manufacturers of cell phones worldwide, such as

Motorola, as “an individual moral responsibility,” and an “ongoing project composed of public and private performances,” which people carried out in their lives.⁸³

These self-actualizing performances were structured by industrial designers, and commodified for individuals, through cell phones. A premier “technology of the self,” it offered its users the chance to control, or cocoon, their own health through consistent, intimate contact with friends and family, as I discussed in the first part of this chapter. Or the cell phone encouraged people to take up an active, fit lifestyle, as designers fantasized in the last chapter. Cell phone scholars Adriana de Souza e Silva and Jordan Frith remind us that such a vision of an empowered, connected, yet ultimately atomized cell phone owner remains one of the essential appeals of this technology.⁸⁴

Free zones stood stark contrast to this vision. As their name implied, these safe spaces would exist in contradistinction to a commercial technology, and an industry ideology, that framed health as a consumer obligation. The zones would “free” individuals by distributing health responsibilities across a range of actors. As participants at the Stockholm forum emphasized, when and if cell phones crippled people’s wellbeing, a sizeable, *institutional* network of support would be needed to handle the ramifications. Constructing free zones might require the participation of federal and municipal environmental regulators, public transit authorities, collaboration with workers’ safety organizations, industrial designers, and healthcare

institutions, to name but a few. Electrosensitives would certainly participate in this co-production of health, but they would not be the motivational force.

A healthy response?

Although their vivid testimonies captured the attention of journalists, federal authorities, and the cellular industry in the 1990s and early 2000s, electrosensitives in Sweden and the U.S. have attracted very little institutional support for their condition. Nor have they inspired a systemic reframing of consumer wellbeing as a co-constitutive process. Electrosensitives have instead encountered three challenges in their attempts to articulate cellular health effects. As I conclude below, their testimonies have elicited a “simulated responsiveness” from the cellular industry, in which proposed health research and standardization on the part of the industry serves to obscure their disbelief in electrosensitivity.⁸⁵ In legal cases and public hearings, victims’ testimonies have additionally been invalidated as “anecdotal” evidence.⁸⁶ Finally, industrial designers have proposed that cellular risks might be the result of consumer irresponsibility, propelled by an especially emotional relationship with cell phones. Collectively, as we will see, these institutional responses maintain a definition of health as an individual obligation.

Ten days after David Reynard’s testimony on *Larry King Live*, for example, the Cellular Telecommunications Industry Association (a powerful lobbying organization based in Washington D.C. which has represented American cellular manufacturers

and service providers since 1984) put together a “Scientific Advisory Group.”⁸⁷ This industry research panel would be dedicated to decisively measuring the health effects of cellular radio frequencies, the CTIA announced in a widely covered press release. Entrusted with twenty-five million dollars in funding, and allegedly overseen by the Department of Health and Human Services, the Federal Communications Commission, and the Environmental Protection Agency, the Scientific Advisory Group spent \$17 million without ever publishing a report – much to the consternation of many cellular companies who helped pay the group, as well as the public.⁸⁸ It effectively disbanded in 1994, after a leaked memo to *The New York Times* suggested that Motorola attempted to collude with the group and create a media campaign denouncing cellular health effects.⁸⁹

In the U.S. to date, then, the cellular industry attends to the health of its two hundred and eighty-seven million customers by voluntarily designing cell phones according to a recommended practice developed in 1995 by the CTIA, the FCC, and the Institute for Electrical and Electronic Engineers.⁹⁰ The industrial recommendation specifies protocols for measuring the radio frequency output of phones. It does not set limits on users’ exposure to radio frequencies.⁹¹

Nominally addressed by the cellular industry, electrosensitives have also found scant purchase legally or scientifically. Their testimonies in both contexts remain defined as anecdotal evidence, meaning they reflect personal, unverified perceptions about technology rather than “expert” scientific knowledge. In 1995, for example, the

U.S. District Court in Tampa, Florida that deliberated *H. David Reynard v. NEC America, Inc.* said that they “empathized” with David’s anguish over cell phones.⁹² Nonetheless, they dismissed his rejection of the medium due to his uncertain application of mainstream cancer research. None of the material marshaled in his case’s defense had undergone “normal scientific scrutiny through peer review and publication,” and therefore failed to meet the U.S. Daubert standard for the admissibility of scientific evidence.⁹³ Unable to legally claim any causality between his wife Susan’s brain tumor and her cell phone, David was further denied the legal authority to advance his argument against the individualization of consumer health, which he felt was taking place in relation to cell phones.

A similar dismissal of testimony hampered electrosensitive efforts in Sweden after the Stockholm forum in March 2000. In their final report delivered to the Swedish federal government in December of that year, the Council for Work Life Research ultimately did not side with sufferers. Since victims relied upon their personal experiences to define the health effects of cell phones, the council stated that they could not reach “any conclusions pertaining to the occurrence and typical array of symptoms regarding electro-hypersensitivity based upon this documentation.”⁹⁴

Four years later, another public forum in Stockholm again dismissed electrosensitive testimonies as anecdotal. After victims described the visceral effects they felt from phones’ radio frequencies – this time to the Swedish Radiation Protection Authority (SSI) – the federal agency recommended no further inquiry into

victims' experiences. As an agency official concluded, "The basis for SSI is scientific and as I see it, anecdotal evidence is something else. I don't know how to deal with that. Maybe it is another type of scientific evidence, but not the type SSI deals with."⁹⁵ Like the Reynards in the U.S., therefore, electrosensitives in Sweden failed to garner the institutional authority to contest the significant liability cell phone users face regarding their own wellbeing.

Beyond the legal and scientific rebuttal of electrosensitivity, one industrial designer, Richard Harper, developed another defense to deal with consumer health concerns. Rather than disregard electrosensitive testimonies as anecdotal, he suggested framing such cases as a form of emotional excess. In other words, consumer ailments might represent an underlying behavioral issue. This behavior, Harper consequently argued, would simply dissipate as individuals learned to manage their use of phones. He presented a version of this argument at the Mobile Human Computer Interaction International Symposium in 2003. Speaking to fellow designers culled from Motorola, Nokia, Sony, Ericsson, Philips, IBM, and Siemens, Harper began by candidly admitting that consumers might encounter multiple risks with their phones. They could experience personal injuries, for instance, or struggle with financial hardship (where phones "swallow up all the available cash they have," as Harper memorably observed).⁹⁶

Yet he was optimistic that users could handle the risks as long as they exercised a little self-regulation.⁹⁷ As he argued, each of these issues stemmed from consumer

“irrationality,” when “they cannot control their behavior with mobiles.”⁹⁸ Harper thus reassured cellular designers that the devices they helped construct were benign. As he reiterated, the aforementioned threats “are really emotional, insofar as it is sometimes the heart that exerts control over the mind” of the average consumer.⁹⁹ With this statement, Harper flipped the electrosensitive refusal of cell phones on its head. His argument suggested that testimonies of illness and injury might actually signify the points at which consumers became too invested in their phones, an issue which consumers alone could resolve.

Defining health as a personal liability is troubling, since it offers little incentive to study how the cellular industry and its products may impact users’ overall wellbeing. If such a critical framework persists within industrial design, or other professional communities in the industry, gauging the cocooning or malignant health effects of cell phones will apparently depend upon how individuals such as David and Susan Reynard choose to use and feel about their phones. What we will lose is the opportunity, and the perspective, to study social, emotional, and physical wellbeing at the intersections where people interact with cell phones – technology constructed in part by designers like Harper, who affect consumer health as they build devices according to personal, political, economic, and professional beliefs and constraints.

The individualization of health may also stigmatize mixed or negative reactions to technology as the culprits behind injury and illness, rather than see them as important indicators of risks. Performances of media refusal remain under-examined

as a result. As sociologists Jane Vincent and Leopoldina Fortunati suggest, experiencing the cocoon of wellbeing that cell phones offer represents socially and institutionally acceptable behavior.¹⁰⁰ Experiencing ambivalence, curiosity, fear, or doubt about the technology, on the other hand, means succumbing to the “sensational emotions of the new media age,” to borrow a phrase from Brenton Malin, and trafficking in uninformed speculation, unsuccessful litigation, and “voodoo science.”¹⁰¹ From this perspective, electrosensitives’ refusal of media seems to pose a greater concern than a cell phone and its radio frequencies.

Or, such intensely negative reactions and unresolved health debates might constitute a bold new market for industrial designers. While electrosensitives in the U.S. and Europe continue to seek recognition legally, scientifically, and medically, a pair of leading consumer electronics designers in Britain embraced this marginalized community beginning in the mid 1990s. As we will see throughout the next chapter, however, these designers were uninterested in corroborating electrosensitives’ testimonies against phones. Nor did they question the encompassing individualization of health around this medium, which so galvanized electrosensitives’ efforts. Instead, these two designers explored electrosensitivity as a way to broaden the emotional scope of cellular design and propose fresh products – psychological “comfort zones.” These would be specifically engineered to negotiate and defuse controversial instances when consumers might feel injured or made ill by cell phones.

Designers cannot always solve problems; we cannot switch off the vast electromagnetic networks surrounding us all. Although we cannot change reality, we can change people's perception of it.

- Anthony Dunne and Fiona Raby (2002)¹

TECHNOLOGICAL RISK

Chapter 4: Electrosensitivity, Sanctuaries, and Psychological Adventures

Anthony Dunne and Fiona Raby tended to dwell on darker affairs.

In 1989, they were married twenty-somethings, hotshot architecture and design graduates from the Royal College of Art in London. They looked disturbed in photographs taken during interviews about their increasingly admired design firm, resembling the glacial, distressed denizens of a David Cronenberg film. Given their sensibilities, the British couple took up an appropriately grim topic: the safety of consumer electronics.

Their interest began while Dunne filled two stints at the Sony Design Center and NEC in Japan in 1989, designing answering machines, radios, televisions, and updated versions of the Walkman personal cassette player. As he sketched ideas (and worked alongside a future head of design for Motorola) he chafed at his employers' simplistic understanding of his vocation, that being, "Good design is design that sells."² He was also turned off by Sony's obsession to build and sell mobile media to a narrow, elite consumer demographic, in which the design of products like the Walkman was supposed to match a conceptual portfolio that included "images of French restaurants, high-priced leather goods, Mercedes-Benz cars, and English country houses."³ Nor was Dunne satisfied with the "happy-ever-after" vision of

consumers that his fellow designers at the company believed in, where products like cell phones were the “solution to every problem,” be they social, emotional or physical in nature.⁴

Instead, a nagging question preoccupied Dunne, which he shared with Raby. Did the owners of media – especially newer communications media like cell phones – sometimes feel negatively affected by the devices? Were they particularly disturbed by the “leakages” of radio frequencies emanating from these products?⁵ If so, how did consumers come to terms with this negative affect? Dunne and Raby wanted to know.

Once he completed his contract at Sony, in the early 1990s Dunne returned with Raby to the Royal College of Art, where he embarked upon a PhD in design, which he researched collaboratively with his wife.⁶ The topic of Dunne’s dissertation, the couple agreed, would nail the “pathology” of cell phones.⁷ Throughout the 1990s, they investigated electrosensitive reactions to phones in the United States and Europe. Rather than debate specific cases, such as David and Susan Reynard’s 1992 lawsuit against phone maker NEC, Dunne and Raby imagined electrosensitives as a community of vernacular designers. In the process Dunne and Raby discovered that due to scientific, industrial, and legal disregard, electrosensitives had individually devised cell phone free zones for themselves. These zones took shape as customized homes, or smaller safeguards that screened sufferers from the potentially damaging radio frequencies of cell phones.

After spending seven years researching electrosensitivity in the 1990s, Dunne and Raby were unconvinced that cell phones caused brain tumors, or chronic disorders including migraines, nausea, depression, or paralyzing joint pain. Instead, the designers were intrigued by what electrosensitivity might reveal about users' complex emotional interactions with their phones. As the designers concluded from their study, "The range of emotions offered through most electronic products is pathetically narrow."⁸ Feelings of risk comprised an integral part of cellular experiences, Dunne and Raby argued – feelings they believed could be mined to design protective safeguards.⁹

Among industrial designers, this electrosensitive inquiry enjoyed considerable acclaim. In a 2010 review, renowned architecture and design critic Edwin Heathcote praised Dunne and Raby's work as "perhaps the most profound reinterpretation of the potential of the [design] discipline in a century."¹⁰ Their focus on electronic media and feelings of risk specifically inspired work within the Design and Emotion Society, an international think tank established in 1999, in part dedicated to mitigating negative consumer experiences.¹¹ By 2009, Dunne and Raby's eminence in design was such that their research was featured in the documentary *Objectified* (2009). A popular survey of movers and shakers in contemporary industrial design, the film put Dunne and Raby in league with Jonathan Ive, principal designer for the Apple iPhone. In the context of this dissertation, Dunne and Raby's research also matches the influence of another cell

phone designer, Richard Harper at Microsoft. As we encountered in the last chapter, Harper theorized that cell phones created a “cocoon” of wellbeing for users.

In the following pages, I want to dip beneath the surface of Dunne and Raby’s wildly popular work. I use their electrosensitive project to assess how industrial designers might mediate between the medical establishment, the cellular industry, and concerned consumers in addressing the health effects of cell phones. As the first half of this chapter details, mainstream medicine disregards electrosensitivity without exception. This sizeable population of media users is left to feel out the hazardousness of cell phones on their own. Their feelings inform the design of what Dunne and Raby call “sanctuaries,” a manifestation of the “free zones” discussed in the previous chapter. These uniquely rendered spaces and objects insulate people from phones.¹² As industrial designers for hire, Dunne and Raby are eager to tap this marginalized market.

Dunne and Raby’s embrace of electrosensitivity is complicated, though. Like the medical establishment, the designers think the condition is psychosomatic, or what they colorfully describe as a “psychological adventure.”¹³ Dunne and Raby’s resulting product, called the “Electro-draught Excluder,” provides only a “comfort zone” for “neglected psychological needs,” trading electrosensitives’ physical sanctuaries for a *feeling of safety*.¹⁴ This product becomes my focus for the second half of the chapter. As I discuss, the Excluder does not medically quantify cellular risks according to industrial safety guidelines. Nor does it offer the palpable shielding so

important to electrosensitives. For Dunne and Raby, the threat a cell phone poses may all be in your head, something to be fixed with a placebo. Their philosophy, I argue, deepens a medical and industrial distrust of consumers and their perceptions of risk. In turn, Dunne and Raby's work furthers a lack of institutional accountability for the wellbeing of consumers.

Approach

In line with the past three chapters, the following pages explore how conceptions of health are socially constructed through the design of two communications media, the telephone and cell phone. Within this subject, my look at Dunne and Raby returns us to a central concern of my dissertation: the individualization of media users' health. As Chapter 2 for example illustrated, Motorola (the earliest manufacturer of cell phones in the U.S.) designed cell phones to offload fitness responsibilities onto an exclusive class of "executives" in the 1970s and 1980s. As the cellular market exploded in size and diversity in the 1990s, Chapter 3 explored how several thousand users in the U.S. and Europe refused this individualization of health, working with journalists to publicize the injuries and illnesses they allegedly experienced from cell phones. As Chapter 3 concluded, the cellular industry, industrial designers, and federal and legal authorities dismissed these testimonies as unreliable, emotional, anecdotal evidence. By withholding

institutional recognition for electrosensitivity, these rulings framed health around cell phones as an individual responsibility.

While I fold Dunne and Raby's work into this discussion, I draw upon types of evidence that informed my previous three chapters. To analyze medical professionals' continued presence in conversations about health and media I first evaluate the seventy-one published, peer-reviewed medical studies on electrosensitivity, since they so closely echo Dunne and Raby's definition of the condition. As we will see through this literature, interactions between electrosensitives and mainstream medical practitioners are deeply unequal. They underscore that the "authoritative discourses of science and medicine," as anthropologist Joseph Dumit argues, attempt to "dissociate people from their own bodies and experiences," and make illness and injury reliant upon expert opinion.¹⁵ Consequently, this process of dissociation allows physicians to discredit the risks electrosensitives feel from cell phones, requiring victims to treat their own condition.

My sources in this chapter differ slightly from previous chapters, however, due to the nature of Dunne and Raby's work. Unlike the standardized, mass-produced, widely used designs I have surveyed so far (such as AT&T's mechanically ventilated telephone booths, or Motorola's portable cell phone), the Electro-draught Excluder remains a prototype, despite Dunne and Raby's stature in their field. In this case, the British couple remain the primary source for their work, accessible through writings they published in the past fifteen years. The designers extensively described their

interest in electrosensitivity in *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design*, a popular volume based upon Dunne's dissertation, published in 1999 by the MIT Press and reprinted in 2005. They wrote about their Excluder in an ensuing book, *Design Noir: The Secret Life of Electronic Objects*, published in 2001 by Swiss design and architecture imprint Birkhäuser. These two books illuminate how Dunne and Raby conducted research into electrosensitivity, performed primarily by collecting news reports, rather than interacting with sufferers. Their writing also explicates their working philosophy behind designing the Excluder, which they define as a "medical placebo" meant to gently ease fears of cell phones, and induce a feeling of safety.¹⁶

To assess the efficacy of Dunne and Raby's work, I finish this chapter by surveying the Excluder's lukewarm reception in installations at the Selfridges department store in London in 2001, and the Museum of Modern Art in New York in 2005-2006. In these exhibits, the Excluder met with criticism from heavyweight architecture and design journal *Blueprint*, art magazines *Artforum* and *Frieze*, national newspapers in the U.S. and Britain, as well as the influential medical organ *The British Medical Journal*.¹⁷ Dunne and Raby also collected in-depth reactions from two non-electrosensitive consumers. As these responses attest, the Excluder is distinctly unappealing because it treats health and safety as merely perceptual.

A vacuum remains for designers to participate in creating cellular sanctuaries, an opportunity I discuss in the closing pages of this chapter. A growing number of

consumers in the U.S. and Europe identify as electrosensitive, and desire some form of physical protection from cell phones. Dunne and Raby's stillborn design (and fierce opposition from the cellular industry and mainstream medicine) underline that for the time being, electrosensitives may be responsible for designing their own sanctuaries and free zones around media.

Electrosensitivity: the medical perspective

Before examining Dunne and Raby's electrosensitive research, or their Electro-draught Excluder, I want to contextualize their position relative to the medical establishment, which has dismissed electrosensitivity since the early 1990s. As I detail, several thousand electrosensitives have sought medical treatment due to cellular-related illnesses. Yet their condition refuses to coalesce into an "object of scientific knowledge and institutional control," since it cannot be measured by the "intricate systems of instrumentation" and testing that modern medicine relies upon to identify product risks.¹⁸ Electrosensitive attempts to "medicalize" their own symptoms are further derided as emotionally biased, again distancing them from medical recognition. This section consequently foreshadows Dunne and Raby's own definition of the condition as a psychological adventure.

In 1992, when David Reynard filed his lawsuit against cell phone manufacturer NEC (one of Dunne's employers), twelve identical lawsuits appeared in the United States.¹⁹ By the mid-1990s, the Environmental Health Center, an alternative treatment

facility in Dallas, Texas, claimed to have administered to some 1,500 patients suffering from exposure to the “exhaust” of cell phones.²⁰ (A similar facility, Breakspear Hospital, has operated since 1982 some thirty miles north of Dunne and Raby’s London design office).²¹ By the late 1990s, some 6,420 consumers worldwide claimed they had developed cancer from cell phones’ radio frequencies, which contain low doses of radiation.²² A substantially greater majority – roughly two to three percent of citizens in the U.S., the U.K., Italy, France, Austria, Germany, Denmark, and Sweden – struggled with frustratingly subjective maladies, including headaches, nausea, dizziness, depression and anxiety.²³ Victims often felt their symptoms so intensely that many physicians called their condition an “affective spectrum disorder.”²⁴

Despite their vividly felt reactions to cell phones, and their growing numbers, electrosensitives found little help from the medical establishment in the 1990s, in terms of treatment, coverage, or basic acknowledgement that their symptoms even existed. Historically, Ludmilla Jordanova notes, mainstream medicine only recognizes hazards articulated through “value-free science.”²⁵ Greg Siegel explains that in product safety cases since 1947, personal feelings about technological risks have been medically invalidated. During U.S. medical inquiries into automobile crashes that year, Siegel states, “Laypersons were often found to be fallible psychologically, morally, and perceptually; they did not always think straight, talk straight, or see straight.”²⁶ Dumit concludes that for product hazards up until the present, medical professionals have

believed “we cannot trust our senses but must trust other technologies of identification” to define product risks.²⁷

In the 1990s and early 2000s, electrosensitivity failed to be resolved by such “technologies of identification,” and so remained a scientifically suspect condition. Thirty-three published epidemiological experiments undertaken in the United States and Europe uncovered no causal link between cell phones and cancer through either cross-sectional, case-control, or cohort studies, which are routinely used to quantify sources of cancer.²⁸ Neither did thirty-seven peer-reviewed double-blind “provocation studies” on electrosensitive symptoms pinpoint a precise cellular culprit.²⁹ The Cellular Telecommunications Industry Association, the Federal Communications Commission, and the Institute for Electrical and Electronics Engineers sponsored another inconclusive study in 1993, utilizing an anthropometric model of the human head, filled with dielectric fluid that approximated the brain’s absorption of cell phones’ radio frequencies.³⁰ The cellular industry as well as the medical community agreed that since electrosensitives’ symptoms could not be measured by these instrumental techniques, their illness was psychosomatic, rooted in biased feelings about cell phones.³¹

Without medical or industrial help in identifying and alleviating symptoms, electrosensitives in the U.S. and abroad individually collected and interpreted medical material – from scientific research, medical reference books, magazines, television, nascent Internet communities, and alternative health sources such as the

Environmental Health Center. They did so in an attempt to “medicalize” their condition in order to “become objects of attention and care,” Dumit argues.³² As I detailed in the last chapter, electrosensitives like David even conducted their own experiments on cell phones to clarify risks. Summing up electrosensitives’ willingness to define their own conditions, victim and *Economist* reporter Nicols Fox stated in a 2007 interview, “I don’t care if there’s research or not. I’ve done my own research.”³³

Such subjective interpretations further disinclined physicians to recognize electrosensitivity. Victims’ efforts, health practitioners countered, were emotionally tainted. In a 2011 review of electrosensitivity for *The New York Times Sunday Magazine*, cancer epidemiologist Siddhartha Mukherjee, for instance, characterized David Reynard’s experiments on cell phones as an extreme emotional reaction to cancer. He memorably observed, “Tumors, like clouds, can assume the shapes of our imaginations,” intimating that due to the devastation of losing his wife to a brain tumor, Reynard could not accurately gauge the health effects of cell phones.³⁴ Mukherjee as a result is skeptical of claims that cell phones cause cancer.

The medical disavowal of electrosensitivity matches that of industrial designers whom we encountered in the last chapter. Richard Harper, for example, attributed cellular risks to consumers who “cannot control their behavior with mobiles,” in which “the heart sometimes exerts control over the mind.”³⁵ Like Harper, medical professionals do not trust consumer perceptions of risks, which they also frame as emotionally distorted, or what neurologists Sandra Stöckenius and Peter Brugger

deem a form of “magical ideation.”³⁶ As I explore below, Dunne and Raby tried to distinguish themselves from these institutional perspectives, with limited success. I now turn to analyze their research into electrosensitivity.

Electrosensitivity: Dunne and Raby’s investigation

Despite mainstream medical disregard, electrosensitivity piqued the attention of Dunne and Raby. This section looks at their research, which reveals how electrosensitives defend themselves from cell phones. They build “sanctuaries” – shelters or objects that permit a radio frequency-free space for sufferers to dwell, designed according to *felt* rather than clinical conceptions of safety. This research lays bare electrosensitives’ intent to be *physically* protected from phones. As I will explore in the following section, this desire runs counter to Dunne and Raby’s diagnosis of electrosensitivity as an emotional issue.

Motivated by cases about the “pathology” of cell phones, Dunne undertook his dissertation at the Royal College of Art from 1991 to 1998 (his dissertation would in turn birth the Electro-draught Excluder). At his project’s outset, Dunne wrote that the scientific controversy around electrosensitivity should not keep it from influencing the industrial design of phones. As he and Raby proposed, “Designers could draw on the specialist knowledge, concerns, and pleasures of beta-testers, early adopters, electro-connoisseurs, and hyper-sensitives to evolve a deeper understanding of how to make

ourselves at home in this new environment” of cell phones and their “electro-climates” of radio frequencies.³⁷

Following their own advice to draw upon this “specialist knowledge” of electrosensitives, Dunne and Raby delved into the condition. Throughout their investigation, they realized that electrosensitives customized living spaces to make themselves “at home” with cell phones. The first space the designers discovered in 1996, when roughly thirty-six electrosensitives in the U.S. relocated to the National Radio Quiet Zone (NRQZ) on the border between Virginia and West Virginia. A 13,000 square mile wilderness preserve established by the Federal Communications Commission in 1958, the NRQZ originally cocooned the world’s largest radio telescope at the National Radio Astronomy Observatory, with minimal interference from radio and television stations, trucks, airlines, radar, and electrical and telephone networks.³⁸

Electrosensitives repurposed the NRQZ as a health preserve. Dunne and Raby wrote that it offered a “sanctuary relatively free of electromagnetic pollution,” where electrosensitives could exist untroubled by cell phones, and their radio frequencies.³⁹ In a separate investigation at the NRQZ, journalist Joseph Stromberg supplies even more detail about electrosensitive domesticity than Dunne and Raby. Victims live in housing free not only of cell phones, but computers, televisions, and radios, too. They outfit their residences with typewriters, gas lamps, iceboxes rather than electrical refrigerators, and especially heavy insulation if electrical wiring is present.⁴⁰ (Media-“sanitized” homes are erected by electrosensitives in other countries, too. In a high-

profile case, former Ericsson cellular engineer and electrosensitive Per Segerbäck escaped to a cabin in rural Sweden, buried his electrical source in an underground cellar, and encased any media in his residence in thick plates of steel.)⁴¹ Though these sufferers primarily customize homes against cell phones' radio frequencies, their domestic environments evolve into "sanctuaries" insulated from contemporary media in general – in spite of scant medical advice that these media are dangerous.⁴²

Electrosensitives did not always pursue expensive, radical domestic choices. Dunne and Raby discovered that other victims made simpler, cheaper shields against cell phones. Researching for his dissertation, Dunne located a "DIY treatment" designed by Pauline, a British electrosensitive whom he read about in the UK fashion and interior design magazine *Red*.⁴³ To alleviate the cataclysmic migraine headaches she experienced from cell phones, Pauline said she fashioned a "flex," or a bare wire loop she wrapped around her finger or big toe. On the other end of the wire she affixed a homemade earth pin to electrically ground herself. This would "drain her body" of radio frequencies until she felt better, turning her very body into a sanctuary.⁴⁴

Beyond Dunne's finding, I recovered thirty-five patents filed with the U.S. Patent Office from 1993 until 2003, which evidence the popularity of inexpensive, simple designs such as Pauline's. The "Radiation Shield for Cellular Telephones" designed by James Hunt of Florida in 1993, for instance, is nothing more than a strip of metal affixed to a cell phone, installing a small pocket of distance between a person's

head and a phone's antenna.⁴⁵ Another safeguard, the "Radiation Shielding Device" patented by Eyal Rinot of Illinois in 1999, envisions a radio frequency lightning rod for users to strap atop their heads, creating another small bubble of safety.⁴⁶ The majority of patents are even more basic. They offer sleek sheathes fitted tightly over cell phones' antennae (bringing to mind another human safeguard: the condom). They are made from a colorful variety of material – foam rubber, plastic, carbon fiber, polished aluminum, brass alloy, the mineral-metal compound tourmaline – or other conductive material inventors felt might draw radio frequencies away from users' heads.⁴⁷ In each patent, the aim is the same: building a space free from the influence of cell phones.

The patented shields, Pauline's flex, and homes at the NRQZ illustrate the variety of ways that electrosensitives tried to protect their health from phones. Lacking medical research, recognition, or treatment, electrosensitives' pursuit of wellbeing indeed resulted in highly idiosyncratic designs – an affective rather than institutional architecture of safety. Some sufferers entirely refashioned their environment. Others made do with sundry cheap, insulating layers to manage their relationship with cell phones. Despite the variation, though, these sanctuaries did share a unifying purpose: *physical protection* from phones. This, as we will see momentarily, conflicts with Dunne and Raby's belief that electrosensitives require psychological protection from cell phones.

A psychological adventure?

Dunne and Raby were floored by the options electrosensitives crafted to care for their health. In this section, I want to interrogate their sympathetic response, highlighting that Dunne and Raby did not define electrosensitivity as a bodily illness caused by cell phones – as sufferers clearly believed. Instead, Dunne and Raby interpreted the intensely felt condition as a “psychological adventure” – a definition I argue is influenced by their limited contact with victims during research.⁴⁸ Their diagnosis illustrates that, like the medical community, other designers, and the cellular industry, Dunne and Raby also marginalized the condition as psychosomatic, suggesting on a broader level the tendency for industrial design to reinforce an institutional distrust of consumers and their perceptions of risk. I will return to these issues in the second half of this chapter, as they impact the design and reception of Dunne and Raby’s Electro-draught Excluder.

The sheer creative agency of electrosensitives persuaded Dunne and Raby that the condition was an important health concern. Although moving to the NRQZ, or fashioning a flex, might initially “come across as slightly paranoid,” as Dunne and Raby put it, these activities indicated that a small, but entrenched number of consumers were taking charge of their wellbeing – irrespective of “rational” explanations for cellular health effects.⁴⁹ When looking at designs like Pauline’s flex, Dunne and Raby excitedly concluded, “They obviously offer psychological protection...embody[ing]

knowledge and ideas about wellbeing and comfort that may eventually find their way into the mainstream.”⁵⁰

Their fascination with electrosensitivity notwithstanding, Dunne and Raby’s use of phrases like “slightly paranoid,” or “psychological protection,” indicate that they saw electrosensitivity as an emotional quirk – not an illness caused by cellular use. As the couple concluded from Dunne’s dissertation research, electrosensitives were “entering into a psychological adventure.”⁵¹ Here, desires for “wellness and well-being” were matched by desires for “danger, excitement, and transgression,” satisfied by living in exotic “sanctuaries” like the NRQZ, freed from cell phones.⁵² For sufferers like Pauline, who crafted cellular safeguards, Dunne and Raby further opined, “[They] have learnt how to derive enjoyment from electronic materiality, from rejecting the material realities on offer and constructing their own.... They display a level of pleasure in customization currently limited to home DIY and custom car hobbyists.”⁵³

These quotes clarify Dunne and Raby’s definition of electrosensitivity as an elaborate fantasy. Their diagnosis offers a lively variation of the more punitive medical diagnoses electrosensitives report receiving. Juliene Lipson, a professor of nursing and anthropology at the University of California San Francisco, remarks that sufferers are often told by doctors, “You’re crazy. If you just believed differently, it wouldn’t be real.”⁵⁴ Likewise, Dunne and Raby did not believe that electrosensitives could be affected by cell phones in any medically measurable way. They saw this condition as

an avenue for consumers to creatively reimagine the linkages between cell phones, health, and emotion.

Such subtle discrediting of electrosensitivity demonstrates one role industrial designers might perform in product safety cases, in which a dispute between mainstream medicine and victims must be bridged. Dunne and Raby's work illustrates that designers may tend to reinforce what Michelle Murphy calls the "fantasy of a value-free science" and its authority to determine the "real" health effects of technologies.⁵⁵ Designers might solidify this power dynamic in deft ways, reformulating victims' "evidence of experience" with harmful products as merely a form of play, where a cell phone's toxicity is actually part of a bizarre personal "adventure," for instance.⁵⁶

This sublimation of controversial consumer experiences can be read through Dunne and Raby's research methods, which gave electrosensitives few chances to articulate their conflict with cell phones. Primarily, the designers skirted what they called "ethnographic or anthropological methodologies," and "chose to adopt a more informal process," meaning they did not come into contact briefly or more extensively with sufferers.⁵⁷ Instead, they examined their sanctuaries through secondhand summaries in fashion and design publications, such as *Red*.

Due to their selection of evidence, Dunne and Raby did not include electrosensitive perspectives on health, safety, risk, or cell phones. Dunne's dissertation, published across two books, *Hertzian Tales* and *Design Noir*, lacks quotes

from victims, or images of their insulated living spaces and safeguards. Electrosensitives remain invisible, a common fate for bodies whose illnesses are not “transparently intelligible” to medicine.⁵⁸ If Dunne set out to “draw upon the specialist knowledge” of these sufferers during his dissertation, his resulting investigation with Raby suggested that they drew upon this knowledge in limited measure.

With such an approach, Dunne and Raby’s accuracy in diagnosing electrosensitivity is questionable. When given the chance to speak, many individuals at the NRQZ state that they derive very little sense of psychological adventure from their symptoms, or their customized homes. In interviews Stromberg conducted at the NRQZ in 2007, electrosensitives emphasized being crippled physically, economically, socially, and emotionally, despite their best efforts to adapt. Victim Diane Schou reported “intense discrimination” against electrosensitives like herself. Unaffected inhabitants of the NRQZ routinely told her, “We don’t want your kind of people here;” they subsequently stole her mail, and stuffed her mailbox with dead animals.⁵⁹ Others lacked steady work due to their inability to use cell phones, and faced social isolation for the same reasons, while continuing to struggle with the lingering effects of cell phone exposure, including migraines, nausea, and depression. Electrosensitives paid a high price for attempting to build a sanctuary away from phones. As sufferer Deborah Cooney plainly put it, “This is a tough place to live. I really don’t know how I’m going to be able to support myself.”⁶⁰

The research Dunne and Raby conducted does not acknowledge these health ramifications. Like many medical professionals, the industrial designers viewed electrosensitivity as a phobia. Consequently, they discounted the sometimes-extreme work electrosensitives put into physically protecting themselves, marginalizing the “materiality’ of an already abjected condition,” as Murphy writes.⁶¹ I will illustrate in this chapter’s second half, therefore, that electrosensitives are only partially aided by Dunne and Raby’s Electro-draught Excluder, since it provides “psychological comfort” rather than physical safety against cell phones.⁶²

An electrosensitive placebo

Once they defined electrosensitivity as a purely emotional reaction to cell phones, Dunne and Raby turned to design a series of cellular safeguards in the late 1990s and early 2000s. These potential products included the Electro-draught Excluder, finished in 2000.⁶³ Health, safety, and risk remained highly subjective categories throughout the design process. “We wanted to zoom in on phobias and fears,” Dunne informed the London *Financial Times* in a 2010 interview. “Some of the fears may be irrational...but let’s not judge them. Instead, we want to address them, to address broader emotional needs.”⁶⁴

As a result, the Excluder is designed to manage consumers’ feelings about cellular risks. Dunne and Raby’s work indicates a shift in guidelines for designing safe products, which are historically based upon medical advice and which privilege

physical protection. Safety Dunne and Raby instead suggest is a feeling that can be designed into consumers. This philosophy haunts the rest of this chapter as the central reason behind the Excluder's controversial reception with consumers, design critics, and the cellular industry.

Dunne and Raby intended the Excluder to function as a variation upon electrosensitives' domestic sanctuaries at the NRQZ. Their final design bears an unintended resemblance to the patented shields I uncovered, too. Measuring 19³/₄" x 19³/₄" x 4" the Excluder comprised a perfectly square aluminum panel, studded on one side with pyramid-shaped, carbon-loaded urethane foam cones. These cones scatter, deflect, and absorb wireless radio frequencies, and so are commonly installed in anechoic chambers (industrial sites for testing the radio frequency and electrical output of nearly any consumer- or industrial-grade electronic device, including cell phones).⁶⁵

The designers appropriated this foam insulation for their Excluder, domesticating the scientific and industrial. They dyed the foam cones a cheerful, pale pink, made the Excluder light enough to carry, and outfitted it with a handle. In so doing, Dunne and Raby primed the Excluder to be used as a portable shield, as well as a pop-up sanctuary. In the designers' words, it could be placed between a person and any cell phone they encountered, "to create a sort of shadow – a comfort zone where you simply feel better."⁶⁶ Photographs Dunne and Raby commissioned continued to frame the Excluder as a safe, radio frequency-free dwelling. The striking image for the

front cover of *Design Noir* depicts a young woman curled in a fetal position behind the Excluder, her eyes closed, peacefully asleep.

Inspired by electrosensitives' sanctuaries, the Electro-draught Excluder differed in one crucial way. It was an emotional pacifier. Unlike the fully insulated, isolated homes electrosensitives fashioned at the NRQZ, or the shields they proposed affixing to cell phones, Dunne and Raby's object was not designed to protect a person physically. Since the designers thought electrosensitivity was an emotional disturbance, their Excluder only inspired a *feeling* of protection against phones. As Dunne and Raby reiterated, "This object is a classic placebo. Though the Draught Excluder is made from conductive foam, it is not grounded, and therefore does not really absorb radiation. We were interested in whether or not it would make the owner feel more comfortable."⁶⁷

Dunne and Raby's philosophy behind the Excluder diverges markedly from the typical industrial design approach to health and safety. Jane Fulton, head human factors psychologist at prominent design consultancy IDEO, writes that up until the 1990s, industrial designers traditionally relied upon safety guidelines such as Henry Dreyfuss's "Environmental Comfort Zone" (1945-1967). An aggregation of epidemiological research, the "Comfort Zone" quantified human limits for dangerous elements like radiation in order to "keep us from getting sick, damaged, or irritated," Fulton remarks.⁶⁸ The "Environmental Comfort Zone" especially privileged physical protection from consumer goods, since it tangibly convinced consumers that a

product was “built around a person.”⁶⁹ Electrosensitives at the NRQZ might as well have been Dreyfuss’s inspiration for the “Comfort Zone’s” primary diagram, which depicts a human body utterly insulated from expanding circles of environmental threats.⁷⁰

In the 1990s, though, the physical effects of newer electronics like cell phones became difficult for designers to estimate, or address. This was primarily due to a medical rejection of conditions like electrosensitivity, which might otherwise have updated the “Environmental Comfort Zone” to include phenomena such as radio frequencies. Product design engineer Alastair MacDonald notes that in this case, designers sought out more “qualitative” models for designing safe products.⁷¹ Rubrics that measured emotional reactions such as fear, anxiety, or sadness – such as the “Typology of Affective Reactions” first developed in 1989-1991 by marketing specialists Christian Derbaix and Michel Pham – took root in American and European design.⁷² These qualitative models began to supersede those like the “Environmental Comfort Zone,” which demarcated the “great discomfort or possible damage” products might cause.⁷³ For many designers other than Dunne and Raby, then, the health and safety of consumers were redefined as *matters of feeling*.⁷⁴

This disciplinary shift, which encouraged products like the Excluder, gives us a strong indication about how conditions like electrosensitivity might continue to fare with industrial designers. Though they may be intrigued with small, neglected groups of concerned media users, they will ultimately depend upon the “authoritative

discourses of science and medicine” to keep them apprised of technological risks. Media effects that cannot be medically explained, therefore, will be consigned to the softer realms of emotion, where they can be managed with designer placebos. In this regard, the Excluder outwardly caters to electrosensitives, offering a “shadow,” a “comfort zone,” or a “sanctuary” “to simply feel better,” while subtly reinforcing a conservative opinion of how dangerous cell phones might actually be.

The Excluder and its critics

Beyond Dunne and Raby’s studio, few were eager to curl up and find refuge behind the Electro-draught Excluder. When the product was exhibited in 2001, design critics and a medical journalist dismissed it, as did consumers Dunne and Raby interviewed. I now turn to examine this criticism against the Excluder, in the process revealing a surprising, broader affinity for sanctuaries like those electrosensitives design, concretely separating people from cell phones in definably safe spaces.

The Excluder drew fire from design critics as a “mere sham” as soon as Dunne and Raby installed it in Spring 2001 at Selfridges, an exclusive department store in downtown London.⁷⁵ Competing for the coveted Perrier-Jouët Selfridges Design Prize, Dunne and Raby were given an opportunity to display the Excluder in one of Selfridges’ massive, gleaming store windows on Oxford Street. Their product was visible to several hundred passersby a day for a month.⁷⁶ Of these witnesses, *Guardian* columnist Charles Jennings took a dim view of the Excluder. He reeled off its faults, stating, “While the rest of us want things that work,” Dunne and Raby concentrated

upon “ludic pleasures.”⁷⁷ Their Excluder, in other words, elicited an unfounded sense of comfort around cell phones. Since it did not block radio frequencies, and potentially protect a person’s health, Jennings concluded that the Excluder would prove an impractical product, and “nothing you or I might buy.”⁷⁸

Design critics and a medical journalist expanded upon Jennings’ charges when the Museum of Modern Art in New York featured the Excluder in their 2005-2006 exhibit, *Safe: Design Takes on Risk*. MoMA curator Paola Antonelli billed the show as a collection of contemporary designs that “provide a sense of comfort and security.”⁷⁹ She specifically chose Dunne and Raby’s Excluder for its emotional, domestic qualities. As she wrote in the exhibition catalogue, the Excluder exemplified how “no definition of safety can be more powerful than the one each of use carries inside.”⁸⁰ Antonelli correspondingly arranged the Excluder amongst several other designer “cocoon” and “shields” that she wrote “isolate and defend us from the perceived dangers of the outside world.”⁸¹

Reviews in *The New York Times* and the professional design journal *Blueprint* disagreed with Antonelli’s emotional definition of safety, as well as her enthusiasm for the Excluder. Writers for both publications claimed that the Excluder failed to engage health or safety on any physical level.⁸² New York medical journalist Janice Hopkins Tanne furthered this line of criticism. As she observed in her review for the *British Medical Journal*, the products in the MoMA exhibit that were more important for everyday people, as well as doctors, were those that physically protected people.⁸³ She

selected as an example the “Urban Nomad” inflatable homeless shelter, a plastic cocoon designed to protect its occupants from weather extremes that physicians agreed caused bodily harm.⁸⁴ Dunne and Raby’s Excluder, by contrast, offered only the most nebulous sense of insulation from cell phones, failing to physically shield consumers from the radio frequencies of cell phones. Although Tanne did not necessarily believe in electrosensitivity, she nonetheless felt it inappropriate to design such a flimsy, subjective sense of safety.

Tellingly, electrosensitive responses to the Excluder remain unaccounted for. Their absence implies that Dunne and Raby did not send their design to the NRQZ in West Virginia, for example, illustrating their continued division from these afflicted users – and suggesting on a deeper level the lack of voice given to consumer complaints that are medically unacknowledged. Had Dunne and Raby allowed electrosensitives to use their Excluder, though, they likely would have considered it an unsatisfactory shield against cell phones. The product does not match the comprehensive, all-encompassing insulation electrosensitives design for themselves in their homes.

The likelihood that electrosensitives would have rejected the Excluder is born out by reactions Dunne and Raby did gather from a non-electrosensitive couple living in London, named Jan and Lauren. They volunteered to live with the Excluder for a month, after its pyramidal pink foam caught their eye from the Selfridges display window.⁸⁵ After a month, Dunne and Raby interviewed the couple at their home in

June 2001 to gauge if they felt any safer, or healthier, using the piece of design against cell phones.⁸⁶

Their response was a resounding ‘no.’ Jan and Lauren’s reactions deepened earlier criticism leveled against the Excluder. For the couple, Dunne and Raby’s design not only failed to block cellular radio frequencies. It additionally failed to inculcate the feeling of safety Dunne and Raby intended. Lauren told the designers during the interview, “I hadn’t expected it would make me feel more insecure in my house, you just assume you get this protective thing and you’d feel protected. I didn’t really think you could have something in your house that made you much more sensitive to things.”⁸⁷ Her sensitivity, she explained, came from the Excluder’s troublesome lack of physical shielding. She described for example how she could not comfortably position the Excluder to shield her head from the cell phone she kept on her nightstand.

Jan felt similarly unprotected by the Excluder due to its size and dimensions. As he told Dunne and Raby, “It’s too small to protect you, really. It can protect parts of your body, but you’re going to absorb radiation from around it.”⁸⁸ Jan’s comment underscored that he would feel safer from a piece of design that enveloped his entire body, recalling the domestic sanctuaries that electrosensitives built at the NRQZ to segregate themselves from cell phones and their radio frequencies. Failing to offer such protection, the Excluder did not hold Jan’s interest. As he concluded in frustration, “I’d like to hang it on the wall, get it out the way. It’s quite an aesthetic work of art. This absorbing radiation thing, I haven’t been able to see it that way.”⁸⁹

Dunne and Raby, it would appear, had rashly assumed two things: one, that consumers shared their sense of electrosensitivity as a dark fantasy, and two, that feelings of safety could be manipulated independently of any tangible, protective architecture. What seemed an irrational “psychological adventure” to these two designers was in fact a much more mainstream concern, shared among design critics like Jennings, medical journalists, and everyday consumers such as Jan and Lauren. Emotional pacifiers with pink foam insulation would not suit. As the last two individuals plainly reiterated, they wanted a sanctuary they could readily *believe* made them safe, one that clearly blocked the radio frequencies of cell phones.

Conclusion: fraud, distrust, and “self-customization”

By way of conclusion, I want to bring my look at Anthony Dunne and Fiona Raby full circle, and discuss the unlikeliness that the Electro-draught Excluder will be adopted by the cellular industry, based upon their dismissal of similar products in the late 1990s and early 2000s. I do not find this to be the end of the conversation about design, cell phones, and health effects, however. My research suggests that mainstream scientific and medical discourse – through which the industry defines the safety of its products – are not nearly as influential for contemporary media consumers, who are increasingly designing and practicing their own ways of caring for their health. I speculate what this burgeoning sense of autonomy might mean for future designs that mediate between cell phones and their users.

First, let me go over Dunne and Raby's lack of traction within the cellular industry. In the fifteen years since they introduced the Electro-draught Excluder in 2000, the designers have offered a bevy of keynote presentations (and performed private consulting work) for cellular companies including Finnish cell phone manufacturer Nokia, France Telecom, and the T-Mobile Creation Center, as well as other high-profile electronics corporations like Intel and Microsoft.⁹⁰ Dunne and Raby's industry connections mask the fact that actual production of their work is nonexistent. For the cellular industry, electrosensitivity is still taboo.

At the close of the 1990s in the United States, for example, manufacturers marshaled sophisticated scientific techniques to discredit cellular sufferers. In 1999, Motorola Florida Research Laboratories tested nine cellular shields manufactured from patents filed with the U.S. Patent Office (which I looked at earlier in this chapter). Motorola obtained a robotic radio frequency measurement probe and the human head model first developed by the IEEE and the FCC in 1993, and measured whether the patented shields blocked radio frequencies from entering the average human head.⁹¹ Motorola's results weren't complimentary. "Shields are ineffective in reducing the exposure of the head to radio frequencies emitted by a mobile phone," the company's report concluded.⁹²

The industry continued gnashing its teeth over electrosensitivity and related designs a few years later in 2002, when men's clothing giants Levi-Strauss and Dockers introduced a short-lived prototype for men's trousers. The pants boasted a copper-

and-silver-lined pocket that would allegedly keep cellular frequencies from seeping into a wearer's body.⁹³ Levi's and Dockers framed the design as a response to recent consumer research which "showed that fashion-conscious consumers are also health-conscious" about their media devices.⁹⁴ Cell phone manufacturers were unimpressed by the retailers' "inappropriate" decision to design clothing according to consumer feelings, rather than hard scientific evidence about cell phones.⁹⁵

That same year, the Federal Trade Commission went a step beyond gnashing its teeth. They legally prohibited two small companies (Stock Value 1 and Comstar Communications) from selling cell phone shields in the U.S. "These companies are using a shield of misrepresentation to block consumers from the facts. There is no scientific evidence that their products work as they claim," charged the director of the Commission's Bureau for Consumer Protection.⁹⁶ (Levi's and Dockers eluded a similar prohibition.) For the U.S. government as well as the cellular industry, the message was clear: any electrosensitive-related design equated to consumer fraud. Dunne and Raby's emotional placebo was unlikely to find a sympathetic audience with institutions so adherent to clinical medical findings.

Despite attempts to reconcile cell phones and consumer health under this official medical rubric, electrosensitivity persists. In 2006, while compiling large-scale population surveys across western Europe and the United States, Öjan Hallberg and Gerd Oberfeld uncovered a surprisingly high percentage of electrosensitives: nearly 4% of California's residents in 2002, 9% of Sweden in 2004, another 9% of Germany in

2005, and 16% of Ireland and England in 2004-2005.⁹⁷ Few of these individuals may be receptive to the medical conclusions offered by Motorola and the FTC. As Keith Petrie comments, electrosensitives in the 2000s overwhelmingly seek “alternative” medical opinions and treatment due to a history of institutional marginalization, and they harbor a broader distrust of modern science, which they perceive as producing hazardous technologies like cell phones in addition to harmful pesticides, antibiotics, vaccines, growth hormones and genetically modified food.⁹⁸

In the United States, a coinciding economic imperative may have additionally distanced many more media consumers from the dominant medical discourse parlayed by Motorola and the FTC. From 1993 to 2003, as electrosensitivity escalated and Dunne and Raby kept pace, expenditures for health insurance, hospital care, prescriptions and medical procedures skyrocketed from \$900 billion to \$1.7 trillion in the U.S.⁹⁹ This not only barred many consumers from access to traditional medical knowledge and aid. It has also eroded general public trust in the medical establishment, as Stephen Zuckerman and Joshua McFeeters point out.¹⁰⁰ Electrosensitives are not the only consumer group on the rocks with mainstream medicine. A rapidly diminishing number of people are now able to retain the status of normative, treatable patients.

The result has been an uptick in consumers designing for their own health and safety, particularly when it comes to electronics. This increase surfaced in a series of ethnographies and online surveys completed in 2004 by Rod Falcon and Leah Spalding

for the Institute for the Future, a long-running Silicon Valley think tank that specializes in forecasting trends in consumer technologies, healthcare, science, and public policy.¹⁰¹ The authors discovered that approximately 42% of their respondents pursued a model of health care resembling that of electrosensitives at the NRQZ.¹⁰² They were stringent about allowing “only ‘pure’ things in their bod[ies],” such as chemically or electronically untainted air.¹⁰³ They also frequently blueprinted their own designs for “healthy homes” that shut out impurities, recalling electrosensitive sanctuaries insulated from contemporary technologies.¹⁰⁴ Falcon and Spalding were so taken by these designs that they listed “self-customization” as a dominant trend in “Health Horizons,” their ten-year forecast for consumer health care circulated to organizations including Kaiser Permanente, the American Cancer Association, Microsoft, AT&T, and Intel.¹⁰⁵

The relationship between cell phones, people’s health, and “self-customized” design is ripe for further exploration. Cell phones may increasingly be stippled with a multiplicity of modifications, devised by everyday users as they come to terms with feelings of health, risk, and safety. As is evidenced throughout this chapter, these ad-hoc designs may often be physically protective: a small metal sheath coating an antenna, a simple earth pin wound round a finger. Or these designs might mean a larger kind of spatial separation from phones, such as carving out radio frequency-free zones in one’s home – a new geography where staying healthy trumps staying in touch. On a less material level, these designs will also represent the profound role

individual affect is playing in shaping cell phones, attuned to sensitivities that elude medical scrutiny, or even the most observant industrial designers. It is remarkable to think that the interplay between humans and such a ubiquitous medium might remain so charged, personal, and mysterious.

Conclusion: Sketches for Continued Inquiry

The end of my dissertation came into abrupt focus on a scalding Friday afternoon in early August 2015, when I shook hands with Jake Dunagan and Rachel Maguire, veteran “futurists” and research directors for the Silicon Valley-based think tank the Institute for the Future. Fanning their faces, Dunagan and Maguire traded dry quips about the heat beating down outside, ordered something to drink, and sat down with me in a corner of a coffee shop to talk about something decidedly more esoteric than the weather: telephones, cell phones, health risks, and industrial design.

Although I attempted to match their feckless professionalism, I was nonetheless immensely excited that Dunagan and Maguire had agreed to meet. From the early 1990s through much of the 2000s, the Institute for the Future has offered a plethora of publications for a broad public audience of health and media consumers in the United States. Through white papers, summaries, data visualizations, and even the occasional “futurology” game, the Institute consistently attempts to shed light upon the coalescing partnerships between the gargantuan, hermetic healthcare system in the U.S, and the country’s much flashier tech industry. The many Institute publications that Dunagan and Maguire spearheaded over the past fifteen years are particularly important for my own work, since they comment upon the intensely individualistic philosophies that structure operations within both industries.

Given this, I set about presenting my research to Dunagan and Maguire. I ended by posing a few questions that continue to remain unanswered in this dissertation. First, I asked if they felt there was any possibility that either healthcare professionals or communications media innovators might take greater responsibility for the wellbeing of the many people who utilize both health services and media devices. If so, could the health and communications media industries be persuaded by media refusers such as electrosensitives, whose health conditions, public testimonies, and vernacular designs suggest that a less individualistic approach to health is desired? And of the many industry players, would industrial designers – those who allegedly operate “on the very cusp of production and consumption” – be especially receptive to addressing these controversial users?¹

Sipping their drinks, Dunagan and Maguire listened patiently as I posed my questions, and then they each shook their heads. Dunagan leaned forward and replied, “When you talk about healthcare and tech, you’re talking about two utterly closed worlds here. In my opinion, everyone who has been invited to work in those worlds is absolutely convinced that how they function – the kinds of decisions they make for consumers – are the right choices. Unless a lot of consumers really react, and these worlds begin to lose major amounts of money, or are found to have been criminally negligent in some way, there is no way I can see that either healthcare or tech is going to want to be caught holding the bag for something as precarious as someone’s health.”

Maguire chimed in, taking a slightly different tack. “We’re at a point in which *everything* going to be routed through phones: banking, healthcare, entertainment, education, you name it. There’s so much momentum behind it from so many directions. For the kinds of people [meaning electrosensitives] you’re talking about, they may just be out of luck. However,” she continued, “among the major tech corporations I’ve sat with, many executives *are* nervous about whether they really have the public’s trust on issues like health and privacy. ‘Are consumers really okay with us intervening to this degree in these intimate aspects of these lives?’ companies like Apple often ask us.”

Maguire paused and sipped her drink before continuing. “So, although they are just as confident and insular as Jake says, a true groundswell of consumer activity can definitely change their minds. The trick,” she concluded, “is proving to tech companies that consumers *don’t actually want* the individual freedoms and responsibilities that you’re saying have been built into phones.”

My meeting with Dunagan and Maguire left me with a lot to consider. Over the past several years spent researching and writing the four chapters of *Ill Communication*, I had gradually come to believe that three arguments were worth pursuing. First, my dissertation illustrates how two epidemic biological risks were socially constructed on deeply unequal terms, favoring white, wealthy Americans who could afford to pay for media that would allegedly help ensure their wellbeing. Second, I was interested in revealing that physicians, industrial designers, and

everyday users each made material decisions about the design of telephones and cell phones based upon highly partial, emotionally-informed speculations about biological and technological health risks, and how they might be prevented through the use (or disuse) of communications media. Indeed, despite their medical and technical expertise, their significant institutional backing, and their perceived social authority, the physicians and industrial designers profiled in my dissertation often operate under preconceptions not that far removed from the anecdotal evidence compiled by electrosensitives. Third, I was determined to understand how a stratospheric increase in the costs of medical care in the 1960s and 1970s in the U.S. helped decisively frame healthcare as an individual responsibility, too unwieldy for institutional oversight or intervention. This shift in responsibility, as I've argued in the preceding pages, has placed citizens under a "burden of empowerment," in which they are persuaded to undertake the lion's share of work in diagnosing, preventing, and treating biological and technological risks.

However, Maguire's comment that consumers might actually be *attracted* to taking care of their own health is a perspective worthy of sustained consideration. By way of bringing this dissertation to a close, I want to urge those interested in furthering the conversation about communications media, health risks, and notions of responsibility to examine why consumers and users in the U.S. have historically been complicit in the process of individualization detailed in my work. To do so, I encourage scholars to engage with the research of two media historians, Michael Palm

and Fred Turner. Each has examined in detail how U.S. consumers came to engage in – and even outright demand – media that allowed them to complete labor previously under the domain of state or private corporate entities. From my perspective, these historians’ work provides a fruitful starting point for contemplating this development, and understanding how it has potentially affected the many intersections between healthcare and communications media.

In his labor history, Michael Palm looks at the push for greater individual responsibility by concentrating upon the design of AT&T’s telephones. Palm argues that from the 1930s through the 1970s, under the insistent advice of business analysts, human factors experts, and marketing teams, AT&T reframed the operations of their telephone network in accordance with the emergent ideal of “self-service.” As this “consumer productivity movement” stipulated, consumers would begin “providing for themselves a service previously performed for them by paid employees.”² Over a period of forty years, AT&T made this highly profitable shift all but imperceptible to its several million consumers in the U.S. The transition occurred as AT&T introduced rotary dial and Touch-Tone dialing handsets into American homes. The design of these telephones forced users across the nation to begin dialing and connecting their own calls.³ Such a seemingly minor design innovation permitted AT&T to gradually deskill, lay off, and ultimately fire the thousands of telephone operators who originally dialed and connected calls. While saving on labor expenditures, AT&T also made up to \$120 million in profits in the late 1970s by selling the Touch-Tone component of their

telephones as a “special feature.” Consequently, Palm argues, AT&T charged subscribers for the privilege of completing what was once salaried, complex technological work.⁴

Consumers had every right to be dismayed and indignant with AT&T’s carefully designed decisions. Yet Palm reveals quite the opposite occurred. Self-service proved to have its “enchancing as well as its exploitative aspects” for consumers.⁵ They largely embraced the “great labor transfer” as it took hold in the 1970s (the same period that Motorola began attempting to persuade nascent cell phone users that they could prevent coronary heart disease on their own). As Palm argues, taking on new, seemingly incremental forms of labor like dialing telephone numbers made individuals feel like “good citizens” doing “easy” and “gratifying” work, giving them an appealing overall sense of “autonomy.”⁶

Although he never makes the connection explicit, Palm’s case study reiterates how deeply the political economic doctrine of neoliberalism structures U.S. society, in which services formerly provided by state or corporate actors are reallocated to individual citizens. These citizens in turn allegedly relish the opportunity to exercise their entrepreneurial spirit, skills, and freedom of choice as they conduct their daily affairs.⁷ Palm’s historical work may therefore shed light upon why the marriage of healthcare, communications media, and individual responsibility happened without greater criticism from consumers for much of the twentieth century.

On a broader technological and historical scale, Fred Turner also argues that U.S. citizens were highly receptive to consuming and using media designed to increase individual responsibilities. As Turner demonstrates, a substantial cultural split occurred in the late 1960s between communities such as civil rights organizations, interested in institutional reform and robust social welfare programs, and other communities who believed that maximizing individual autonomy with the help of “small-scale technologies” would vanquish the structural inequalities of a “highly bureaucratized society.”⁸ The latter community, concentrated around the figures of R. Buckminster Fuller, Stewart Brand, and Kevin Kelly, became a strong ideological foundation for the information and communications media industry that developed in northern California from the 1960s through the 1990s. Turner argues that the general design of media – even computers and cell phones, predicated on providing people with an expanded social network of support – were constructed according to a firm belief that “the self was the ultimate driver of social change...individual lifestyle choices became political acts, and both consumer and lifestyle technologies – including information technologies – would have to take on a newly political valence.”⁹

In Turner’s account, as in Palm’s, American consumers embraced media designed to encourage greater self-actualization. They strove to embody an idealized construct that Turner refers to as the “Comprehensive Designer,” who through continual use of information and communications media would “have access to all of

the information within American's burgeoning technocracy while at the same time remaining outside it."¹⁰ Though this envisioned sort of U.S. citizen remains a very popular cultural archetype, Turner incisively points out that only a tiny percentage of white, healthy young men, well educated and well insulated financially, could ever actually operate as Comprehensive Designers. In other words, only citizens supported by multiple unspoken forms of social welfare could operate as technologically empowered individualists. For those less fortunate, being a Comprehensive Designer might be more akin to the electrosensitive experienced I've depicted in my dissertation, in which the seductive lure of individual autonomy rubs up against the stark realities of social and geographic isolation, institutional disregard, and tenuous control over one's own wellbeing.

With the research provided by Palm and Turner in mind, I urge scholars to continue focusing upon the nexus of healthcare and communications media. I look forward to engaging with others to unveil how everyday people in the U.S. have come to believe that institutional aid is somehow evidence of personal or larger social weaknesses, or that the use of institutional aid will constrain people's individual freedoms. Rather, they have gradually become convinced that it is in their best interests to take care of themselves with limited help from the media they are responsible for continually consuming and accurately using.

Far from enriching a person's autonomy, such responsibilities are profoundly oppressive. As Palm and Turner suggest, taking care of yourself often constitutes little

more than paying to undertake intensive labor that used to be provided as a state or corporate service. Perhaps if we pursue a greater excavation of this media history, we will conclusively reveal how unlikely it is that individuals can ever fully manage to diagnose, treat, or prevent biological and technological risks – no matter how advanced communications media becomes. If an understanding of this current predicament can take hold, we begin to discuss more equitable ways to protect an extremely valuable resource: our health.

Notes to Introduction

¹ Tamara Rosin, “10 Things to Know About Oscar Health Insurance: Will It Be the Uber of Health Plans,” *Becker’s Hospital Review*, 4 August 2015, no pp.

² John Frank, “Vital Signs: Mobile Health App Revenue to Grow Tenfold by 2017, Study Predicts,” *Modern Healthcare*, 22 May 2014, accessed 11 July 2015, <http://www.modernhealthcare.com/article/20140522/BLOG/305229997>

³ Daniel Schulke, “The Regulatory Arms Race: Mobile-Health Applications and Agency Posturing,” *Boston University Law Review* 93 (2013): 1707.

⁴ Catey Hill, “The Five Most (and Least) Popular Diet and Fitness Apps,” *Market Watch*, 20 January 2015, accessed 8 June 2015, <http://www.marketwatch.com/story/the-5-most-and-least-popular-diet-and-fitness-apps-2015-01-06>

⁵ Schulke, 1704.

⁶ *Ibid.* 1718.

⁷ Kelly Barnes, “Top Health Industry Issues of 2015: Outlines of a Market Emerge,” *PriceWaterhouseCoopers Health Institute* (December 2014): 3.

⁸ Barnes, 2.

⁹ *Ibid.* 2.

¹⁰ *Ibid.* 2.

¹¹ *Ibid.* 1, 5.

¹² Rose Galvin, “Disturbing Notions of Chronic Illness and Individual Responsibility: Towards a Genealogy of Morals,” *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine* 6, no. 2 (2002): 110.

¹³ Galvin, 113.

¹⁴ *Ibid.* 110.

¹⁵ *Ibid.* 108.

¹⁶ *Ibid.* 117, 119.

¹⁷ Although I focus on groups of people who operate as media *designers*, these are by no means the only individuals who help construct knowledge about health risks, health responsibilities, and the role played by media. Journalists in particular recur as an influential secondary category of participants. They serve to document the work of designers, physicians, and everyday users across the twentieth century, they help frame certain media and health risks as matters of local and national importance, and they largely help reinforce a medico-technological hierarchy in which physicians and designers remain principal authorities in defining biological and technological risks, and determining their relationship to media. I explicitly note the role played by journalists in Chapters 1 and 3, though their presence is felt in every chapter of this dissertation.

¹⁸ Sidney Aronson, “*The Lancet* on the Telephone 1876-1975,” *Medical History* 21 (1977): 69-87.

¹⁹ Stuart McClean, “‘The Illness is Part of the Person’: Discourses of Blame, Individual Responsibility and Individuation at a Centre for Spiritual Healing in the North of England,” *Sociology of Health & Illness* 27, no. 5 (2005): 635.

²⁰ McClean, 632.

²¹ Ruud Ter Meulen and Hans Maarse, “Increasing Individual Responsibility in Dutch Healthcare: Is Solidarity Losing Ground?” *Journal of Medicine and Philosophy* 33 (2008): 276.

²² Jonathan Oberlander, “The Political History of Medicare,” *Journal of the American Society on Aging* 39, no. 2 (Summer 2015): 121-124.

²³ Oberlander, 120.

²⁴ Carolyn Marvin, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (New York: Oxford University Press: 1988), 64.

²⁵ Aronson, 73.

²⁶ Meulen and Maarse, 273.

²⁷ Claude Fischer, *America Calling: A Social History of the Telephone to 1940* (Berkeley: University of California Press, 1994), 24.

²⁸ Fischer, 25.

²⁹ William Rothstein, *Public Health and the Risk Factor: A History of an Uneven Medical Revolution* (Rochester: University of Rochester Press, 2008), 107.

³⁰ Aronson, 73.

³¹ *Ibid.* 73.

³² Paul Starr, *The Social Transformation of American Medicine: The Rise of a Sovereign Profession and the Making of a Vast Industry* (New York: Basic Books, 1982), 86-88.

³³ Marvin, 108.

³⁴ *Ibid.* 108.

³⁵ *Ibid.* 90.

³⁶ *Ibid.* 108.

³⁷ Stephen Boyd Davis, “Educating the Multimedia Designer,” in *Becoming Designers: Education and Influence*, eds. Esther Dudley and Stuart Mealing (Portland: Intellect Books, 2000), 70.

For more on the portrayal of industrial designers as artists, see:

Adrian Forty, *Objects of Desire: Design and Society Since 1750* (New York: Pantheon, 1986).

Jeffrey Miekke, *Twentieth Century Limited: Industrial Design In America 1925-1939* (Philadelphia: Temple University Press, 1979).

Carma Gorman, ed., *The Industrial Design Reader* (New York: Allworth Press, 2003).

John Walker, *Design History and the History of Design* (New York: Pluto Press, 1989).

³⁸ Shelley Nickles, “More Is Better: Mass Consumption, Gender, and Class Identity in Postwar America,” *American Quarterly* 54, no. 4 (December 2002): 585-588.

-
- ³⁹ Paul du Gay, Stuart Hall, Linda Janes, Hugh Mackay, and Keith Negus, *Doing Cultural Studies: The Story of the Sony Walkman* (London: Sage, 1997), 69.
- ⁴⁰ du Gay et al., 62.
- ⁴¹ Ibid. 65.
- ⁴² Ibid. 64, 66, 69.
- ⁴³ Christina Cogdell, *Eugenic Design: Streamlining America in the 1930s* (Philadelphia: University of Pennsylvania Press, 2004), 125-127.
- ⁴⁴ Cogdell, 181.
- ⁴⁵ Ibid. 4.
- ⁴⁶ Natasha Dow Schüll, *Addiction By Design: Machine Gambling in Las Vegas* (New Jersey: Princeton University Press, 2012), 221
- ⁴⁷ Schüll, 191, 244-245, 260-267.
- ⁴⁸ Ibid. 245.
- ⁴⁹ Faris Howat, "Motorola MicroTAC Elite," *Cellular Business* 11, no. 13 (December 1994): 84.
- ⁵⁰ Nadim Mahmud et al., "The Cell Phone Problem/Solution," *Journal of Environmental Health* 76, no. 6 (January/February 2014): 140.
- World Telecommunication Development Report 1999: Mobile Cellular, Executive Summary* (Geneva: International Telecommunication Union, 1999), 2-3.
- ⁵¹ U.S. Department of Health, Education, and Welfare, *Vital Statistics of the United States, 1960, Volume 2, Mortality, Part A* (Washington, D.C.: Government Printing Office, 1963), I-23.
- ⁵² Miriam Lueck Avery, Adam Elmaghraby, Ben Hamamoto, Lyn Jeffery, Bradley Kreit, Rachel Maguire, Sarah Smith, Kathi Vian, "Reworking Health: New Authorities in a Well-Being Economy," *The Institute for the Future Health Horizons* (2013): 3.
- ⁵³ Öjan Hallberg and Gerd Oberfeld, "Will We All Become Electrosensitive?" *Electromagnetic Biology and Medicine* 25 (2006): 190.
- ⁵⁴ Neil Selwyn, "Apart From Technology: Understanding People's Non-Use of Information and Communication Technologies in Everyday Life," *Technology in Society* 25 (2003): 106.
- ⁵⁵ Selwyn, 104.
- ⁵⁶ Lori Reed, "Domesticating the Personal Computer: The Mainstreaming of a New Technology and the Cultural Management of a Widespread Technophobia, 1964-," *Critical Studies in Media Communication* 17, no. 2 (June 2000): 162, 175.
- ⁵⁷ Gerard Goggin, *Cell Phone Culture: Mobile Technology in Everyday Life* (New York: Routledge, 2006), 114.
- ⁵⁸ Schüll, 14.
- ⁵⁹ Guy Julier, *The Culture of Design* (London: Sage Publications, 2007), 68.
- ⁶⁰ Julier, 60, 68.
- ⁶¹ Shoshanna Zuboff, *In the Age of the Smart Machine: The Future of Work and Power* (New York: Basic Books, 1988), 137-138.

-
- ⁶² Zuboff, 141.
- ⁶³ Ibid. 141.
- ⁶⁴ Wiebe Bijker and Trevor Pinch, "The Social Construction of Facts and Artifacts: Or How the Sociology of Science and The Sociology of Technology Might Benefit Each Other," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, eds. Wiebe Bijker, Thomas Hughes, and Trevor Pinch (Cambridge: The MIT Press, 1987), 18-19.
- ⁶⁵ Bijker and Pinch, 27.
- ⁶⁶ Ibid. 28.
- ⁶⁷ Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham: Duke University Press, 2003), 203.
- ⁶⁸ Sterne, 203.
- ⁶⁹ Bijker and Pinch, 29.
- ⁷⁰ Alfred Moore and Jack Stilgoe, "Experts and Anecdotes: The Role of 'Anecdotal Evidence' in Public Scientific Controversies," *Science, Technology, & Human Values* 34, no. 5 (September 2009): 661.
- ⁷¹ Linda Soneryd, "Deliberations on the Unknown, the Unsensed, and the Unsayable? Public Protests and the Development of Third-Generation Mobile Phones in Sweden," *Science, Technology, & Human Values* 32, no. 3 (May 2007): 287-314.
- ⁷² Bijker and Pinch, 46.
- ⁷³ Judy Wacjman, *Feminism Confronts Technology* (University Park: Pennsylvania State University Press, 1991), 16-17.
- ⁷⁴ Starr, 88-92.
- ⁷⁵ Langdon Winner, *The Whale and the Reactor* (Chicago: University of Chicago Press, 1986), 19.
- ⁷⁶ Bijker and Pinch, 27.
- ⁷⁷ Ibid. 26.
- ⁷⁸ Lisa Gitelman, *Always Already New: Media, History and the Data of Culture* (Cambridge: The MIT Press, 2006), 1.
- ⁷⁹ Gitelman, 25-88.
- ⁸⁰ Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge: Harvard University Press, 1998), 114-123.
- ⁸¹ Valentin Fuster, "Epidemiology of Cardiovascular Disease," *Promoting Cardiovascular Health in the Developing World: A Critical Challenge to Achieve Global Health*, eds. Valentin Fuster and Bridget Kelly (Washington, D.C.: The National Academies Press, 2010), 52.
- ⁸² William Rothstein, *Public Health and the Risk Factor: A History of an Uneven Medical Revolution* (Rochester: University of Rochester Press, 2008), 196.
- ⁸³ Winner, 29.
- ⁸⁴ Bijker and Pinch, 24.
- ⁸⁵ Ibid. 40.

⁸⁶ Ibid. 40.

⁸⁷ Winner, 26.

Notes to Chapter 1

¹ R.S. Stanley, “Dangers of Infection Which Lurk in the Telephone,” *Memphis Medical Monthly* 24 (1904): 636.

² Richard John, *Network Nation: Inventing American Telecommunications* (Cambridge: Harvard University Press, 2010), 239.

³ John, 7.

⁴ William Rothstein, *Public Health and the Risk Factor: A History of an Uneven Medical Revolution* (Rochester: University of Rochester Press, 2008), 107.

⁵ Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge: Harvard University Press, 1998), 114-123.

⁶ Tomes, 111.

Rothstein, 81.

⁷ Ibid. 107.

⁸ Tomes, 131.

⁹ John, 218-219.

¹⁰ John, 285.

¹¹ *Historical Statistics of the United States* (Cambridge: Cambridge University Press, 2006), tables 19, 69, 182.

The reference to AT&T as an “octopus” comes from a famous muckraking expose of the company’s business practices published in this era. See Paul Latzke, *A Fight with an Octopus: Being the Story of a Great Contest that was Won Against Tremendous Odds* (Chicago: The Telephony Publishing Company, 1906).

¹² John, 244.

¹³ Charles Fay, “Address of the President,” *National Telephone Exchange Association Proceedings* (September 1886): 7.

¹⁴ John, 241.

¹⁵ Ibid. 243, 247.

¹⁶ Simon Sterne, *Speech of Simon Sterne, Esq., before the Assembly Committee on General Laws, January 30, 1889, in Favor of Bill Limiting Telephone Charges* (New York: George F. Nesbitt and Co., 1889), 5, 19.

¹⁷ Rothstein, 84.

¹⁸ “Telephones Too Costly,” *The New York Times*, 6 March 1895, no pp.

¹⁹ Cyrus Edson, “The Microbe as a Social Leveller,” *North American Review* 161 (1895): 421-426.

²⁰ John, 305.

²¹ Ibid. 304.

²² Dugald Jackson, William Crumb, and George Wilder, *Report on the Telephone Situation in the City of Chicago* (Chicago: Gunthrop-Warren, 1907), 92, 96.

-
- ²³ R.A. Persche, Newspaper Feature Story for May 1962 Release, Ohio Bell Telephone Company Public Relations Department, 25 May 1962, 2.
- ²⁴ Angus Hibbard, *Hello Goodbye: My Story of Telephone Pioneering* (New York: A.C. McClurg and Company, 1941), 149.
- ²⁵ John E. Kingsbury, *The Telephone and Telephone Exchanges: Their Invention and Development* (New York: Longmans, Green, and Company, 1915), 339-340.
- ²⁶ Herbert Casson, *The History of the Telephone* (Chicago: A.C. McClurg and Company, 1910), 44.
- ²⁷ *Catalog of Telephone Apparatus and Supplies No. 12* (New York: Western Electric Company, 1912), 12-14.
- ²⁸ Avital Ronell, *The Telephone Book: Technology, Schizophrenia, Electric Speech* (Lincoln: University of Nebraska Press, 1989), 268.
- ²⁹ Pro Bono Publico, "Telephone Mouthpieces Dangerous?" *The New York Times*, 17 August 1911, 6.
- ³⁰ Mary Douglas, *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo* (Boston: ARK Paperbacks, 1984), 2.
- ³¹ Stanley, 636.
- ³² *Ibid.* 637.
- ³³ *Ibid.* 638.
- ³⁴ *Ibid.* 637.
- ³⁵ *National Library of Medicine: John Shaw Billings Centennial* (Washington, D.C.: U.S. Department of Health, Education and Welfare, 1965), 3-4.
- ³⁶ John Shaw Billings, *Ventilation and Heating* (New York: The Engineering Record, 1893), 98-99.
- ³⁷ Stanley, 637.
- ³⁸ *Ibid.* 639.
- ³⁹ *Ibid.* 639.
- ⁴⁰ *Ibid.* 639.
- ⁴¹ *Good Health Magazine: Organ of the Health and Efficiency League of America* 48, no. 1 (January 1913), front flap.
- ⁴² S.M. Baker, "Nursing in Homes, Private Hospitals and Sanitariums," *Hospitals, Dispensaries, and Nursing* (June 1893): 618-620.
- ⁴³ Ruth Engs, *The Progressive Era's Reform Movement: A Dictionary* (Westport: Praeger, 2003), 79.
- "Three R's for Health Seekers," *The Battle Creek Idea* 5 (February 1912): 8.
- ⁴⁴ "Tuberculosis Day: A Proclamation from the Governor," *Report of the Michigan Association for the Prevention and Relief of Tuberculosis* (1908-1909): 4-5.
- ⁴⁵ "Taft Stuck in Booth," *The Los Angeles Times*, 28 July 1908, p. 14.
- ⁴⁶ John, 327.
- ⁴⁷ Charles Rosenberg, *No Other Gods: On Science and American Social Thought* (Baltimore: Johns Hopkins University Press, 1997), 8.

-
- ⁴⁸ Robert Whitaker, *Mad in America: Bad Science, Bad Medicine, and the Enduring Mistreatment of the Mentally Ill* (New York: Basic Books, 2002), 49, 54.
- ⁴⁹ James Whorton, *Crusaders for Fitness: The History of American Health Reformers* (Princeton: Princeton University Press, 1982), 196.
- ⁵⁰ Engs, 122-123.
- ⁵¹ John Henderson, "The Ventilation of Telephone Booths," *Good Health* 51, no. 12 (1910): 656-657.
- ⁵² Whorton, 202-204.
- ⁵³ Henderson, 656.
- ⁵⁴ *Ibid.* 656.
- ⁵⁵ John, 250, 263, 341.
- ⁵⁶ *Ibid.* 656.
- ⁵⁷ *Ibid.* 656-657.
- ⁵⁸ Francis Gable, "Who Does Your Washing?" *Good Health* 51, no. 12 (1910): 660-661.
- ⁵⁹ Gable, 660.
- ⁶⁰ W.H. Martin, "The Public Health Aspect of the Telephone," *Bell Telephone Quarterly* (October 1937): 229-243.
- ⁶¹ John, 240.
- ⁶² *Ibid.* 203, 306.
- ⁶³ *Historical Statistics of the United States*, 19, 69, 182.
- ⁶⁴ "Field of Electricity: A Working Smith's View of Electricity," *The Los Angeles Times*, 16 March 16, 1896, 6.
- "Near Death in Booth: Man Trapped in Telephone Box Collapses Before Rescue," *The Washington Post*, 9 April 1913, 3.
- "Live in Booths," *The Milwaukee Journal*, 29 November 1907, 9.
- "The Telephone and Infection," *Electrical Engineering*, 2 July 1908, 29.
- ⁶⁵ Francis Allan, "The Public Telephone Call Office as a Factor in the Spread of Disease," *The Lancet* 27 (July 1907): 240.
- ⁶⁶ Allan, 240.
- ⁶⁷ Venus Green, *Race on the Line: Gender, Labor, and Technology in the Bell System, 1880-1980* (Durham: Duke University Press, 2001), 99.
- ⁶⁸ Green, 79-80.
- ⁶⁹ *Heating and Ventilation Catalogue 215* (Boston: B.F. Sturtevant Company, 1914), 176.
- ⁷⁰ Ethelbert Stewart and Charles Baldwin, *Investigation of Telephone Companies* (Washington, D.C: United States Government Printing Office, 1910), 71.
- ⁷¹ Stewart and Baldwin, 79.
- ⁷² *Ibid.* 79-80.
- ⁷³ Edward J. Hall, "Certain Matters in the Personnel Program," paper presented at the Bell System Operating Conference, May 1926, 13.
- ⁷⁴ Hall, 13.

⁷⁵ *Ventilation Laws in the United States*, Heating and Ventilating Magazine Company, New York, 1917, p. 3-4.

⁷⁶ John Duffy, *The Sanitarians: A History of American Public Health* (Urbana: University of Illinois Press, 1990), 153.

⁷⁷ Milton Rosenau and George McCoy, "Hygiene and Public Health," *The American Journal of the Medical Sciences* 158, no. 6 (December 1919): 911.

⁷⁸ Green, 171.

⁷⁹ *Ibid.* 151.

⁸⁰ *The Sturtevant Ready-to-Run Ventilating Set and Facts About Ventilation* (Boston: B.F. Sturtevant Company, 1910), 8.

⁸¹ *Ready-to-Run*, 8.

⁸² *Ibid.* 5.

⁸³ "An Electrical Telephone Booth Ventilator," *Telephony* 64, no. 7 (1913): 68B.

"Cool Telephone Booth," *Telephony* 64, no. 26 (1913): 56.

⁸⁴ *Ready-to-Run*, 27.

⁸⁵ "Operating Fan and Lights in a Telephone Booth Automatically," *Popular Mechanics* 18, no. 5 (1912): 751.

⁸⁶ "Essential in All Well-Ventilated Buildings," *The Heating and Ventilating Magazine* (1914): 71.

⁸⁷ John, 268.

⁸⁸ Dan Schiller, "The Hidden History of U.S. Public Service Telecommunications, 1919-1956," *Info* 9, no. 2-3 (2007): 18.

⁸⁹ Schiller, 21-22.

⁹⁰ "A Centennial Celebration for the Telephone Booth," *Benner-Nawman's Public Access* (October 1988): 2-3.

⁹¹ Rothstein, 107.

⁹² Tomes, 131.

⁹³ *Ibid.* 132.

Notes to Chapter 2

¹ Michel Foucault, *Discipline and Punish: The Birth of the Prison* (New York: Vintage, 1995), 137.

² John Leslie King and Joel West, "Ma Bell's Orphan: U.S. Cellular Telephony, 1947-1996," *Telecommunications Policy* 26 (2002): 191.

³ King and West, 192.

"Net Profits Stay Even for AT&T," *The Washington Post*, 18 March 1971, H1.

⁴ George Calhoun, *Digital Cellular Radio* (Norwood: Artech House, 1988), 31.

⁵ John Pinheiro, "AT&T Divestiture and the Telecommunications Market," *Berkeley Technology Law Journal* 2, no. 2 (September 1987): 305.

⁶ King and West, 190.

-
- ⁷ Robert Galvin and William Weisz, *Motorola Annual Report 1973* (Schaumburg: Motorola, Inc., 1973), 31.
- ⁸ Tom Farley, "Mobile Telephone History," *Teletronikk* 3, no. 4 (2005): 29.
- ⁹ Gerard Goggin, *Cell Phone Culture: Mobile Technology in Everyday Life* (New York: Routledge, 2006), 35.
- Hazel Lacohee, Nina Wakeford, and Ian Person, "A Social History of the Mobile Telephone with a View of its Future," *BT Technology Journal* 21 (2003): 205.
- ¹⁰ The term "desk-bound" was historically used to describe the sedentary occupational labor of executives from the 1950s through the 1970s. See Shelly McKenzie, *Getting Physical: The Rise of Fitness Culture in America* (Lawrence: University of Kansas Press, 2013), 86.
- ¹¹ "Burden of empowerment" is a term borrowed from June Anne English-Lueck, who uses it to describe the individualization of the U.S. healthcare system in general in the 2000s. See English-Lueck, *Being and Well-Being: Health and the Working Bodies of Silicon Valley* (Stanford: Stanford University Press, 2010), 34.
- ¹² William Rothstein, *Public Health and the Risk Factor: A History of an Uneven Medical Revolution* (Rochester: University of Rochester Press, 2008), 211-217, 287-294, 362-363.
- ¹³ David Himmelstein and Steffie Woolhandler, "Medicine as Industry: the Health-Care Sector in the United States," *Monthly Review* 35 (April 1984): 15.
- ¹⁴ United States Council on Wage and Price Stability, *The Complex Puzzle of Rising Health Care Costs: Can the Private Sector Fit it Together?* (Washington, D.C.: Government Printing Office, 1976), 75.
- ¹⁵ He, Zi-Lin, et al., "Entry and Competitive Dynamics in the Mobile Telecommunications Market," *Research Policy* 35 (2006): 1147-1165.
- ¹⁶ The reports are available at http://www.motorolasolutions.com/en_us/about/company-overview/history/annual-report-archive.html
- ¹⁷ Rothstein, 261.
- ¹⁸ Bob Walz, Rebecca Knesel, "Motorola Demonstrates Portable Telephone to Be Available for Public use by 1976," *Motorola Communications Division Information Services*, 3 April 1973, 1-2.
- ¹⁹ Yukari Iwatani, "How Mobiles Got Out of the Car," *The Australian*, 13 May 2003, T21.
- ²⁰ Galvin and Weisz, 31.
- ²¹ Edward J. Caramela, "Salary Levels Continue Sharp Rise in White-Collar Occupations," *Monthly Labor Review* 92, no. 4 (April 1969): 47.
- ²² Council on Wage and Price Stability, 75.
- ²³ Jean Flexner and Anna-Stina Ericson, "White-Collar Employment and Income: Trends and Current Status of Employment and Income for a Large but Diverse Group of Workers," *Monthly Labor Review* 79, no. 4 (April 1956): 401.
- Carol Barry, "White-Collar Employment: I—Trends and Structure," *Monthly Labor Review* 84, no. 1 (January 1961): 13.

-
- ²⁴ Flexner and Anna-Stina Ericson, 403.
- ²⁵ Ibid. 408.
- Caramela, 47.
- ²⁶ U.S. Department of Health, Education, and Welfare, *Vital Statistics of the United States, 1960, Volume 2, Mortality, Part A* (Washington, D.C.: Government Printing Office, 1963), I-23.
- ²⁷ U.S. Department of Health, Education, and Welfare, *Vital Statistics of the United States, 1971, Volume 2, Mortality, Part A* (Washington, D.C.: Government Printing Office, 1963), I-6.
- ²⁸ U.S. Department of Health, Education, and Welfare, *Vital Statistics of the United States, 1971, Volume 2, Mortality, Part A* (Washington, D.C.: Government Printing Office, 1983), 8.
- ²⁹ See the mortality statistics above.
- ³⁰ Lawrence Hinkle, Susan Carver, and Michael Steves, "The Frequency of Asymptomatic Disturbances of Cardiac Rhythm and Conduction in Middle-Aged Men," *The American Journal of Cardiology* 24 (November 1969): 630.
- ³¹ John Gofman, *What We Do Know About Heart Attacks* (New York: Putnam, 1958), 61.
- ³² "Executive Health Programs: A Survey (For the Informed Executive)," *Management Review* 43, no. 11 (November 1954): 707-708.
- ³³ "Keeping Fit in the Company Gym," *Fortune* 92 (Oct. 1975): 136-43.
- ³⁴ David White, "New Product of General Foods: The Physically Fit Employee," *The New York Times*, 30 May 1974, 17.
- John Getze, "Executives Sweat to Save Their Companies Money," *The Los Angeles Times*, 5 October 1975, G1.
- ³⁵ John McCann, "A Strategy to Improve Executive Health," *Advanced Management Journal* (Spring: 1977): 35.
- ³⁶ Gofman 61-3, 85.
- ³⁷ No author, "The Rising Pressure to Perform," *Time* 94, no. 3 (July 1969): 89-90.
- ³⁸ Walter Alvarez, "Debate on Exercise Continues," *The Los Angeles Times*, 19 September 1971, M16.
- ³⁹ McKenzie, 105-106.
- ⁴⁰ Getze, G1.
- ⁴¹ Ibid. G1.
- ⁴² No author, "Y To Mark Off Miles to Start Fitness Drive," *The Los Angeles Times*, 28 January 1965, WS1.
- ⁴³ Christopher Andersen, "In 30 Minutes a Week You Can Get in Shape, Says the Astronauts' Fitness Expert," *People Magazine* 3, no. 20 (May 26, 1975): no pp.
- ⁴⁴ Getze, G2
- ⁴⁵ Ibid. G2
- ⁴⁶ McKenzie, 90.

⁴⁷ Clarke et al., 171-172.

⁴⁸ No author, "Father of the Cell Phone," *The Economist*, 6 June 2009, accessed 4 March 2014, <http://www.economist.com/node/13725793/print>

⁴⁹ Patrick Seitz, "Inventor Martin Cooper: His Persistence Powered Cellular Communications," *Investor's Business Daily*, 18 December 2000, A4.

⁵⁰ "Father of the Cell Phone."

⁵¹ Devra Davis, *Disconnect: The Truth About Cell Phone Radiation, What the Industry Has Done to Hide it, and How to Protect Your Family* (New York: Dutton, 2012), 21.

⁵² Davis, 22.

⁵³ *Ibid.* 22.

⁵⁴ Harry Mark Petrakis, *The Founder's Touch: The Life of Paul Galvin of Motorola* (New York: McGraw-Hill, 1965), 192-193.

⁵⁵ Petrakis, 13.

⁵⁶ *Ibid.* 13.

⁵⁷ Council on Wage and Price Stability, 40.

⁵⁸ Nicholas von Hoffman, "In the Pink of Health (and in the Black) in Phoenix," *The Washington Post*, 6 October 1972, C1.

⁵⁹ Council on Wage and Price Stability, 41-42.

⁶⁰ No author, *Motorola Annual Report 1948* (Schaumburg: Motorola, Inc., 1948), 9.

⁶¹ Andy Affrunti, Sr., *A Personal Journey: Fifty Years at Motorola* (Illinois: Motorola University Press, 1994), 80.

⁶² English-Lueck, 87.

⁶³ *Ibid.* 121.

⁶⁴ Kevin Patrick et al., "Health and the Mobile Phone," *Journal of Preventive Medicine* 35, no. 2 (2008): 180.

⁶⁵ English-Lueck, 126.

⁶⁶ Edmund Klemmer and Karl Haig, "Weight and Balance of a New Telephone Handset," *Applied Ergonomics* 19, no. 4 (1988): 271-274.

⁶⁷ Troy Wolverton, "Calling the Future: Cell Phone Pioneer Says He Sees 'Another Revolution' in Wireless Coming," *San Jose Mercury News*, 7 April 2008, 1C.

⁶⁸ Wolverton, 1C.

⁶⁹ Iwatani, D4.

⁷⁰ The term "coerce" comes from Michel Foucault's history of diffuse seventeenth and eighteenth century institutional practices that came to "center on the body as a machine, optimizing its capabilities, increasing its usefulness and docility, integrating it into systems of efficient and economic controls." Anson Rabinbach advances Foucault's theory of coercive institutional strategies to the design of industrial machinery in the nineteenth and twentieth centuries. See Michel Foucault, *The Birth of Biopolitics: Lectures at the Collège de France, 1978-79*, ed. Michel Senellart (New York: Palgrave Macmillan, 2008), 139; Foucault, *Discipline and Punish*, 139-145; and

Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (New York: Basic Books, 1990), 242.

⁷¹ Melissa Gregg, "Typewriter, Telephone, Transistor: Labor Politics in Three Formats," unpublished essay, (2015): 7.

⁷² Natasha Dow Schüll, *Addiction By Design: Machine Gambling in Las Vegas* (New Jersey: Princeton University Press, 2012), 73.

⁷³ "Father of the Cell Phone."

⁷⁴ Leslie Cauley, "It All Started with the DynaTAC," *USA Today*, 18 October, 2007, 2B.

⁷⁵ Hansi Lo Wang, "Father Of The Cellphone 'Unleashed' World's Callers From Copper Wires," *All Things Considered*, 9 July 2012, accessed 10 July 2015, <http://www.npr.org/sections/alltechconsidered/2012/07/09/156481784/father-of-the-cellphone-unleashed-worlds-callers-from-copper-wires>

⁷⁶ No author, "First Cell Phone a True 'Brick'," *NBC News*, 11 April 2005, accessed 2 September 2013 http://www.nbcnews.com/id/7432915/#.UqPZ_01Q16g

⁷⁷ Wolinsky, 58.

⁷⁸ Iwatani, D4.

⁷⁹ Wolinsky, 58.

⁸⁰ John Free, "New Take-Along Telephones Give You Push-button Calling to Any Number," *Popular Science* (July 1973): 130.

⁸¹ Tanja Kotro and Mika Pantzar, "Product Development and Changing Cultural Landscapes: Is Our Future in 'Snowboarding?'" *Design Issues* 18, no. 2 (Spring, 2002): 32.

⁸² Faris Howat, "Motorola MicroTAC Elite," *Cellular Business* 11, no. 13 (December 1994): 84.

Kotro and Pantzar, 34.

⁸³ Roy Furchgott, "Devices to Keep Track of Calories, Lost or Gained," *The New York Times*, 5 January 2012, B6.

⁸⁴ John Frank, "Vital Signs: Mobile Health App Revenue to Grow Tenfold by 2017, Study Predicts," *Modern Healthcare*, 22 May 2014, accessed 11 July 2015, <http://www.modernhealthcare.com/article/20140522/BLOG/305229997>

⁸⁵ Ahmedin Jemal, et al., "Trends in the Leading Causes of Death in the United States, 1970-2002," *Journal of the American Medical Association* 294, no. 10 (September 2005): 1255.

⁸⁶ Earl Ford, et al., "Explaining the Decrease in U.S. Deaths from Coronary Heart Disease," *New England Journal of Medicine* 356 (2007): 2389.

⁸⁷ Ford et al., 2388, 2395.

⁸⁸ Mike Freeman, "Mobile's Magic Moment," *San Diego Union-Tribune*, 21 April 2013, C1.

⁸⁹ Freeman, C1.

⁹⁰ The Persuasive Technology Lab provides an introductory overview of its history and design activities on its website, which including peacekeeping-related and behavior modification smartphone apps. See <http://captology.stanford.edu/>

⁹¹ BJ Fogg and Dean Eckles, "The Future of Persuasion is Mobile," in *Mobile Persuasion: 20 Perspectives on the Future of Behavior Change*, eds. BJ Fogg and Dean Eckles (Stanford: Stanford Captology Media, 2007), 1.

⁹² Erik Damen, "Simply Persuasive: Using Mobile Technology to Boost Physical Activity," in *Mobile Persuasion: 20 Perspectives on the Future of Behavior Change*, 39.

⁹³ Sunny Consolvo, Eric Paulos, and Ian Smith, "Mobile Persuasion for Everyday Behavior Change," in *Mobile Persuasion: 20 Perspectives on the Future of Behavior Change*, 82.

⁹⁴ Consolvo, Paulos, and Smith, 83.

⁹⁵ Catey Hill, "The Five Most (and Least) Popular Diet and Fitness Apps," *Market Watch*, 20 January 2015, accessed 8 June 2015, <http://www.marketwatch.com/story/the-5-most-and-least-popular-diet-and-fitness-apps-2015-01-06>

⁹⁶ Tom Sims, "Don't Just Map Your Run, Earn Points for It," *The New York Times*, 10 August 2012, accessed 11 July 2015, http://www.nytimes.com/2012/08/11/sports/11iht-athlete11.html?_r=0

⁹⁷ An overview of Argus' workings is available at <http://www.azumio.com/s/argus/index.html>

⁹⁸ Daniel Schulke, "The Regulatory Arms Race: Mobile-Health Applications and Agency Posturing," *Boston University Law Review* 93 (2013): 1716-1718.

⁹⁹ Schulke, 1718.

¹⁰⁰ *Ibid.* 1715.

¹⁰¹ *Ibid.* 1714.

¹⁰² The estimate for fitness-related smartphone use comes from Susannah Fox and Maeve Duggan, "Mobile Health 2012," *Pew Internet and American Life Project*, 8 November 2012, 14.

Notes to Chapter 3

¹ John Schneidawind, "Cellular Phone Firms Fight Tumor Charges," *USA Today*, 25 January 1993, 1B.

² My use of the term "malignant shadow" comes from Siddhartha Mukherjee, "Do Cellphones Cause Brain Cancer?" *The New York Times Sunday Magazine*, 17 April 2011, MM30.

³ Steven Herbert, "Debate Draws Larry King's Top Rating," *The Los Angeles Times*, 11 November 1993, A3.

⁴ Anthony Ramirez, "Health Claims Cause Turmoil In the Cellular-Phone Market," *The New York Times*, 30 January 1993, A1.

⁵ Mike Mills, "Still Waiting for the Call: Do Cellular Phones Cause Brain Tumors?" *The Washington Post*, 6 April 1997, H1.

⁶ C. Mason and S. Titch, "Cancer Scare Hits Cellular," *Telephony* 224, no. 5 (1 February 1993): 9.

⁷ Theodore Rappaport, "The Wireless Revolution," *IEEE Communications Magazine* (November 1991): 70. He also made his thoughts on radio frequencies' health effects known in an interview with *The New York Times* three years before the Reynards' scandal appeared. See Leonard Sloan, "Cellular Phone Deals for Alert Buyers," *The New York Times*, 20 October 1990, 48.

⁸ Robert Park, "The Seven Warning Signs of Voodoo Science," *Think* (Spring 2003): 33-42.

Park based his article on the Reynards off of his previous dismissal into the health effects of electromagnetic radiation in his bestselling book, *Voodoo Science: The Road from Foolishness to Fraud* (New York: Oxford University Press, 2000).

For more on the American scientific community's historical tendency to dismiss technological injuries as fraudulent, see Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (New York: Basic Books, 1990), 229-230.

For an expanded discussion of "junk science" as it relates to cell phones, see also Gary Taubes, "The Cell-Phone Scare: When Fear is the Opponent, Science Doesn't Stand a Chance," *MIT Technology Review*, 1 November 2000.

⁹ In 1992, Motorola maintained a 22% percent market share in the U.S., followed by Nokia at 14%, Mitsubishi at 10%, NovAtel at 9%, Toshiba at 8.2%, and NEC at 7%. Barnaby Feder, "Motorola Will Be Just Fine, Thanks," *The New York Times*, 31 October 1993, F1.

Duane Stoltzfus, "Mobile Mania – Americans Going Cellular by the Millions," *The New Jersey Record*, 28 February 1993, B01.

Reuters, "Cellular Phone Growth Cited," *The New York Times*, 11 October 1993, D7.

¹⁰ My concept of health as a "co-production" derives from Bruno Latour's strategy for reading technology and technological effects as byproducts of specific interactions with people. Effects are therefore neither technologically or socially determined, but are forged at sites of engagement, allowing both human and nonhuman entities a measure of agency. Additionally, this co-production can be read not only in terms of how a technology is used by consumers, for instance, but also in how a technology represents and materializes interactions with people throughout its entire cycle of invention, design, engineering, and marketing, as well. In the context of this chapter, my appropriation of Latour's work explicitly attempts to avoid a tendency in scholarship on cellular health effects, and lay blame upon a particular company, industry, technology, or group of users. Rather, I seek to portray health concerns around cell phones at the points where these multiple actors intersect. See Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge: Harvard University Press, 1987).

¹¹ Wiebe Bijker and Trevor Pinch, "The Social Construction of Facts and Artifacts: Or How the Sociology of Science and The Sociology of Technology Might Benefit Each Other," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, eds. Wiebe Bijker, Thomas Hughes, and Trevor Pinch (Cambridge: The MIT Press, 1987), 18-19.

¹² Judith Herman, *Trauma and Recovery* (New York: Basic Books, 1992), 181.

¹³ For television news reports related to the Reynards' case, See *The NBC Evening News with Tom Brokaw*, "Cellular Phones and Cancer Link," first broadcast 25 January 1993 by NBC.

The CBS Evening News/Eye to Eye, "Cellular Phones and Safety," first broadcast 17 December 1993 by CBS.

Motorola's press conference was met with significant skepticism by journalists, best encapsulated by Gerald Meyers and Susan Meyers, "All the Facts on Cellular Phones, Please," *The New York Times*, 7 February 1993, 13.

Trade journal essays about the Reynards' case include:

Wayne Eckerson and Ellen Messmer, "Users Not Jumping Gun on Cellular Phone, Cancer Link," *Network World* 10, no. 6, (Feb 1993): 17.

"Curing Cellular's Health Scare," *Cellular Business* 10, no. 5 (May 1993): 22.

Mark Fischetti, "The Cellular Phone Scare," *IEEE Spectrum* (June 1993): 47.

Dan O'Shea, "Research Group to Study Cellular/Cancer Link," *Telephony* 227, no. 10 (September 1994): 15.

Excepting the Reynards' case, nearly all of the lawsuits filed in 1993 were against Motorola. For an overview of each case, see Shawn Steward, "Wireless Health and Safety Check Up," *Cellular Business* 12, no. 8 (August 1995): 26.

¹⁴ Adam Burgess, *Cellular Phones, Public Fears, and a Culture of Precaution* (New York: Cambridge University Press, 2004), 116.

¹⁵ Jason Mittell, "Audiences Talking Genre: Television Talk Shows and Cultural Hierarchies," *Journal of Popular Film and Television* 31, no. 1 (January 2003): 42.

¹⁶ Science and technology scholar and philosophy Don Ihde was one of the earliest writers to use the term "cocoon" to describe the protective, self-monitoring routines people develop around technologies and the built environment. See Ihde, *Existential Technics* (Albany: SUNY Press, 1983), 21.

¹⁷ Richard Harper, "People Versus Information: The Evolution of Mobile Technology," in *Human-Computer Interaction with Mobile Devices and Services Lecture Notes in Computer Science* 2795 (2003): 6.

¹⁸ Harper, 2.

¹⁹ *Ibid.* 9.

²⁰ *Ibid.* 4.

²¹ Manuel Castells, Mireia Fernández-Ardèvol, Jack Linchuan Qiu, and Araba Sey, *Mobile Communication and Society: a Global Perspective* (Cambridge: MIT Press, 2007), 92, 248.

²² Sherry Turkle, *Alone Together: Why We Expect More from Technology and Less from Each Other* (New York: Basic Books, 2011), 175-179.

²³ Michael Chan, "Mobile Phones and the Good Life: Examining the Relationships Among Mobile Use, Social Capital and Subjective Well-being," *New Media & Society* 20, no. 10 (December 2013): 1-18.

²⁴ Mizuko Ito, Daisuke Okabe, Misa Matsuda, eds. *Personal, Portable, Pedestrian: Mobile Phones in Japanese Life* (Cambridge: MIT Press, 2005), 178-179.

For more on the resemblance between cellular cocoons and those experienced with automobiles, see Karin Bijsterveld, "Acoustic Cocooning: How the Car became a Place to Unwind," *The Senses and Society* 5, no. 2 (July 2010): 189-211.

John Urry, *Mobilities* (Cambridge: Polity Press, 2007), 120, 127.

²⁵ Richard Ling, *The Mobile Connection: The Cell Phone's Impact on Society* (New York: Morgan Kaufman, 2004), 45.

²⁶ Jane Vincent and Leopoldina Fortunati, "The Emotional Identity of the Mobile Phone," in *The Routledge Companion to Mobile Media*, eds. Gerard Goggin and Larissa Hjorth (New York: Routledge, 2014), 315.

²⁷ Adele Clarke et al., "Biomedicalization: Technoscientific Transformations of Health, Illness, and U.S. Biomedicine," *American Sociological Review* 68 (April 2003): 164, 169-170, 182.

²⁸ Despite its price tag, the NEC 9A was actually one of the more inexpensive phones available, open to consumers beyond the business professionals that constituted the consumer base of cell phones up until the late 1980s. Few other phones targeted everyday consumers in this period. In 1989, for example, Motorola's cheapest cell phone still cost \$2,995.

See "Motorola Inc. Introduces Pocket Phone," *The Austin American-Statesman*, 7 May 1989, AAS.

Untitled NEC Advertisement, *The Washington Post*, 21 January 1991, A4.

²⁹ "Curing Cellular's Health Scare," 22.

³⁰ David Reynard and Anthony Bernardi, *Call Waiting: The Authorized Susan Reynard Story* (Reynard and Bernardi, 2013), 209, 364.

³¹ Nancy McVicar, "Lines Busy to Lawyer Handling Reynard Case," *Sun-Sentinel*, 31 January 1993, 22A.

³² The term "always on" comes from Sherry Turkle's characterization of typical cell phone use as "always on, always on you." See Turkle, "Always-On/Always-on-You: The Tethered Self," in *Handbook of Mobile Communication Studies*, ed. James E. Katz (Cambridge: MIT Press, 2008), 121-138.

Natasha Dow Schüll, *Addiction By Design: Machine Gambling in Las Vegas* (New Jersey: Princeton University Press, 2012), 245.

For more on the definition of health as a bodily state that demands medical and technological supplementation, see Joseph Dumit, *Drugs for Life: How Pharmaceutical Companies Define Our Health* (Durham: Duke University Press, 2012).

³³ Paul Polishuk and Hui Pan, "Cellular Survey," *Wireless Cellular Telecommunications* 1, no. 2 (September 1991): 2.

³⁴ Harper, 2.

³⁵ *Ibid.* 9.

³⁶ Lynn Spigel, *Make Room For TV: Television and the Family Ideal in Postwar America*. (Chicago: University of Chicago Press, 1992), 34.

For a broader perspective on the gendered history of "containment" in the United States, see Elaine Tyler May, *Homeward Bound: American Families in the Cold War Era* (New York: Basic Books, 1988).

Amparo Lasén has updated this discussion of tracking, containment, transparency, and disclosure as it relates to the cell phone use of couples on an international scale.

See Lasén, "Mobile Sentimental Education: Attachment, Recognition, and Modulations of Intimacy," in *The Routledge Companion to Mobile Media*, eds. Gerard Goggin and Larissa Hjorth (New York: Routledge, 2014), 400-401.

³⁷ "Curing Cellular's Health Scare," 22.

³⁸ Reynard and Bernardi, 235-6.

³⁹ Reynard and Bernardi, 211.

⁴⁰ McVicar, 22A.

⁴¹ Barry Flynn, "Tenneco Boss Tells of Tumor – Walsh Upbeat, to Keep Working," *Newport News/Daily Press*, 21 January 1993, C7.

⁴² John Labate Huey, "Mike Walsh Takes on Brain Cancer," *Fortune* 127, no. 4 (February 1993): 76-77.

⁴³ Harper, 3.

⁴⁴ Laura Portwood-Stacer, "Media Refusal and Conspicuous Non-Consumption: The Performative and Political Dimensions of Facebook Absention," *New Media and Society* 15, no. 7 (2012): 1043.

⁴⁵ Elaine Silvestrini, "Local Inventors Put Squeeze on Copycat Juicer Sex Devices," *The Tampa Tribune*, 6 May 2006, 5.

⁴⁶ Bernardi and Reynard, 136. As a bizarre side note, circa 2001, David rebounded from the tragedy of losing Susan to cancer by performing another inventive feat: he profitably cornered the sex toy market with a glass penis he concocted to resemble a hand-held fruit juicer. See Silvestrini, 5.

⁴⁷ The term "mixed emotions" comes from an early, influential study conducted by Leslie Haddon concerning the adoption or "domestication" of cell phones, in which he argued that users "wrestle with their relations with the device," and never fully accept or domesticate cell phones' presence in their lives. My use of Haddon's terminology hopes to extend his argument as it reflects the emotional work that goes into performances of media refusal. See Haddon, "Domestication and Mobile Telephony," in *Machines That Become Us: The Social Context of Personal Communication Technology*, ed. James E. Katz (New Brunswick: Transaction Publishers, 2003), 47.

⁴⁸ Antonio Casilli, "A History of Virulence: The Body and Computer Culture in the 1980s," *Body & Society* 16, no. 4 (2010): 16.

⁴⁹ Paul Brodeur's series of muckraking essays in *The New Yorker* in the late 1970s about microwaves first brought their safety into question. He collected them in *The Zapping of America: Microwaves, Their Deadly Risk, and the Cover-up* (New York: Norton and Company, 1977).

See also Nicholas Steneck, *The Microwave Debate* (Cambridge: MIT Press, 1984).

⁵⁰ David's imagined hands-free headset in fact did become a reality, albeit not for the reasons he intended. With the development of Bluetooth wireless communications technology by Swedish cellular manufacturer Ericsson in 1999-2001, cellular companies began offering hands-free handsets to customers. These accessories have in turn served as a controversial industry response to another, more recent health debate concerning cell phones – distracted driving. See Katie Hafner, "Promising an End to Cable Spaghetti," *The New York Times*, 30 September 1999, G11.

Brian Johnston, "Cell Phones and Choice Architecture," *Injury Prevention* 15, no. 5 (October 2009): 289-290.

⁵¹ Schüll, 19-20.

⁵² *Ibid.* 244-245.

⁵³ Portwood-Stacer, 1053.

⁵⁴ Haddon, 46.

Rich Ling and Per Helmersen, "It Must Be Necessary, It Has to Cover a Need': The Adoption of Mobile Telephony Among Pre-Adolescents and Adolescents," Presented at the Conference on the Social Consequences of Mobile Telephony, 16 June 2000.

Rich Ling and Birgitte Yttri, "Hyper-coordination Via Mobile Phones in Norway," in *Perpetual Contact: Mobile Communication, Private Talk, Public Performance*, eds.

James E. Katz and Mark Aakhus (Cambridge: Cambridge University Press, 2002).

Turkle, 227-228.

⁵⁵ The concept of "addiction" to consumer media is highly controversial. A body of scientific literature suggests that the stimuli produced by television, cell phones, video games, and the Internet correspond with human psychology in multiple ways that encourage increased and involuntary interaction with these media. However, many within the social sciences counter that such research overlooks the cultural construction of "addiction" as it is used by certain social and institutional groups to pathologize and limit access to technology (allowing parents, for example, to exert greater control over their children's useage of media).

For a review of scientific literature, see James Lin, "Popularity, Funding for Health-Effect Research and Cell-Phone Addiction," *IEEE Antennas and Propagation Magazine* 52, no. 2 (April 2010): 164-166.

See also Ting-Jui Chou and Chih-Chen Ting, "The Role of Flow Experience in Cyber-Game Addiction." *Cyberpsychology and Behavior* 6 (2003): 663-675.

For a culturally oriented rebuttal of media “addiction,” see danah boyd, *It’s Complicated: The Social Lives of Networked Teens* (New Haven: Yale University Press, 2014), 77-99.

⁵⁶ Portwood-Stacer, 1050-1051.

⁵⁷ *Ibid.* 1048.

⁵⁸ Nadim Mahmud et al., “The Cell Phone Problem/Solution,” *Journal of Environmental Health* 76, no. 6 (January/February 2014): 140.

⁵⁹ *World Telecommunication Development Report 1999: Mobile Cellular, Executive Summary* (Geneva: International Telecommunication Union, 1999), 2-3.

⁶⁰ *Development Report*, 24.

⁶¹ Murphy, 102.

⁶² Rigmor Granlund-Lind and John Lind, *Black on White: Voices and Witnesses About Electro-Hypersensitivity, the Swedish Experience* (Stockholm: Mimers Brunn Kunskabsforlaget, 2004), 138.

⁶³ Granlund-Lind and John Lind, 141.

⁶⁴ *Ibid.* 4.

⁶⁵ *Ibid.* 6.

⁶⁶ *Ibid.* 4.

⁶⁷ *Ibid.* 143.

⁶⁸ *Ibid.* 108.

⁶⁹ *Ibid.* 6.

⁷⁰ Linda Soneryd, “Deliberations on the Unknown, the Unsensed, and the Unsayable? Public Protests and the Development of Third-Generation Mobile Phones in Sweden,” *Science, Technology, & Human Values* 32, no. 3 (May 2007): 305.

⁷¹ Granlund-Lind and John Lind, 29.

⁷² *Ibid.* 78.

⁷³ *Ibid.* 34, 71, 73-75, 104-5, 121.

⁷⁴ *Ibid.* 6.

⁷⁵ *Ibid.* 36.

⁷⁶ *Ibid.* 30-31.

⁷⁷ *Ibid.* 96.

⁷⁸ *Ibid.* 23-24.

⁷⁹ *Ibid.* 81.

⁸⁰ *Ibid.* 72.

⁸¹ *Ibid.* 142.

⁸² *Ibid.* 142.

⁸³ Clarke et al., 171-172.

⁸⁴ Adriana de Souza e Silva and Jordan Frith, *Mobile Interfaces in Public Spaces: Locational Privacy, Control, and Urban Sociability* (New York: Taylor and Francis, 2012), 26-28.

In an earlier, renowned essay on the Apple iPod, Michael Bull sets the groundwork for discussing the control cell phone users feel over their personal and professional lives and spaces. See Bull, "Investigating the Culture of Mobile Listening: from Walkman to iPod," in *Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies*, eds. Kenton O'Hara and Barry Brown (Dordrecht: Springer, 2006), 131-149.

⁸⁵ Soneryd, 307.

⁸⁶ Alfred Moore and Jack Stilgoe, "Experts and Anecdotes: The Role of 'Anecdotal Evidence' in Public Scientific Controversies," *Science, Technology, & Human Values* 34, no. 5 (September 2009): 659-660.

⁸⁷ Mills, H1.

⁸⁸ Ibid. H7.

⁸⁹ Ibid. H8.

⁹⁰ IEEE Standards Coordinating Committee 34, *IEEE 1528 Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices* (New York: The Institute of Electrical and Electronics Engineers, 1995), iv.

⁹¹ *IEEE 1528*, 1-4.

⁹² Mukherjee, MM30.

⁹³ H. David Reynard, Jr. v. NEC America, Inc., and GTE Mobilnet of Tampa, Inc., 887 F. Supp. 1500 (1995), 1508.

⁹⁴ Ulf Bergqvist, Lena Hillert, and Elizabeth Birke, *Electromagnetic Hypersensitivity and Health Risks from Electric and Magnetic Fields. Research Review and Evaluation. Final Report from the Task Group at the Swedish Council for Work Life Research* (Kinköping: Swedish Council for Work Life Research, 2000), 108.

⁹⁵ Soneryd, 305.

⁹⁶ Harper, 11.

⁹⁷ Ibid. 11.

⁹⁸ Ibid. 8.

⁹⁹ Ibid.

¹⁰⁰ Vincent and Fortunati, 314-316.

¹⁰¹ Brenton Malin, "Mediating Emotion: Technology, Social Science, and Emotion in the Payne Fund Motion-Picture Studies," *Technology and Culture* 50 (April 2009): 368.

Notes to Chapter 4

¹ Anthony Dunne and Fiona Raby, *Design Noir: The Secret Life of Objects* (Basel: Birkhauser, 2001), 75.

² "Sony Workman," *Design* 489 (September 1989): 47.

³ Paul Kunkel, *Digital Dreams: The Work of the Sony Design Center* (New York: Universe Publishing, 1999), 17.

⁴ Dunne and Raby, 6.

⁵ Naomi Stungo and Marcus Field, "Product Overload: Designers Fight Back," *Blueprint* (October 1997): 37.

⁶ Alex Seago and Anthony Dunne, "New Methodologies in Art and Design Research: The Object as Discourse," *Design Issues* 15, no. 2 (1999): 11-17.

⁷ Dunne and Raby, 6.

⁸ *Ibid.* 45.

⁹ *Ibid.* 58, 65.

¹⁰ Edwin Heathcote, "Critical Points," *The Financial Times*, 3 April 2010, 5.

¹¹ See for example the work of Design and Emotion Society participants Steven Fokkinga and Pieter Desmet, "Darker Shades of Joy: The Role of Negative Emotion in Rich Product Experiences," *Design Issues* 28, no. 4 (Autumn 2012): 42-56.

¹² *Ibid.* 20.

¹³ *Ibid.* 46.

¹⁴ *Ibid.* 75.

¹⁵ Joseph Dumit, *Drugs for Life: How Pharmaceutical Companies Define Our Health* (Durham: Duke University Press, 2012), 58.

¹⁶ Dunne and Raby, 75.

¹⁷ Zoë Ryan, "Safer by Design," *Blueprint* 74 (January 2006): 74.

Bruce Sterling, "Safe: Design Takes on Risk," *Artforum* (September 2005): 116.

Emily King, "Are Friends Electric?" *Frieze*, 3 April 2002, 1.

Nicolai Ouroussoff, "If You're Going to Be Safe, May as Well Be Stylish," *The New York Times*, 20 October 2005, C7.

Charles Jennings, "Design Classics? Are They Serious?" *The Guardian Weekend Pages*, 24 March 2001, 54.

Janice Hopkins Tanne, "Safe: Design Takes on Risk," *British Medical Journal* 331 (November 2005): 1087.

¹⁸ Greg Siegel, "The Accident Is Uncontainable/The Accident Must Be Contained: High-Speed Cinematography and the Development of Scientific Crash Testing," *Discourse* 30, no. 3 (Fall 2008): 350-351.

See also John Burnham, *Accident Prone* (Chicago: University of Chicago Press, 2009), 194-198.

For an example of product safety testing for phones in the mid-1990s, see Bryce Rutter and Anne Marie Becka, "Evolution of a Cordless Phone," *Ergonomics in Design* (July 1997): 12.

For a much broader example of how safety guidelines for industrial design and engineering have evolved according to medicoscientific research and are utilized on a larger, systemic level, see Nancy Leveson, *Engineering a Safer World: Systems Thinking Applied to Safety* (Cambridge: The MIT Press, 2011), chapter 9.

¹⁹ A sister condition to electrosensitivity, called "environmental illness" or "multiple chemical sensitivities," also rose to prominence in this era. An early eruption of environmental illness involved 225 construction workers in 1987, inexplicably affected

by remodeled carpet at the Environmental Protection Agency's Washington, D.C. headquarters. Their symptoms were felt on a grander scale by approximately 250,000 U.S. soldiers during the Gulf War of 1990-1991, whose illness suggested a corresponding toxicity between a wide variety of consumer products (including textiles, solvents, and perfumes), and substances like sarin nerve gas and oil smoke. Reports have continued to escalate into the 2000s, and have resulted in some significant strides towards medical recognition. See, Jill Neimark, "Allergic to Life," *Discover Magazine*, November 2013, accessed 15 October 2014, <http://discovermagazine.com/2013/nov/13-allergic-life>

²⁰ William Rea, "Question About EMF Patient Treatment," e-mail message to author, June 17, 2015.

²¹ Dunne and Raby, 39.

²² INTERPHONE Study Group, "Brain Tumour Risk in Relation to Mobile Telephone Use: Results of the INTERPHONE International Case-Control Study," *International Journal of Epidemiology* 39, no. 3 (June 2010): 677.

²³ Kjell Hansson Mild, Mike Repacholi, Emilie van Deventer, Paolo Ravazzani, eds., *Electromagnetic Hypersensitivity, Proceedings of the World Health Organization International Workshop on EMF Hypersensitivity* (Geneva: World Health Organization, 2006), 58-59.

See also: Chris Woolston, "They Feel Sensitive to EMFs," *The Los Angeles Times*, 15 February 2010, E7.

²⁴ Iris Bell, "An Olfactory-Limbic Model of Multiple Chemical Sensitivity Syndrome: Possible Relationship to Kindling and Affective Spectrum Disorders," *Biological Psychiatry* 32 (1992): 218-242.

²⁵ Ludmilla Jordanova, "The Social Construction of Medical Knowledge," *Social History of Medicine* 7, no. 3 (1995): 361-381.

²⁶ Siegel, 356.

²⁷ Dumit, 80.

²⁸ Michael Kundi, "The Controversy about a Possible Relationship between Mobile Phone Use and Cancer," *Environmental Health Perspectives* 117, no. 3 (March 2009): 317.

²⁹ Ben Goldacre, "Why Don't Journalists Mention the Data?" *British Medical Journal* 334 (June 2007): 1249.

Denise Wallace et al., "Do TETRA (Airwave) Base Station Signals Have a Short-Term Impact on Health and Well-Being? A Randomized Double-Blind Provocation Study," *Environmental Health Perspectives* 118, no. 6 (2010): 735-741.

³⁰ Quirino Balzano et al., "Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones," *IEEE Transactions on Vehicular Technology* 44, no. 3 (August 1995): 390-403.

³¹ Mike Mills, "Still Waiting for the Call: Do Cellular Phones Cause Brain Tumors?" *The Washington Post*, 6 April 1997, H1.

³² Dumit, 66.

See also Anne Clarke et al., "Biomedicalization: Theorizing Technoscientific Transformations of Health, Illness, and U.S. Biomedicine," *American Sociological Review* 68, no. 2 (2003): 161-194.

³³ Joseph Stromberg, "Refugees of the Modern World," *Slate*, 12 April 2013, accessed 9 September 2014,

http://www.slate.com/articles/technology/future_tense/2013/04/green_bank_w_v_where_the_electrosensitive_can_escape_the_modern_world.html

³⁴ Siddhartha Mukherjee, "Do Cellphones Cause Brain Cancer?" *The New York Times Sunday Magazine*, 17 April 2011, MM30.

³⁵ Richard Harper, "People Versus Information: The Evolution of Mobile Technology," in *Human-Computer Interaction with Mobile Devices and Services Lecture Notes in Computer Science* 2795 (2003): 8.

³⁶ Sandra Stöckenius and Peter Brugger, "Perceived Electrosensitivity and Magical Ideation," *Perceptual and Motor Skills* 90 (2000): 899.

³⁷ *Ibid.* 40.

³⁸ R.J. Cohen, "The Threat to Radio Astronomy from Radio Pollution," *Space Policy* 5, no. 2 (1989): 91 – 93.

Similar domestic "sanctuaries" have been sought by electrosensitives in France and in Sweden. See Woolston, E7.

See also James Geary, "Disconnect," *Popular Science* (March 2010): 54-63.

³⁹ Dunne and Raby, 20.

⁴⁰ Stromberg, "Refugees."

⁴¹ *Popular Science*, 63.

⁴² Electrosensitives' readjustment of living spaces feeds into a larger trend of domestic self-customization within the environmentally ill community. Denied medical aid in the 1990s, several thousand of the environmentally ill also relocated to uninhabited spaces in New Mexico, Texas, California, Colorado, and Arizona to alleviate their conditions. Within these rural areas, Michelle Murphy writes that the environmentally ill customized housing according to individual health needs. Personal finances permitting, they painstakingly crafted domestic "safe spaces" with steel-foil wall coverings, baked porcelain flooring, and furnishings made of untreated wood or steel. If electrosensitives expunged "a complex soup of electromagnetic radiation" from their homes at the NRQZ, as Dunne and Raby put it, the environmentally ill also customized domestically to achieve a purified "atmospheric soup" bereft of solvents, perfumes, and other "exhaust." See Michelle Murphy, "The 'Elsewhere Within Here' and Environmental Illness; or How to Build Yourself a Body in a Safe Space," *Configurations* 8, no. 1 (Winter 2000): 104-105, 107.

⁴³ Dunne and Raby, 39.

⁴⁴ *Ibid.* 39.

⁴⁵ James Hunt, "Radiation Shield for Cellular Telephones," U.S. Patent 5,613,221, filed April 12, 1993 and issued March 18, 1997.

⁴⁶ Eyal Rinot, "Radiation Shielding Device," U.S. Patent 6,356,773, filed July 8, 1999, and issued March 12, 2002

⁴⁷ See for example Richard Tashjian, "Cellular Phone Shield," U.S. Patent 5,367,309, filed July 9, 1993 and issued November 22, 1994; Marty Liberman and Marilyn MacGillivray, "Radiation Shield for Radio Transmitting Devices," U.S. Patent Publication US 2001/0041545 A1, filed November 15, 2001; Kim Kuniz and Frederick Wood, "Radio Frequency Radiation Shield Unit for Wireless Telephones," U.S. Patent 6,404,403, filed May 30, 2001 and issued June 11, 2002; Jack Miller and Michael Miller, "Device for Reducing Radiation From an Antenna of a Portable Telephone," U.S. Patent 6,708,047, filed January 19, 2001 and issued March 16, 2004.

⁴⁸ Dunne and Raby, 46.

⁴⁹ *Ibid.* 22.

⁵⁰ *Ibid.* 22, 40.

⁵¹ *Ibid.* 46.

⁵² *Ibid.* 52.

⁵³ *Ibid.* 7.

⁵⁴ Juliene Lipson, "Multiple Chemical Sensitivities: Stigma and Social Experiences," *Medical Anthropology Quarterly* 18, no. 2 (2004): 208.

⁵⁵ Murphy, 92.

⁵⁶ *Ibid.* 91.

⁵⁷ Dunne and Raby, 75.

⁵⁸ Murphy, 90.

⁵⁹ Stromberg, "Refugees."

⁶⁰ *Ibid.*

⁶¹ Murphy, 92.

⁶² Dunne and Raby, 75.

⁶³ In addition to the Excluder, Dunne and Raby ended up designing seven other separate safeguards to be used against cell phones, as well as televisions, computers, and other electronic media. Like the Excluder, none of these designs ended up becoming actual products. See Dunne and Raby, 78-79.

⁶⁴ Heathcote, 5.

⁶⁵ William Emerson, "Electromagnetic Wave Absorbers and Anechoic Chambers Through the Years," *IEEE Transactions on Antennas and Propagation* 21, no. 4 (1973): 484-489.

⁶⁶ Dunne and Raby, 78.

⁶⁷ *Ibid.* 78.

⁶⁸ Jane Fulton, "Physiology and Design: New Human Factors," *American Center for Design Journal* 7, no. 1 (1993): 7-8.

⁶⁹ Henry Dreyfuss, *Designing for People* (New York: Simon and Schuster, 1955), 28.

⁷⁰ Henry Dreyfuss and Associates, *The Measure of Man: Human Factors in Design* (New York: Whitney Library of Design, 1967), 1.

⁷¹ Alastair Macdonald, "Developing a Qualitative Sense," *Human Factors in Consumer Products*, ed. Neville Stanton (London: Taylor and Francis, 1998), 175.

⁷² Christian Derbaix and Michel Pham, "Affective Reactions to Consumption Situations: A Pilot Investigation," *Journal of Economic Psychology* 12 (1991): 329.

⁷³ Macdonald, 176.

Not coincidentally, this shift towards more "qualitative" assessments for product safety intersects with a wholesale shift in "experiential" or "interaction" design, an industrial design methodology that ideally privileges user feelings, fantasies, and cultural context in product design. Literature on experiential design is voluminous, and frequently utopian in tone. Two of the clearest boosters of this design method are Rick Robinson and John Thackara. See Robinson, "What to Do With a Human Factor: A Manifesto of Sorts," *American Center for Design Journal* 7, no. 1 (1993): 62-74; and Thackara, *In the Bubble: Designing in a Complex World* (Cambridge: The MIT Press, 2005).

For an example of experiential design as it relates to cell phones in the 1990s, see Sherie Bauer and Pamela Mead, "After You Open the Box: Making Smart Products More Usable, Useful, and Desirable Through Interactive Technology," *Design Management Journal* 6, no. 4 (Fall 1995): 22.

For one of the most incisive critiques of experiential design (which includes criticism of Dunne and Raby's unfeasible conceptual designs), see Johan Redström, "Towards User Design? On the Shift from Object to User as the Subject of Design," *Design Studies* 27 (2006): 135-136.

⁷⁴ For a comprehensive bibliography of other consumer emotion rubrics developed by designers in this era, see Pieter Desmet, "To Love and Not to Love: Why Do Products Elicit Mixed Emotions?," in *Proceedings of the First International Conference on Design and Emotion*, eds. C.J. Overbeeke and Paul Hekkert (Delft: Delft University of Technology, 1999), 67-74.

Designers were not the only individuals to interpret risk as an affective rather than objective phenomenon in this era. This turn towards understanding how humans define and operate on threats socially, psychologically, and emotionally was deepened considerably by the publication of sociologist Ulrich Beck's *Risk Society: Towards a New Modernity* (London: Sage, 1992), and sociologist Anthony Giddens' equally influential book *The Consequences of Modernity* (Cambridge: Polity Press, 1990).

Designers were surprisingly aware of both academics' work. See Robinson, 70.

⁷⁵ Jennings, 54.

⁷⁶ Other competing designers nominated for the prize in 2001 included well-known Ron Arad, Tom Dixon, Jasper Morrison and Marc Newson. See Lisa Godson, "Making Waves," *The Sunday Times*, 4 March 2001, Features 1.

⁷⁷ Jennings, 54.

⁷⁸ Ibid.

⁷⁹ Paola Antonelli, "Grace Under Pressure," *Safe: Design Takes on Risk* (New York: The Museum of Modern Art, 2006), 9.

⁸⁰ Antonelli, 9.

⁸¹ Antonelli, "Shelter," in *Safe: Design Takes on Risk*, 58.

⁸² Ouroussoff, C7.

Ryan, 74.

⁸³ Tanne, 1087.

⁸⁴ Ibid.

⁸⁵ Dunne and Raby, 75.

⁸⁶ Ibid. 85.

⁸⁷ Ibid. 128.

⁸⁸ Ibid. 122.

⁸⁹ Ibid. 122.

⁹⁰ "Cover Interview: Anthony Dunne and Fiona Raby," *Axis* 151, no. 1 (June 2011): 7.

⁹¹ John Patrick Oliver, Chung-Kwang Chou, and Quirino Balzano, "Testing the Effectiveness of Small Radiation Shields for Mobile Phones," *Bioelectromagnetics* 24 (2003): 67.

⁹² Oliver, Chou, and Balzano, 66.

⁹³ George Cole, "A Fashionable Line with a Pocketful of Protection" *The Financial Times*, 5 November 2002, 18.

⁹⁴ Cole, 18.

⁹⁵ Ibid. 18.

⁹⁶ "FTC Charges Sellers of Cell Phone Radiation Protection Patches with Making False Claims," *For Your Information*, 20 February 2002, 1.

⁹⁷ Öjan Hallberg and Gerd Oberfeld, "Will We All Become Electrosensitive?" *Electromagnetic Biology and Medicine* 25 (2006): 190.

⁹⁸ Keith Petrie et al., "Thoroughly Modern Worries: The Relationship of Worries About Modernity to Reported Symptoms, Health and Medical Care Utilization," *Journal of Psychosomatic Research* 51 (2001): 396-397.

⁹⁹ Stephen Zuckerman and Joshua McFeeters, "Recent Growth in Health Expenditures," *The Commonwealth Fund Commission on a High Performance Health System* 914 (March 2006): 1-3.

¹⁰⁰ Rod Falcon and Leah Spalding, "Expanding Meanings of Health," *Institute for the Future Health Horizons Program SR-815 B* (Menlo Park: Institute for the Future 2004), 6, 35.

¹⁰¹ A detailed history of the Institute can be found on their site. See <http://www.iftf.org/what-we-do/history-of-the-future/> Retrieved 2 February 2015.

¹⁰² Falcon and Spalding, 56.

¹⁰³ Ibid. 29.

¹⁰⁴ Ibid. 21.

¹⁰⁵ Ibid. 17.

Notes to Conclusion

¹ Paul du Gay, Stuart Hall, Linda Janes, Hugh Mackay, and Keith Negus, *Doing Cultural Studies: The Story of the Sony Walkman* (London: Sage, 1997), 69.

² Michael Palm, "Phoning It In: Self-Service, Telecommunications and New Consumer Labor" (dissertation, New York University, 2010), 8-9.

³ Palm, 102.

⁴ Ibid. 181-182.

⁵ Ibid. 6.

⁶ Ibid. 25-26.

⁷ For a comprehensive overview of neoliberalism, see David Harvey, *A Brief History of Neoliberalism* (Cambridge: Oxford University Press, 2007).

⁸ Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2006), 34.

⁹ Turner, 38.

¹⁰ Ibid. 56.

Bibliography

- Affrunti, Andy, Sr. *A Personal Journey: Fifty Years at Motorola*. Illinois: Motorola University Press, 1994.
- Allan, Francis. "The Public Telephone Call Office as a Factor in the Spread of Disease." *The Lancet* 27 (July 1907): 240-241.
- Antonelli, Paola. *Safe: Design Takes on Risk*. New York: The Museum of Modern Art, 2006.
- Aronson, Sidney. "The Lancet on the Telephone 1876-1975." *Medical History* 21 (1977): 69-87.
- Balzano, Quirino, Oscar Garay, and Thomas Manning. "Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones." *IEEE Transactions on Vehicular Technology* 44, no. 3 (August 1995): 390-403.
- Barry, Carol. "White-Collar Employment: I—Trends and Structure." *Monthly Labor Review* 84, no. 1 (January 1961): 139-147.
- Bauer, Sherie, and Pamela Mead. "After You Open the Box: Making Smart Products More Usable, Useful, and Desirable Through Interactive Technology." *Design Management Journal* 6, no. 4 (Fall 1995): 21-26.
- Beck, Ulrich. *Risk Society: Towards a New Modernity*. London: Sage, 1992.
- Bell, Iris. "An Olfactory-Limbic Model of Multiple Chemical Sensitivity Syndrome: Possible Relationship to Kindling and Affective Spectrum Disorders." *Biological Psychiatry* 32 (1992): 218-242.
- Bergqvist, Ulf, Lena Hillert, and Elizabeth Birke. *Electromagnetic Hypersensitivity and Health Risks from Electric and Magnetic Fields. Research Review and Evaluation. Final Report from the Task Group at the Swedish Council for Work Life Research*. Kinköping: Swedish Council for Work Life Research, 2000.
- Bijker, Wiebe and Trevor Pinch. "The Social Construction of Facts and Artifacts: Or How the Sociology of Science and The Sociology of Technology Might Benefit Each Other." In *The Social Construction of Technological Systems: New Directions in the*

Sociology and History of Technology, edited by Wiebe Bijker, Thomas Hughes, and Trevor Pinch. Cambridge: The MIT Press, 1987.

Bijsterveld, Karin. "Acoustic Cocooning: How the Car became a Place to Unwind." *The Senses and Society* 5, no. 2 (July 2010): 189-211.

Billings, John Shaw. *Ventilation and Heating*. New York: The Engineering Record, 1893.

boyd, danah. *It's Complicated: The Social Lives of Networked Teens*. New Haven: Yale University Press, 2014.

Brodeur, Paul. *The Zapping of America: Microwaves, Their Deadly Risk, and the Cover-up*. New York: Norton and Company, 1977.

Bull, Michael. "Investigating the Culture of Mobile Listening: from Walkman to iPod." In *Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies*, edited by Kenton O'Hara and Barry Brown, 131-149. Dordrecht: Springer, 2006.

Burgess, Adam. *Cellular Phones, Public Fears, and a Culture of Precaution*. New York: Cambridge University Press, 2004.

Burnham, John. *Accident Prone*. Chicago: University of Chicago Press, 2009.

Calhoun, George. *Digital Cellular Radio*. Norwood: Artech House, 1988.

Caramela, Edward J. "Salary Levels Continue Sharp Rise in White-Collar Occupations." *Monthly Labor Review* 92, no. 4 (April 1969): 46-48.

Casilli, Antonio. "A History of Virulence: The Body and Computer Culture in the 1980s." *Body & Society* 16, no. 4 (2010): 1-31.

Casson, Herbert. *The History of the Telephone*. Chicago: A.C. McClurg and Company, 1910.

Castells, Manuel, Mireia Fernández-Ardèvol, Jack Linchuan Qiu, and Araba Sey. *Mobile Communication and Society: a Global Perspective*. Cambridge: MIT Press, 2007.

Chan, Michael. "Mobile Phones and the Good Life: Examining the Relationships Among Mobile Use, Social Capital and Subjective Well-being." *New Media & Society* 20, no. 10 (December 2013): 1-18.

Chou, Ting-Jui, and Chih-Chen Ting. "The Role of Flow Experience in Cyber-Game Addiction." *Cyberpsychology and Behavior* 6 (2003): 663-675.

Clarke, Adele et al. "Biomedicalization: Technoscientific Transformations of Health, Illness, and U.S. Biomedicine." *American Sociological Review* 68 (April 2003): 161-194.

Cogdell, Christina. *Eugenic Design: Streamlining America in the 1930s*. Philadelphia: University of Pennsylvania Press, 2004.

Cohen, Ronald J. "The Threat to Radio Astronomy from Radio Pollution." *Space Policy* 5, no. 2 (1989): 91-93.

Davis, Devra. *Disconnect: The Truth About Cell Phone Radiation, What the Industry Has Done to Hide it, and How to Protect Your Family*. New York: Dutton, 2012.

Davis, Stephen Boyd. "Educating the Multimedia Designer." In *Becoming Designers: Education and Influence*, edited by Esther Dudley and Stuart Mealing. Portland: Intellect Books, 2000.

de Souza e Silva, Adriana, and Jordan Frith. *Mobile Interfaces in Public Spaces: Locational Privacy, Control, and Urban Sociability*. New York: Taylor and Francis, 2012.

Derbaix, Christian, and Michel Pham. "Affective Reactions to Consumption Situations: A Pilot Investigation." *Journal of Economic Psychology* 12 (1991): 325-355.

Desmet, Pieter. "To Love and Not to Love: Why Do Products Elicit Mixed Emotions?" In *Proceedings of the First International Conference on Design and Emotion*, edited by C.J. Overbeeke and Paul Hekkert, 67-74. Delft: Delft University of Technology, 1999.

Douglas, Mary. *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo*. Boston: ARK Paperbacks, 1984.

Dreyfuss Henry. *Designing for People*. New York: Simon and Schuster, 1955.

du Gay, Paul, Stuart Hall, Linda Janes, Hugh Mackay, and Keith Negus. *Doing Cultural Studies: The Story of the Sony Walkman*. London: Sage, 1997.

Duffy, John. *The Sanitarians: A History of American Public Health*. Urbana: University of Illinois Press, 1990.

Dumit, Joseph. *Drugs for Life: How Pharmaceutical Companies Define Our Health*. Durham: Duke University Press, 2012.

Dunne, Anthony, and Fiona Raby. *Design Noir: The Secret Life of Objects*. Basel: Birkhauser, 2001.

Edson, Cyrus. "The Microbe as a Social Leveller." *North American Review* 161 (1895): 421-426.

Emerson, William. "Electromagnetic Wave Absorbers and Anechoic Chambers Through the Years." *IEEE Transactions on Antennas and Propagation* 21, no. 4 (1973): 484-489.

English-Lueck, June Anne. *Being and Well-Being: Health and the Working Bodies of Silicon Valley*. Stanford: Stanford University Press, 2010.

Engs, Ruth. *The Progressive Era's Reform Movement: A Dictionary*. Westport: Praeger, 2003.

Falcon, Rod, and Leah Spalding. "Expanding Meanings of Health." *Institute for the Future Health Horizons Program SR-815 B* (Menlo Park: Institute for the Future 2004).

Farley, Tom. "Mobile Telephone History." *Teletronikk* 3, no. 4 (2005): 22-34.

Fischer, Claude. *America Calling: A Social History of the Telephone to 1940*. Berkeley: University of California Press, 1994.

Fischetti, Mark. "The Cellular Phone Scare." *IEEE Spectrum* (June 1993): 43-47.

Flexner, Jean, and Anna-Stina Ericson. "White-Collar Employment and Income: Trends and Current Status of Employment and Income for a Large but Diverse Group of Workers." *Monthly Labor Review* 79, no. 4 (April 1956): 401-409.

Fogg, BJ and Dean Eckles, editors. *Mobile Persuasion: 20 Perspectives on the Future of Behavior Change*. Stanford: Stanford Captology Media, 2007.

Fokkinga, Steven, and Pieter Desmet. "Darker Shades of Joy: The Role of Negative Emotion in Rich Product Experiences," *Design Issues* 28, no. 4 (Autumn 2012): 42-56.

Ford, Earl, Ajani Umed, Janet Croft, Julia Critchley, Darwin Labarthe, Thomas Kottke, Wayne Giles, and Simon Capewell. "Explaining the Decrease in U.S. Deaths from Coronary Heart Disease." *New England Journal of Medicine* 356 (2007): 2388-2398.

Forty, Adrian. *Objects of Desire: Design and Society Since 1750*. New York: Pantheon, 1986.

Foucault, Michel. *Discipline and Punish: The Birth of the Prison*. New York: Vintage, 1995.

Foucault, Michel. *The Birth of Biopolitics: Lectures at the Collège de France, 1978-79*, edited by Michel Senellart. New York: Palgrave Macmillan, 2008.

Fulton, Jane. "Physiology and Design: New Human Factors." *American Center for Design Journal* 7, no. 1 (1993): 7-8.

Fuster, Valentin. "Epidemiology of Cardiovascular Disease." *Promoting Cardiovascular Health in the Developing World: A Critical Challenge to Achieve Global Health*, edited by Valentin Fuster and Bridget Kelly. Washington, D.C.: The National Academies Press, 2010.

Galvin, Rose. "Disturbing Notions of Chronic Illness and Individual Responsibility: Towards a Genealogy of Morals." *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine* 6, no. 2 (2002): 107-137.

Giddens, Anthony. *The Consequences of Modernity*. Cambridge: Polity Press, 1990.

Gitelman, Lisa. *Always Already New: Media, History and the Data of Culture*. Cambridge: The MIT Press, 2006.

Gofman, John. *What We Do Know About Heart Attacks*. New York: Putnam, 1958.

Goggin, Gerard. *Cell Phone Culture: Mobile Technology in Everyday Life*. New York: Routledge, 2006.

Goldacre, Ben. "Why Don't Journalists Mention the Data?" *British Medical Journal* 334 (June 2007): 1249.

Gorman, Carma, editor. *The Industrial Design Reader*. New York: Allworth Press, 2003.

Granlund-Lind, Rigmor, and John Lind. *Black on White: Voices and Witnesses About Electro-Hypersensitivity, the Swedish Experience*. Stockholm: Mimers Brunn Kunskabsforlaget, 2004.

Green, Venus. *Race on the Line: Gender, Labor, and Technology in the Bell System, 1880-1980*. Durham: Duke University Press, 2001.

Haddon, Leslie. "Domestication and Mobile Telephony." In *Machines That Become Us: The Social Context of Personal Communication Technology*, edited by James E. Katz, 43-56. New Brunswick: Transaction Publishers, 2003.

Hallberg, Öjan and Gerd Oberfeld. "Will We All Become Electrosensitive?" *Electromagnetic Biology and Medicine* 25 (2006): 189-191.

Hallberg, Öjan, and Gerd Oberfeld. "Will We All Become Electrosensitive?" *Electromagnetic Biology and Medicine* 25 (2006): 189-191.

Harper, Richard. "People Versus Information: The Evolution of Mobile Technology." In *Human-Computer Interaction with Mobile Devices and Services Lecture Notes in Computer Science* 2795 (2003): 1-14.

Harvey, David. *A Brief History of Neoliberalism*. Cambridge: Oxford University Press, 2007.

He, Zi-Lin, Kwanghui Lim, and Poh-Kam Wong. "Entry and Competitive Dynamics in the Mobile Telecommunications Market." *Research Policy* 35 (2006): 1147-1165.

Henry Dreyfuss and Associates. *The Measure of Man: Human Factors in Design*. New York: Whitney Library of Design, 1967.

Herman, Judith. *Trauma and Recovery*. New York: Basic Books, 1992.

Hibbard, Angus. *Hello Goodbye: My Story of Telephone Pioneering*. New York: A.C. McClurg and Company, 1941.

Himmelstein, David, and Steffie Woolhandler. "Medicine as Industry: the Health-Care Sector in the United States." *Monthly Review* 35 (April 1984): 13-25.

Hinkle, Lawrence, Susan Carver, and Michael Steves. "The Frequency of Asymptomatic Disturbances of Cardiac Rhythm and Conduction in Middle-Aged Men." *The American Journal of Cardiology* 24 (November 1969): 629-650.

IEEE Standards Coordinating Committee 34. *IEEE 1528 Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices*. New York: The Institute of Electrical and Electronics Engineers, 1995.

Ihde, Don. *Existential Technics*. Albany: SUNY Press, 1983.

INTERPHONE Study Group. "Brain Tumour Risk in Relation to Mobile Telephone Use: Results of the INTERPHONE International Case-Control Study." *International Journal of Epidemiology* 39, no. 3 (June 2010): 675-694.

Ito, Mizuko, Daisuke Okabe, Misa Matsuda, editors. *Personal, Portable, Pedestrian: Mobile Phones in Japanese Life*. Cambridge: MIT Press, 2005.

Jackson, Dugald, William Crumb, and George Wilder. *Report on the Telephone Situation in the City of Chicago*. Chicago: Gunthrop-Warren, 1907.

Jemal, Ahmedin, Elizabeth Ward, Yongping Hao, and Michael Thun. "Trends in the Leading Causes of Death in the United States, 1970-2002." *Journal of the American Medical Association* 294, no. 10 (September 2005): 1255-1259.

John, Richard. *Network Nation: Inventing American Telecommunications*. Cambridge: Harvard University Press, 2010.

Johnston, Brian. "Cell Phones and Choice Architecture." *Injury Prevention* 15, no. 5 (October 2009): 289-290.

Jordanova, Ludmilla. "The Social Construction of Medical Knowledge." *Social History of Medicine* 7, no. 3 (1995): 361-381.

Julier, Guy. *The Culture of Design*. London: Sage Publications, 2007.

King, John Leslie, and Joel West. "Ma Bell's Orphan: U.S. Cellular Telephony, 1947-1996." *Telecommunications Policy* 26 (2002): 189-203.

Kingsbury, John E. *The Telephone and Telephone Exchanges: Their Invention and Development*. New York: Longmans, Green, and Company, 1915.

Klemmer, Edmund, and Karl Haig. "Weight and Balance of a New Telephone Handset." *Applied Ergonomics* 19, no. 4 (1988): 271-274.

Kotro, Tanja, and Mika Pantzar. "Product Development and Changing Cultural Landscapes: Is Our Future in 'Snowboarding?'" *Design Issues* 18, no. 2 (Spring, 2002): 30-45.

Kundi, Michael. "The Controversy about a Possible Relationship between Mobile Phone Use and Cancer." *Environmental Health Perspectives* 117, no. 3 (March 2009): 316-324.

Kunkel, Paul. *Digital Dreams: The Work of the Sony Design Center*. New York: Universe Publishing, 1999.

Lacohée, Hazel, Nina Wakeford, and Ian Person. "A Social History of the Mobile Telephone with a View of its Future." *BT Technology Journal* 21 (2003): 203-211.

Lasén, Amparo. "Mobile Sentimental Education: Attachment, Recognition, and Modulations of Intimacy." In *The Routledge Companion to Mobile Media*, edited by Gerard Goggin and Larissa Hjorth, 396-406. New York: Routledge, 2014.

Latour, Bruno. *Science in Action: How to Follow Scientists and Engineers Through Society*. Cambridge: Harvard University Press, 1987.

Latzke, Paul. *A Fight with an Octopus: Being the Story of a Great Contest that was Won Against Tremendous Odds*. Chicago: The Telephony Publishing Company, 1906.

Leveson, Nancy. *Engineering a Safer World: Systems Thinking Applied to Safety*. Cambridge: The MIT Press, 2011.

Lin, James. "Popularity, Funding for Health-Effect Research and Cell-Phone Addiction." *IEEE Antennas and Propagation Magazine* 52, no. 2 (April 2010): 164-166.

Ling, Rich, and Birgitte Yttri. "Hyper-coordination Via Mobile Phones in Norway." In *Perpetual Contact: Mobile Communication, Private Talk, Public Performance*, edited by

James E. Katz and Mark Aakhus, 139-169. Cambridge: Cambridge University Press, 2002.

Ling, Richard. *The Mobile Connection: The Cell Phone's Impact on Society*. New York: Morgan Kaufman, 2004.

Lipson, Juliene. "Multiple Chemical Sensitivities: Stigma and Social Experiences." *Medical Anthropology Quarterly* 18, no. 2 (2004): 200-213.

Macdonald, Alastair. "Developing a Qualitative Sense." *Human Factors in Consumer Products*, edited by Neville Stanton, 175-191. London: Taylor and Francis, 1998.

Mahmud, Nadim et al. "The Cell Phone Problem/Solution." *Journal of Environmental Health* 76, no. 6 (January/February 2014): 140-144.

Mahmud, Nadim, Isaac Holeman, Kenny Puk, Regina Lam, and Damian Lee. "The Cell Phone Problem/Solution." *Journal of Environmental Health* 76, no. 6 (January/February 2014): 140-144.

Malin, Brenton. "Mediating Emotion: Technology, Social Science, and Emotion in the Payne Fund Motion-Picture Studies." *Technology and Culture* 50 (April 2009): 366-390.

Martin, W.H. "The Public Health Aspect of the Telephone." *Bell Telephone Quarterly* (October 1937): 229-243.

Marvin, Carolyn. *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century*. New York: Oxford University Press: 1988.

May, Elaine Tyler. *Homeward Bound: American Families in the Cold War Era*. New York: Basic Books, 1988.

McCann, John. "A Strategy to Improve Executive Health." *Advanced Management Journal* (Spring: 1977): 33-37.

McClellan, Stuart. "'The Illness is Part of the Person': Discourses of Blame, Individual Responsibility and Individuation at a Centre for Spiritual Healing in the North of England." *Sociology of Health & Illness* 27, no. 5 (2005): 628-648.

McKenzie, Shelly. *Getting Physical: The Rise of Fitness Culture in America*. Lawrence: University of Kansas Press, 2013.

Miekle, Jeffrey. *Twentieth Century Limited: Industrial Design In America 1925-1939*. Philadelphia: Temple University Press, 1979.

Mild, Kjell Hansson, Mike Repacholi, Emilie van Deventer, Paolo Ravazzani, editors. *Electromagnetic Hypersensitivity, Proceedings of the World Health Organization International Workshop on EMF Hypersensitivity*. Geneva: World Health Organization, 2006.

Mittell, Jason. "Audiences Talking Genre: Television Talk Shows and Cultural Hierarchies." *Journal of Popular Film and Television* 31, no. 1 (January 2003): 36-46.

Moore, Alfred, and Jack Stilgoe. "Experts and Anecdotes: The Role of 'Anecdotal Evidence' in Public Scientific Controversies." *Science, Technology, & Human Values* 34, no. 5 (September 2009): 654-677.

Murphy, Michelle. "The 'Elsewhere Within Here' and Environmental Illness; or How to Build Yourself a Body in a Safe Space." *Configurations* 8, no. 1 (Winter 2000): 87-120.

Nickles, Shelley. "More Is Better: Mass Consumption, Gender, and Class Identity in Postwar America." *American Quarterly* 54, no. 4 (December 2002): 581-622.

No author. "Executive Health Programs: A Survey (For the Informed Executive)." *Management Review* 43, no. 11 (November 1954): 707-708.

Oberlander, Jonathan. "The Political History of Medicare." *Journal of the American Society on Aging* 39, no. 2 (Summer 2015): 121-124.

Oliver, John Patrick, Chung-Kwang Chou, and Quirino Balzano. "Testing the Effectiveness of Small Radiation Shields for Mobile Phones." *Bioelectromagnetics* 24 (2003): 66-69.

Palm, Michael. "Phoning It In: Self-Service, Telecommunications and New Consumer Labor." Dissertation, New York University, 2010.

Park, Robert. "The Seven Warning Signs of Voodoo Science." *Think* (Spring 2003): 33-42.

Patrick, Kevin, William Griswold, Fred Raab, and Stephen Intille. "Health and the Mobile Phone." *Journal of Preventive Medicine* 35, no. 2 (2008): 177-184.

Petrakis, Harry Mark. *The Founder's Touch: The Life of Paul Galvin of Motorola*. New York: McGraw-Hill, 1965.

Petrie, Keith et al. "Thoroughly Modern Worries: The Relationship of Worries About Modernity to Reported Symptoms, Health and Medical Care Utilization." *Journal of Psychosomatic Research* 51 (2001): 396-397.

Pinheiro, John. "AT&T Divestiture and the Telecommunications Market." *Berkeley Technology Law Journal* 2, no. 2 (September 1987): 303-355.

Portwood-Stacer, Laura. "Media Refusal and Conspicuous Non-Consumption: The Performative and Political Dimensions of Facebook Absention." *New Media and Society* 15, no. 7 (2012): 1041-1057.

Rabinbach, Anson. *The Human Motor: Energy, Fatigue, and the Origins of Modernity*. New York: Basic Books, 1990.

Rappaport, Theodore. "The Wireless Revolution." *IEEE Communications Magazine* (November 1991): 52-71.

Redström, Johan. "Towards User Design? On the Shift from Object to User as the Subject of Design." *Design Studies* 27 (2006): 123-139.

Reed, Lori. "Domesticating the Personal Computer: The Mainstreaming of a New Technology and the Cultural Management of a Widespread Technophobia, 1964-." *Critical Studies in Media Communication* 17, no. 2 (June 2000): 159-185.

Reynard, David, and Anthony Bernardi. *Call Waiting: The Authorized Susan Reynard Story*. Reynard and Bernardi, 2013.

Robinson, Rick. "What to Do With a Human Factor: A Manifesto of Sorts." *American Center for Design Journal* 7, no. 1 (1993): 62-74.

Ronell, Avital. *The Telephone Book: Technology, Schizophrenia, Electric Speech*. Lincoln: University of Nebraska Press, 1989.

Rosenau, Milton, and George McCoy. "Hygiene and Public Health." *The American Journal of the Medical Sciences* 158, no. 6 (December 1919): 911-914.

Rosenberg, Charles. *No Other Gods: On Science and American Social Thought*. Baltimore: Johns Hopkins University Press, 1997.

Rothstein, William. *Public Health and the Risk Factor: A History of an Uneven Medical Revolution*. Rochester: University of Rochester Press, 2008.

Ryan, Zoë. "Safer by Design." *Blueprint* 74 (January 2006): 74.

Schiller, Dan. "The Hidden History of U.S. Public Service Telecommunications, 1919-1956." *Info* 9, no. 2-3 (2007): 17-28.

Schulke, Daniel. "The Regulatory Arms Race: Mobile-Health Applications and Agency Posturing." *Boston University Law Review* 93 (2013): 1699-1752.

Schüll, Natasha Dow. *Addiction By Design: Machine Gambling in Las Vegas*. New Jersey: Princeton University Press, 2012.

Seago, Alex, and Anthony Dunne. "New Methodologies in Art and Design Research: The Object as Discourse." *Design Issues* 15, no. 2 (1999): 11-17.

Selwyn, Neil. "Apart From Technology: Understanding People's Non-Use of Information and Communication Technologies in Everyday Life." *Technology in Society* 25 (2003): 99-116.

Siegel, Greg. "The Accident Is Uncontainable/The Accident Must Be Contained: High-Speed Cinematography and the Development of Scientific Crash Testing." *Discourse* 30, no. 3 (Fall 2008): 348-372.

Soneryd, Linda. "Deliberations on the Unknown, the Unsensed, and the Unsayable? Public Protests and the Development of Third-Generation Mobile Phones in Sweden." *Science, Technology, & Human Values* 32, no. 3 (May 2007): 287-314.

Spigel, Lynn. *Make Room For TV: Television and the Family Ideal in Postwar America*. Chicago: University of Chicago Press, 1992.

Stanley, R.S. "Dangers of Infection Which Lurk in the Telephone." *Memphis Medical Monthly* 24 (1904): 634-640.

Starr, Paul. *The Social Transformation of American Medicine: The Rise of a Sovereign Profession and the Making of a Vast Industry*. New York: Basic Books, 1982.

Steneck, Nicholas. *The Microwave Debate*. Cambridge: MIT Press, 1984.

Sterling, Bruce. "Safe: Design Takes on Risk." *Artforum* (September 2005): 116.

Sterne, Jonathan. *The Audible Past: Cultural Origins of Sound Reproduction*. Durham: Duke University Press, 2003.

Sterne, Simon. *Speech of Simon Sterne, Esq., before the Assembly Committee on General Laws, January 30, 1889, in Favor of Bill Limiting Telephone Charges*. New York: George F. Nesbitt and Co., 1889.

Stewart, Ethelbert, and Charles Baldwin. *Investigation of Telephone Companies*. Washington, D.C: United States Government Printing Office, 1910.

Stöckenius, Sandra, and Peter Brugger. "Perceived Electrosensitivity and Magical Ideation." *Perceptual and Motor Skills* 90 (2000): 899-900.

Stungo, Naomi, and Marcus Field. "Product Overload: Designers Fight Back." *Blueprint* (October 1997): 37-40.

Tanne, Janice Hopkins. "Safe: Design Takes on Risk." *British Medical Journal* 331 (November 2005): 1087-1088.

Ter Meulen, Ruud and Hans Maarse. "Increasing Individual Responsibility in Dutch Healthcare: Is Solidarity Losing Ground?" *Journal of Medicine and Philosophy* 33 (2008): 262-279.

Thackara, John. *In the Bubble: Designing in a Complex World*. Cambridge: The MIT Press, 2005.

Tomes, Nancy. *The Gospel of Germs: Men, Women, and the Microbe in American Life*. Cambridge: Harvard University Press, 1998.

Turkle, Sherry. "Always-On/Always-on-You: The Tethered Self." In *Handbook of Mobile Communication Studies*, edited by James E. Katz, 121-138. Cambridge: MIT Press, 2008.

Turkle, Sherry. *Alone Together: Why We Expect More from Technology and Less from Each Other*. New York: Basic Books, 2011.

Turner, Fred. *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*. Chicago: University of Chicago Press, 2006.

U.S. Department of Health, Education, and Welfare. *Vital Statistics of the United States, 1960, Volume 2, Mortality, Part A*. Washington, D.C.: Government Printing Office, 1963.

U.S. Department of Health, Education, and Welfare. *Vital Statistics of the United States, 1971, Volume 2, Mortality, Part A*. Washington, D.C.: Government Printing Office, 1963.

U.S. Department of Health, Education, and Welfare. *Vital Statistics of the United States, 1971, Volume 2, Mortality, Part A*. Washington, D.C.: Government Printing Office, 1983.

United States Council on Wage and Price Stability. *The Complex Puzzle of Rising Health Care Costs: Can the Private Sector Fit it Together?* Washington, D.C.: Government Printing Office, 1976.

Urry, John. *Mobilities*. Cambridge: Polity Press, 2007.

Vincent, Jane, and Leopoldina Fortunati. "The Emotional Identity of the Mobile Phone." In *The Routledge Companion to Mobile Media*, edited by Gerard Goggin and Larissa Hjorth, 312-319. New York: Routledge, 2014.

Wacjman, Judy. *Feminism Confronts Technology*. University Park: Pennsylvania State University Press, 1991.

Walker, John. *Design History and the History of Design*. New York: Pluto Press, 1989.

Wallace, Denise et al. "Do TETRA (Airwave) Base Station Signals Have a Short-Term Impact on Health and Well-Being? A Randomized Double-Blind Provocation Study." *Environmental Health Perspectives* 118, no. 6 (2010): 735-741.

Whitaker, Robert. *Mad in America: Bad Science, Bad Medicine, and the Enduring Mistreatment of the Mentally Ill*. New York: Basic Books, 2002.

Whorton, James. *Crusaders for Fitness: The History of American Health Reformers*. Princeton: Princeton University Press, 1982.

Winner, Langdon. *The Whale and the Reactor*. Chicago: University of Chicago Press, 1986.

World Telecommunication Development Report 1999: Mobile Cellular, Executive Summary. Geneva: International Telecommunication Union, 1999.

Zuckerman, Stephen, and Joshua McFeeters. "Recent Growth in Health Expenditures," *The Commonwealth Fund Commission on a High Performance Health System* 914 (March 2006): 1-14.