What Cleanliness Smells Like: An Environmental History of Doing the Wash, 1842-1996

By

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Introduction: To Make a House a Home

"Cold as Greenland today and such a searching wind. I've had trying times this Monday, come near freezing in putting out clothes."[1]

— Francis R. Paige, Diary, 1862

Introduction

Nature crept, scuttled, oozed, and seeped into nineteenth-century households. In New England, it arrived on doorsteps as mice and chipmunks, in eaves as squirrels and bats, and through chinks in walls as gusts of snow. In the U.S. South, it spilled over windowsills as red dirt and beat down as sun through gaps in tar paper. In the territories of the Rocky Mountain West, it scuttled in as wolf spiders; in California, it crept through as black mold. Worse, sometimes nature did not arrive. The creek froze over, ran dry, or filled in with mud. The roof rotted. The cow did not produce. Nature infused nineteenth-century domestic spaces; households were made from it.[2]

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[1] Francis R. Paige, Diary entry, January 13, 1862; Cairns Collection of American Women Writers, Memorial Library, University of Wisconsin-Madison.

[2] Domestic advice literature is one of multiple places I look for discussions of ecological management practices in nineteenth-century households. I enumerate other sources—diaries, letters, oral testimonies, and also the material record—throughout this dissertation, pointing to these resources as expanding our critical understanding of domestic advice manuals. See Catharine Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845); Catharine Beecher, *The American Woman's Home, or, Principles of Domestic Science* (New York: J.B. Ford and Company, 1869); Leslie Eliza, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey and Hart, 1840); Leslie Eliza, *Directions for Cookery, In its Various Branches* (Philadelphia: Carey and Hart, 1840); Sarah Josepha Buell Hale, *The workwoman's guide: containing instructions to the inexperienced in cutting out and completing those articles of wearing apparel, &c. which are unusually made at home: also, explanations on upholstery, straw-platting, bonnet-making, knitting, &c.*, (London: Simpkin, Marshall, and Co., 1838); Andrew Jackson Downing and Alexander Anderson, *The architecture of country houses: including designs for cottages, farm houses, and villas, with remarks on interiors, furniture, and the best modes of warming and ventilating, with three hundred and twenty illustrations* (Philadelphia: G.S. Appleton, 1850); William A. Alcott, *The Young Woman's Guide to Excellence* (New York: Clark, Austin & Smith, 1852); Mrs. Cornelius, *The young housekeeper's friend, or, A guide to domestic economy and comfort* (Boston: Tappan and Whittemore, 1855). On domestic advice guides as a genre that historians must regard with caution, see Barbara Ehrenreich and Deirdre English, *For Her Own Good: 150 Years of Experts' Advice*

Keeping house did not mean excising the non-human from a space; it merely meant asserting some order over ecological unruliness. The work of ordering nature *was* domestic work. Testimonies from nineteenth-century homemakers reveal the flimsiness of social standards like cleanliness in the face of seasonal ecological flux. "The first sound on waking this morning was the rain pattering on the blinds and the south wind blowing like mad … done my washing but didn't hang out my cloths [sic]," Amanda Welch Beach opined in April 1870. For Beach, the cold temperatures and precipitation kept her from starching and ironing garments, a practice that homemaking guides advised should be weekly habit. By two months later, Beach was hampered by a dearth of precipitation, rather than a deluge. "[B]eing out of soft water I only washed a little with well water," she wrote in her diary in June 1870. Summertime meant washing fewer garments, and with less frequency.[3]

Ecological heterogeneity generated social problems. Domestic standards like cleanliness were intended to be uniform, unchanging across time of year or region of the new nation. Despite exhortations from at least one New England Methodist minister that "cleanliness is indeed next to Godliness," it would have been more accurate to say that, by the 1840s, *habit* was the closest thing to moral rectitude. Advice guides, sermons, domestic circulars, and even decorative cross-stitches urged homemakers to follow a schedule: Monday for washing; Tuesday for ironing; Wednesday and Thursday for mending, folding, and putting away of linens. "There is no one thing more necessary to a housekeeper in performing her varied duties, than *a habit of system and order*," urged Catharine Beecher, mid-nineteenth century author whose advice guides

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to Women (Garden City, NY: Anchor Press, 1978); Sarah A. Leavitt, *From Catharine Beecher to Martha Stewart: A Cultural History of Domestic Advice* (Chapel Hill, NC: University of North Carolina Press, 2002).

[3] Amanda Welch Beach, "Monday [May] 30, 1870" diary entry, Cairns Collection of American Women Writers, Cairns Manuscripts—Beach.

were reprinted more than twenty times across her lifetime.[4] A well-run house, Beecher reminded readers, was distinguished from a poorly-run one by a habit of system and order enforced by the homemaker and proceeding unceasingly.

This dissertation focuses on the pursuit of a system of order, that which U.S. homemakers, domestic workers, and commercial chemists would call cleanliness.[5] The project spans 150 years. Beginning in the 1840s, social critics succeeded at conflating cleanliness with the work of nationhood, particularly national belonging. Clean linens had a specific sensory definition: they were odorless; bleached white; starched stiff; and a day-long labor to create. Respectable citizens of the new nation demonstrated their belonging by owning property, working land, participating in civic life—and wearing clean garments. Washing was the "peculiar responsibilit[y] of American women," exhorted one domestic advice author. American women, she asserted, "should feel an interest in the support of the democratic institutions of their Country."[6] By this logic, the work of cleaning *was* the work of nation building.[7]

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[4] Beecher, *The American Woman's Home* (1869), 222, emphasis original. On the reprinting and reception of Beecher's multiple works, see Kathryn Kish Sklar, *Catharine Beecher: A Study in American Domesticity* (New York: W.W. Norton & Company, 1973).

[5] I mirror the language of my historical actors in specific chapters, for example using the term "sanitation" when discussing the rise and fall of commercial steam laundries, since that term—with a biological and microbial understanding publicly, and a coded racist undertone—was widely used by steam laundry owners. Alternate terminology like "hygiene," "freshness," and "daintiness" (the latter an explicitly marketing-born term) when the historical context warrants. For clarity in the whole project, however, I consistently return to the term "cleanliness" to refer to the contested pursuit of a system of social and ecological order.

[6] Catharine Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845), 25. The full first chapter of Beecher's work is titled "The Peculiar Responsibilities of American Women." Beecher discusses more than domestic work and support for a new national democracy as among these peculiar responsibilities; she also describes an individual's woman's choosing subordination via choosing marriage as helping to create a system of laws that supported new democracy. See Beecher, "Chapter One. The Peculiar Responsibilities of American Women," pp. 25-38.

[7] Kathryn Kish Sklar, *Catharine Beecher: A Study in American Domesticity* (New York: W.W. Norton & Company, 1973); Jeanne Boydston, *Home and Work: Housework, Wages, and the Ideology of Labor in the Early Republic* (New York: Oxford University Press, 1994); Jeanne Boydston, "The Woman Who Wasn't There: Women's Market Labor and the Transition to Capitalism in the United States," *Journal of the Early Republic* 16, no. 2 (Summer 1996): 183-206. The ideal of domesticity was closely tied to the work of empire-building, particularly in the North American west.

Despite idealization, in practice nineteenth-century cleanliness standards butted up against the messy non-human pervading the household: rancidity-prone fat, slippery hard water, moldering starch, and a lack of clear drying days were some sources of difficulty. July cleanliness was significantly less starched and ironed than that had in November; New England cleanliness stank of ox bile, or wood smoke, unless conditions permitted sufficient rinsing and outdoor hanging; Dakota Territory cleanliness smelled of fragrant soapwort only when the plant flourished. The habituation and homogeneity that, by the 1840s, domestic advice authors were insisting were hallmarks of cleanliness—across seasons, across region of the new country—had become standards precisely because they were so hard to come by.[8]

Over the century-and-a-half that followed, a diverse cast of actors struggled to bring other cleaning norms into widespread social acceptance. These actors included homemakers; domestic workers; appliance manufacturers; advertising agents; and public health officials.[9] They also

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See Amy Kaplan, "Manifest Domesticity" *American Literature* 70 (Sept. 1998): 581-606; *Cultures of United States Imperialism*, Amy Kaplan and Donald E. Pease, eds., (Durham: Duke University Press, 1993); Laura Wexler, *Tender Violence: Domestic Visions in an Age of U.S. Imperialism* (Chapel Hill: University of North Carolina Press, 2000); Mary P. Ryan, *Empire of the Mother: American Writing about Domesticity, 1830-1860* (New York: Institute for Research in History and Haworth Press, 1982).

[8] Environmental historians have begun historicizing sensory experience and placing domestic work in an ecological context. See Conevery Bolton Valenčius, *The Health of the Country: How American Settlers Understood Themselves and Their Land* (New York: Basic Books, 2002)*;* Virginia Scharff, *Twenty Thousand Roads: Women, Movement, and the West* (Berkeley: University of California Press, 2003); Andrea G. Radke-Moss, "'Can She Not See and Hear, and Smell and Taste?': Women Students at Coeducational Land-Grant Universities in the American West, 1868-1917," (Ph.D. dissertation, University of Nebraska--Lincoln, 2002).

[9] In this dissertation, I distinguish between homemakers and domestic workers based on their commercial status: the former unpaid, the latter enslaved or poorly paid. I acknowledge that I use the term 'homemaker, itself an early twentieth-century construction, ahistorically. This is for reasons of clarity. Throughout the dissertation I use 'homemaker' to refer to individual women doing the work of maintaining a household. In idealized form, homemakers were white, middle or upper-middle class women with high school educations. It is important to note that this understanding of who a homemaker "was" would shift across the twentieth century, particularly with the rise of domestic science programs offering advanced degrees, and as the class-based connotations of "homemaker" made the term an appealing tool for attracting interest as extension agents sought to enroll rural and poorer women in modernizing efforts in less resourced regions of the country. See Sarah Stage and Virginia B. Vincenti, *Rethinking Home Economics Women and the History of a Profession* (Ithaca: Cornell University Press, 1997). I also use the term "domestic worker" ahistorically, in that its nineteenth-century analog included both "house slave" and "servants." Throughout, I use it to refer to individuals entering a household that was not their own to do work for an employer. Informing my thinking about the term "domestic worker," and its contemporary political resonance, are Ai-Jen Poo

included commercial chemists—thousands of them. As early as the 1850s, textile manufacturing firms began employing chemists, largely to guide the washing of raw materials and the dyeing of spun thread. By the late nineteenth century, chemistry had gained recognition as a profession; a growing number of companies had in-house chemists on retainer.[10]

Early twentieth-century chemists found positions at soap manufacturers like Procter & Gamble, Lever Brothers, and Colgate-Palmolive-Peet; at textile firms like the American Viscose Company and Courtaulds; and at raw material suppliers like DuPont.[11] Though household goods were not the sole purview of their research efforts, this growing cadre of "cleanliness professionals" strove to redefine cleanliness in terms of new household technologies for purchase: powdered soaps, synthetic fabrics, water softeners, bleaching aids, and stain removers. But what they were inventing *towards* remained itself a source of debate. The social definition of cleanliness

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with Ariane Conrad, *The Age of Dignity: Preparing for the Elder Boom in a Changing America* (New York: The New Press, 2015); Catherine Ceniza Choy, *Empire Of Care: Nursing and Migration in Filipino American History* (Durham: Duke University Press, 2003); Nancy Folbre and Paula England, *"The cost of caring," Annals of the American Academy of Political and Social Science; Special Issue, Emotional Labor in the Service Economy* 561, (January 1999): 39-51; Arlie Russell Hochschild, *The Managed Heart: Commercialization of Human Feeling* (Berkeley: University of California Press, 1983).

[10] Philip Ball, *Bright Earth: Art and the Invention of Color* (Chicago: University of Chicago Press, 2003); *Perkin Centenary, London: 100 Years of Synthetic Dyestuffs* (New York: Pergamon Press, 1958).

[11] An unfortunate constraint of this project, chosen in order to make the research demands manageable in the dissertation phase, is the assertion of a national focus. Raw materials, expertise, labor, and branded domestic technologies traveled internationally beginning in the 1890s. I try to make apparent the global aspect to this story especially in Chapter Four ("Polyester") and Chapter Five ("Detergents"), where I acknowledge the international construction of cleanliness standards by describing the European origin of new soap-making technologies, the African and Pacific sourcing of both raw materials and expertise, and the important presence of German chemical expertise in shaping detergency as a research agenda. However, cleanliness standards were often shaped by a national context, and played out at a national scale, even into the twentieth century. This was both because of the nation-building origins of debates over the meaning of cleanliness, and because advertising agents conceived of markets in nationalist terms *especially* as corporations sought to expand internationally in the second half of the twentieth century. See Davis Dyer, Frederick Dalzell, and Rowena Olegario, *Rising Tide: Lessons from 165 Years of Brand Building at Procter & Gamble* (Boston: Harvard Business School Press, 2004); Geoffrey Jones, *Renewing Unilever: Transformation and Tradition* (New York: Oxford University Press, 2005); Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change*, Vol. 1 (London: Cassell & Company Ltd, 1954); Donald Cuthbert Coleman, *Courtaulds: An Economic and Social History, Vols. 1-3* (Oxford: Clarendon Press, 1969-1980); C. H. A. Ward-Jackson, *History of Courtaulds; an Account of the Origin and Rise of the Industrial Enterprise of Courtaulds Limited and of Its Associate the American Viscose Corporation* (London: Printed at the Curwen Press for private circulation, 1941); Whirlpool Corporation, *100 Years at a Glance* (Benton Harbor, M.I.: Whirlpool Corporation, 2011).

remained unstable well into the twentieth-century rise of commercial chemistry. Were clean linens scented or odorless? Soft or stiff? The product of paid labor, or best created by a homemaker herself? Such questions endured as sources of debate. For commercial chemists, however, research was motivated by more motivation than securing a single answer to this question. Increasing company profit margins; decreased company bottom lines; and convincing company executives to expand investment into chemical research over advertising functioned to motivated ongoing product development.[12]

Not all cleaning regimes in the 1910s and 1920s were chemical. Mending, darning and redyeing; boiling of garments; and home dry-cleaning with cornmeal or gasoline—such practices evidenced the continued expertise wielded by domestic workers. But by the 1930s, with the federally-backed push for rural electrification, extended lines of consumer credit, and the popularization of in-home washing machines, commercial chemical definitions of cleanliness ascended. By the 1950s, cleanliness had been recast in definitively branded terms. "Everybody used that Oxygel soap" recalled Mary Robinson, textile worker from Wetumpka, Alabama.[13] By the 1990s, a full 150 years after the solidification of "national" cleanliness norms under Catharine Beecher, commercial chemists had replaced diffused authority with almost singular power to define the meaning of cleanliness. Their definitions of cleanliness operated in branded terms.

Late twentieth-century cleanliness was characterized by stark sensory transformation. Nineteenth-century social norms dictated that linens be odorless, starched stiff, bleached white,

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[12] David Hounshell and John Kenly Smith, Jr., *Science and the Corporate Strategy: Du Pont R&D, 1902-1980* (Cambridge: Cambridge University Press, 1988); *Chemical Sciences in the 20th Century: Bridging Boundaries*, Carsten Reinhardt, ed., (Weinheim, Germany: Wiley-VCH, 2001).

[13] Mary Robinson & Mildred McEwen, interview with Fran Leeper Buss, May 23,1980 in Box 5, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Wisconsin Historical Society: Mss 809 2M/44/F3-4.

and laborious to create. Late twentieth-century clean garments were fragrant; soft; brightly colored; and conveniently made so. Nineteenth-century odorless laundry soaps had been replaced by late twentieth-century detergents featuring boutique encapsulation technologies.[14] The day-long nineteenth-century labor of starching and ironing stiffness into fabrics had been replaced by fabric softeners, garment elasticity, and shape-holding fibers.[15] Nineteenth-century norms emphasizing bleached whiteness had been replaced by garments steeped in stay-fast and fluorescent synthetic dyes.[16] The multi-day labor of doing wash had been rendered a mere hour-long chore.

It is on this sensory transformation that my dissertation focuses most. A 150-year contest over who should do the wash, and how, reveals the multiple actors who sought to translate competing social norms into a stable sensory expectation called cleanliness. Contests over cleanliness were undeniably debates over social order: over appropriate gender role (could respectable men do the wash if employed in a steam plant?); over socioeconomic and racial position (could washing machines help excised paid Black help from the household?); and over expertise (were brand managers or commercial chemists more deserving of additional corporate investment?). Above all, each contest over cleanliness demonstrated the endurance of messy non-

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[14] Michael McCoy, "Soaps and Detergents," *Chemical and Engineering News* 82 no. 4 (Jan. 26, 2004): 23-28; W. Herman de Groot, *Sulphonation Technology in the Detergent Industry* (Dordrecht: Kluwer Academic Publishers, 1991); *Flavor Encapsulation,* Sara J. Risch and Gary A. Reineccius, eds. (Washington, D.C.: American Chemical Society, 1988); Asaji Kondo, *Microcapsule Processing and Technology,* J. Wade Van Valkenburg, ed, and transl. (New York : Marcel Dekker, 1979).

[15] Kaori O'Connor, *Lycra: How a Fiber Shaped America* (New York: Routledge, 2011); Susannah Handley, *Nylon: The Story of a Fashion Revolution* (Baltimore, M.D.: Johns Hopkins University Press, 1999).

[16] Regina Lee Blaszczyk, *The Color Revolution* (Cambridge, Mass.: MIT Press, 2012).

human nature in the household, as each contest constituted an attempt to transform ecological messiness into acceptable social order.[17]

Studying the history of a single domestic task reveals a great deal about the impact of 150-years of industrialization. This study primarily asks not how industrialization shaped upstream or downstream ecosystems, nor only on how it remade craft work into factory drudgery. Instead, my research invites readers to consider what industrialization has meant for nature right where we live: in our homes and in our bodies.

Why Laundry? Establishing the House as a Workscape

Washing, of all domestic tasks, comes with key attribute: the ubiquity and laboriousness of

[17] This framing builds explicitly on the work of anthropologist Mary Douglas, anthropologist known for her 1966 study of pollution as social signifier. In that work, influenced by the New Social History but written in a social science tradition of theory-building, she concluded that seemingly biological categories like "clean" or "polluted" revealed as much about a given dominant culture's perception of correct power relations and their opposite, perverse power relations, than they did about some quality of dirtiness or clean-ness inhering to a particle itself. In doing so, Douglas reframed cleaning as work of re-creating expected order, both social and environmental. For her, as in this dissertation, the two were inseparable. See Mary Douglas, *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo* (London: Routledge & K. Paul, 1966). For the purposes of this dissertation, I draw on Douglas's conception of dirt as "matter out of place" and cleaning as an act of removing "Dirt [that] offends against order." For an earlier sociological approach to the topic of cleanliness that anticipated Douglas's work and Michel Foucault's notion of biopolitics, see Norbert Elias's work from 1939, *Über den Prozeß der Zivilisation*. The work was first translated to English and republished in 1969, three years after Douglas had published her work. Norbert Elias, *The Civilizing Process,* (Oxford: Blackwell, 1969), esp. *Volume I: The History of Manners.* I strive to complicate Douglas's conception of power relations. Her work, written before the popularization of Michel Foucault's conception of "biopower," power adhered to discrete individuals and was enacted as a form of behavioral modification or control. In this dissertation, domestic workers and chemists both act as intermediaries of non-human ingredients like spoilage-prone fat and curd-forming hard water. Though the rise of industrial cleaning products eroded the capacity of domestic workers to shape cleanliness norms at a lived and household scale, any assumed simple power relation between genders, or between human and non-human, grows more complicated when examined through the lens of unruly natural pervading flimsily domesticated space. See also William Connolly, "The 'New Materialism' and the Fragility of Things,' *Millennium — Journal of International Studies* 41 (2013): 401. DOI: 10.1177/0305829813486849; William Connolly, *The Fragility of Things: Self-Organizing Processes, Neoliberal Fantasies, and Democratic Activism* (Durham: Duke University Press, 2013); Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham: Duke University Press, 2010); Ian Bogost, *Alien Phenomenology, Or, What It's Like to Be a Thing* (Minneapolis: University of Minnesota Press, 2012); Bill Brown, *Things* (Chicago: University of Chicago Press, 2004). The philosopher William Connolly argues for reconceptualizing individual human agency as instead a series of entanglements. To demonstrate the importance of such a reconception, he focuses on the unit of the individual human body. "Each human carries about two pounds of bacteria around with it, and many of these bacteria are enfolded into our tissues in ways that help us to define our capacities and functions." This biological reality points out the fuzziness—"the manifold *entanglements*"—that modern science has permitted us to see in our existing models of individual human agency.

the work meant that its doers generated documents. Receipts, letters, diaries, and material culture offer window into the nineteenth-century worlds inhabited by washerwomen writing little about the smell of childbirth or the feel of sun through a new glass window but amply about the unruly non-human showing up in the washtub. That is, the difficulty of the work make it a key place to learn what nineteenth-century homemakers and domestic workers knew, understood, thought about, and did to manage the natural world.[18]

Commercial chemists and appliance manufacturers also generated documents in their drive to reimagine domestic life. Scientific articles, patents, trade journals, and advertisements offer window into expanding corporate power across the twentieth century. Though executives held close their priorities, chemists writing to peers across the Atlantic openly discussed topics like detergency, color retention, tensile strength—and ecological hindrances to redefining cleanliness in branded terms. To do justice to the full history of laundry work, my dissertation draws on each of these set of documents. But to center the perspective of domestic workers themselves, I start and end each chapter with the words of workers themselves.

While the history of domestic work might seem more obviously a topic for labor or cultural historians, this project explicitly borrows tools from environmental history. We cannot understand the history of domestic work, this project suggests, without writing about it in its full

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[18] Numerous scholars serve as examples of centering domestic worker voices. These researchers come from a variety of academic statuses and political persuasions, a feature of our shared work that I value. As relevant examples, see: Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996); Rebecca Sharpless, *Cooking in Other Women's Kitchens: Domestic Workers in the South, 1865-1960* (Chapel Hill: University of North Carolina Press, 2010); Katherine van Wormer, David W. Jackson III, and Charletta Sudduth, *The Maid Narratives: Black Domestics and White Families in the Jim Crow South* (Baton Rouge: Louisiana State University Press, 2012); Elizabeth L. O'Leary, *From Morning To Night: Domestic Service in Maymont House and the Gilded Age South* (Charlottesville: University of Virginia Press, 2003); *The Impact of Her Spirit: An Oral History,* Georgia Hoberg, Priscilla Hargraves, Betty Pipkorn, Ruth Dehne, and Lucille Storm, eds., of the Wisconsin Extension Homemakers Council, Inc. (River Falls, Wisconsin: River Falls Journal, 1989); *Voices of American Homemakers: An oral history project of the National Extension Homemakers Council,* Eleanor Arnold, ed., (National Extension Homemakers Council, 1985); *Dignity: Lower Income Women Tell of Their Lives and Struggles: Oral Histories,* Fran Leeper Buss, compiler, (Ann Arbor: University of Michigan Press, 1985).

ecological context. I build on the work of past historians who have historicized the social norm of cleanliness. As one concrete example: existing histories of cleanliness explore how nineteenth-century cleanliness standards were inflated via the popularization of twentieth-century domestic technologies. These historians are right in showcasing the household appliances, federal financing programs, and crises of masculinity that defined middle-class respectability increasingly in terms of sparkling toilet bowls, and in-unit washing machines. But a through-line of this scholarship has been an assumption that nineteenth-century cleanliness norms coalesced around a single standard, and that twentieth-century household industrialization took the form of mechanical technologies.[19]

Environmental history complicates our understanding of when the household industrialized, and how. In households shot through with humidity changes, seasonal water leaks and then water shortages, regional disparities in hardwood, and daily competing uses for fat, cleanliness was a seasonally changing and regionally differentiated phenomenon at best. What "clean" looked like in New England winter was as different from its appearance in Appalachian summer as one might see between two social classes. Taking seriously the pervasiveness of the non-human in the household reminds us that nineteenth-century norms were not lived practice; lived cleanliness could only truly be stabilized across season and geography with the aid of chemical technologies. Chemical technologies, maybe even more so than mechanical technologies, were crucial to the stabilization of a single twentieth-century norm.[20]

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[19] Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology From the Open Hearth to the Microwave* (New York: Basic Books, 1983); Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon Books, 1982); Suellen Hoy, *Chasing Dirt: The American Pursuit of Cleanliness* (New York: Oxford University Press, 1995); Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge, Mass.: Harvard University Press, 1998).

[20] Historians like Nayan Shah and Andrew Zimmerman exemplify the complicated work of exploring multiple co-existing norms, and tracing continuities between them. See, as examples, Nayan Shah, *Contagious Divides: Epidemics and Race in San Francisco's Chinatown* (Berkeley: University of California Press, 2001); Andrew Zimmerman, *Alabama in*

My dissertation also contributes to a broader research charge exploding the binary between public and private spheres by explicitly focusing on the natural world that shaped nineteenth-century households.[21] Messy non-human nature made parody of a nineteenth-century ideal positioning the domestic realm, centered on the hearth, as somehow separate from and sacrosanct in contrast to its surroundings. Fat moldering in the drippings pan and silverfish scuttling over floorboards made all-too-obvious the porousness of the house.[22] One task for future research, then, is to explain how a Victorian ideal of separate spheres was stabilized despite this porousness.[23]

Beyond contributing to histories of domestic life, this dissertation also invites environmental historians to analyze the household as a site of production, not just consumption. To do this, I draw attention to the ecological expertise possessed by domestic workers that used such knowledge for economic and hierarchy-subverting ends. Asking about the meaning that domestic workers and homemakers gave to their work, rather than assuming it, frees us to also

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Africa: Booker T. Washington, the German Empire, and the Globalization of the New South (Princeton, New Jersey: Princeton University Press, 2010).

[21] Cathy N. Davidson, Lawrence Buell, Amy Kaplan, et. al., "NO MORE SEPARATE SPHERES!" *American Literature 70* (Sept. 1998): 443-606; Linda K. Kerber, Nancy F. Cott, Robert Gross, Lynn Hunt, Carroll Smith-Rosenberg, and Christine M. Stansell, "Beyond Roles, Beyond Spheres: Thinking about Gender in the Early Republic," *The William and Mary Quarterly* 46 (July 1989): 565-85.

[22] Several environmental historians have answered permutations of this question. See, Gregg Mitman, *Breathing Space: How Allergies Shape Our Lives and Landscape* (New Haven: Yale University Press, 2007); Nancy C. Unger, *Beyond Nature's Housekeepers: American Women in Environmental History* (Oxford: Oxford University Press, 2012); *Human/Nature: Biology, Culture, and Environmental History*, John P. Herron & Andrew G. Kirk, eds., (Albuquerque: University of New Mexico Press, 1999), esp. Virginia Scharff, "Chapter 2. Man and Nature! Sex Secrets of Environmental History."

[23] Environmental historians have begun to do this work. See, for example, Conevery Bolton Valenčius, *The Health of the Country: How American Settlers Understood Themselves and Their Land* (New York: Basic Books, 2002). Cultural historians offer one model: tracing the role of domestic norms in justifying U.S. imperial ambitions within and beyond the North American continent. See Kristin L. Hoganson, *Consumers' Imperium: The Global Production of American Domesticity, 1865-1920* (Chapel Hill: University of North Carolina Press, 2007); Amy Kaplan, "Manifest Domesticity" *American Literature* 70 (Sept. 1998): 581-606; *Cultures of United States Imperialism*, Amy Kaplan and Donald E. Pease, eds., (Durham: Duke University Press, 1993)

ask about the ecological knowledge that workers used to lighten chores, refuse subjugation, or take pleasure in what was supposed to be drudgery.[24] In this sense, I build on the research agenda set out by environmental and labor historians like Richard White, Thomas Andrews, Gunther Peck, but invite readers to turn their attention from fisheries and farm fields and toward the household. Households, like any of these other sites, were sites of production and ecological change.[25]

Nineteenth-century workers built functional knowledge of the natural world that made more doable their labors. Keeping house required skills. Because domestic work was always an

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[24] The term "knowledge systems" is more embedded in place and ecological context than is its alternatives, each with their own body of literature. "Expertise" as a term suggests a structure of institutionalized rewards and judgments of legitimacy—government grants, workplace remuneration—that was never a reality for agricultural workers in Carney's narrative but was a reality for some commercial workers in this narrative. As such, I use each term. There are multiple other terms I might use, which have their own bodies of literature. "Skill," suggests a binary between skilled versus unskilled labor, a distinction that has a fraught history of its own. "Informal knowledge," meanwhile, doubles an existing evidentiary problem endemic to the study of workers leaving behind few historical documents. For all of these reasons, I borrow "knowledge system" as a conceptual tool to explore whether and how domestic workers made sense of the natural world. Examples are too countless to offer a comprehensive survey of each of these bodies of literature, but some foundational texts in the sociology and history of expertise include Bruno Latour and Stephen Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton, N.J.: Princeton University Press, 1986); Sheila Jasanoff, *States of Knowledge: The Co-Production of Science and Social Order* (London: Routledge, 2004). On the skill required to excel at manual labor, see Mike Rose, *The Mind at Work: Valuing the Intelligence of the American Worker* (New York: Viking, 2004). And on "informal knowledge," see Harry Collins, *Tacit and Explicit Knowledge* (Chicago: Univ. of Chicago Press, 2010); Michael Eraut, "Non-Formal Learning and Tacit Knowledge in Professional Work" *British Journal of Educational Psychology* 70, no. 1 (March 2000): 113–36; Stephen Gourlay, "Towards Conceptual Clarity for 'Tacit Knowledge': A Review of Empirical Studies," *Knowledge Management Research & Practice* 4, no. 1 (February 2006): 60–69.

[25] Thomas Andrews, *Killing for Coal: America's Deadliest Labor War* (Cambridge: Harvard University Press, 2008); William Boyd, *The Slain Wood: Papermaking and Its Environmental Consequences in the American South* (Baltimore, MD: Johns Hopkins University Press, 2015); Brinda Sarathy, *Pineros: Latino Labour and the Changing Face of Forestry in the Pacific Northwest* (Vancouver: University of British Columbia Press, 2012); Deborah Fitzgerald, *Every Farm a Factory: he Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003); Douglas Sackman, *Orange Empire: California and the Fruits of Eden* (Berkeley: University of California Press, 2005); Mark Fiege, *Irrigated Eden: The Making of an Agricultural Landscape in the American West* (Seattle: University of Washington Press, 1999); Steven Stoll, *The Fruits of Natural Advantage: Making the Industrial Countryside in California*, (Berkeley: University of California Press, 1998); Monica Perales, *Smeltertown: Making and Remembering a Southwest Border Community* (Chapel Hill: University of North Carolina Press, 2010); Christopher Sellers, *Hazards of the Job: From Industrial Disease to Environmental Health Science* (Chapel Hill: University of North Carolina Press, 1997); Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill and Wang, 1996); Carmel Finley, *All the Fish in the Sea* (Chicago: University of Chicago Press, 2011); Arthur McEvoy, *The Fisherman's Problem: Ecology and the Law in the California Fisheries, 1850-1980* (New York: Cambridge University Press, 1986). See also Gunther Peck, "The Nature of Labor: Fault Lines and Common Ground in Environmental and Labor History," *Environmental History* 11 (April 2006): 212-238.

act of managing nature, I argue that this expertise was ecological in its content. Workers knew much about managing the non-human; they needed to, in order to grow a squash, tap a well, or mend a pair of stockings. Expertise took many forms. It was naming: workers recognizing and identifying the parts of the natural world central to their efforts: household distinctions between "tallow" vs. "lard" vs. "suet" vs. "drippings," for example. Expertise was also knowledge of process: workers knew how to soak wood ash into lye, saponify fat into soap, soak wheat into laundry starch, use ox bile into bleach, twist horsehair into clotheslines, and spin wool into yarn, to name a few examples. Further, housework demanded that workers have a functional understanding of decay as well as production. Thus ecological expertise was also about preservation: how to clean fat to avoid rancidity, or knowledge of when to mend versus when to unravel and discard a woolen blanket. Finally, expertise was the capacity to view discarded household materials as resources rather than nuisances. Rain water was wash water, prized for its lack of mineral content; flour sacks could be refashioned into passable dresses, if laundered several times. In each of these categories of skills—naming, making, preserving, and re-making—domestic workers necessarily knew a great deal about the natural world.[26]

Where is nature in this dissertation? I locate the non-human in two places. First, I focus on nature in the washtub. Washing ingredients shaped the meaning of cleanliness itself. Spoil-prone fat in soap; mineral-laden wash water; seasonal shortages of firewood; moldering starch; a

[26] On the mid-nineteenth century wash process prescribed widely as a social norm, see Catharine E. Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845), especially Ch. XXVI. "On Washing;" Ch. XXVII. "On Starching, Ironing, and Cleansing;" and Ch. XXVIII. "On Whitening, Cleansing, and Dyeing;" Leslie Eliza, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey and Hart, 1840); Sarah Josepha Buell Hale, *The workwoman's guide: containing instructions to the inexperienced in cutting out and completing those articles of wearing apparel, &c. which are unusually made at home: also, explanations on upholstery, straw-platting, bonnet-making, knitting, &c.*, (London: Simpkin, Marshall, and Co., 1838).

seasonal lack of clear drying days: each of these environmental realities played a role in defining the work that domestic workers shouldered in the 1870s, 1890s, 1920s and even 1950s. By the 1950s, the widespread arrival of petrochemicals in the washtub made irrelevant many of the spoilage and shrinkage problems workers had faced a generation earlier. Petrochemical technologies also made irrelevant the worker expertise built to manage fat that spoiled or water wells that ran dry.

Second, I locate nature in workers' bodies themselves. Historicizing a phenomenon like cleanliness makes the body a crucial analytic. In the nineteenth-century U.S., clean clothes were above all characterized by four sensory qualities: they were odorless; bleached white; starched stiff; and required a great many steps to be perceived as clean. By the mid-twentieth century, consumer expectations had changed radically, mostly at the hands of a commercial chemical industry. Cleanliness was fragrant; brightly colored; and pliable. It was also one step, thanks to "washday miracles" like Tide detergent and Whirlpool washing machines (though mid-century economist John Kenneth Galbraith, emphasizing the gendering of this "laborless" process, envisioned a future where commercial establishments would replace "wife-operated and – maintained washing machines."). [27] Our expectations of what cleanliness should look, smell, and feel like have been radically rewired over the past 150 years. In this sense we are reminded that our eyes and noses are themselves products of culture and history, rather than some innate *Homo sapien* biology. There no nature is outside politics; the household, and our senses, are not exceptions.

I build on historians like Nancy Langston, Gregg Mitman, Michele Murphy, and Nan Enstad, who also focus on the politicized body via an examination of body burdens and the rise

[27] John Kenneth Galbraith, *Economics and the Public Purpose* (Boston: Houghton Mifflin Company, 1973), 239.

of toxicity. In my work, I focus on less acute bodily burdens, but ones of nonetheless profound implications.[28] Others have demonstrated that the toxicity of commercial products to both upstream and downstream life has only increased across the twentieth century.[29] But few have asked about the implications of industrialization on human bodies—the "historically specific sensing body," as historian Joy C. Parr calls it—in what been dismissed as domesticated households.[30] Homemakers in the 1990s expected cleanliness to look, smell, and feel radically different than had their analog domestics 150 years earlier. Chemists have, over the past century-and-a-half, rewired our very senses—our experiences of being in our bodies. That what we might assume are biological or "natural" senses have been constructed—and constructed for profit—should give us

[28] The term "body burden" comes out of environmental health and toxicology, and in a policy context denotes the threshold quantity or exposure time generating acute health impacts. I use the term "bodily burden," as distinct from "body burden," in an admittedly distinct sense, to denote in-the-moment physical hard as well as uncertain long-term health harms resulting from chemical exposure. I explore these exposures limitedly in the later chapters of the dissertation, particularly the chapters historicizing synthetic detergents and synthetic fabrics. Historians like Arthur Daemmrich, Michelle Murphy, Jody Roberts, Nancy Langston, and Gregg Mitman have done important work to historicize the idea of a "body burden," as well as the fields of industrial health and toxicology. See "Toxic Bodies/Toxic Environments: An Interdisciplinary Forum," Roberts, Jody A., and Nancy Langston, eds., *Environmental History* 13, no. 4 (2008): 629-703.

[29] Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven: Yale University Press, 2010); Gregg Mitman, *Breathing Space: How Allergies Shape Our Lives and Landscape* (New Haven: Yale University Press, 2007); Michelle Murphy, *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, and Women Workers* (Durham: Duke University Press, 2006); *Landscapes of Exposure: Knowledge and Illness in Modern Environments,* Gregg Mitman, Michelle Murphy, and Christopher Sellers, eds. *Osiris* Vol. 19 (2004); Nan Enstad, "Toxicity and the Consuming Subject" in *States of Emergency: The Object of American Studies,* Russ Castronovo and Susan Gillman, eds., (Chapel Hill: University of North Carolina Press, 2009), 55-68. These studies fit into a much larger body of literature on biopower and the making of the body as a medical object, initiated by the French philosopher Michel Foucault and taken up by a wide range of scholars since. See Michel Foucault, *Discipline and Punish: The Birth of the Prison* (New York: Random House, 1979); Michel Foucault, *The Birth of the Clinic: An Archaeology of Medical Perception* (New York: Pantheon Books, 1973); Michel Foucault, *Power/Knowledge: Selected Interviews and Other Writings*, 1972-1977 (New York: Pantheon, 1980).

[30] Taking the case of contests around the regulation of the Bruce Nuclear Power Development in 1970s, along the eastern shores of Lake Huron, Parr argues that olfactory sensation—what Parr calls knowledge produced by the "historically specific sensing body"— complicated decision-making and galvanized citizen action in the face of ongoing scientific uncertainty. See Joy Parr, "Smells like? Sources of Uncertainty in the History of the Great Lakes Environment" *Environmental History* Vol 11, No. 2 (April 2006): 269-299.

pause. What are the smells, tastes or other sensory experiences we as social individuals want to retain as part of our lived experiences? Who has gotten to make those decisions for us historically?[31]

Such work amplifies the efforts of historians like Susan Strasser, Sue Ellen Hoy, Nayan Shah, and Carl Zimring, who have done important work to historicize cleanliness in a U.S. context. These scholars argue that from an unchanging physical condition, cleanliness standards were inflated markedly across the 1870s through 1950s period via the popularization of mechanical household technology, the efforts of public health officials, the diffusion of racial fears into private households, and the use of new marketing techniques.[32]

To this historiography I add an explicitly environmental history perspective. For domestic workers and homemakers doing domestic work over the past 150 years, cleanliness proved anything but a fixed target. Domestic workers and homemakers found themselves wrestling moldering soap, regionally-specific water hardness, and a lack of clear drying days to meet social norm. Commercial chemists, meanwhile, found at-scale soap and textile production efforts hampered by rancidity-prone fats, irregular fiber lengths, fade-prone dyes, and mineral-laden wash water. The soaps, dyes, detergents, and synthetic fabrics that chemists would popularize and homemakers would purchase succeeded at shifting the power to define cleanliness from unpaid homemakers and poorly paid workers to chemists and advertising agents.

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[31] Acknowledging the limits of discussing environment in terms of individual rights, indigenous writer Sheila Watt-Cloutier nonetheless argues forcefully for the coalition-building power of such critiques. See Sheila Watt-Cloutier, *The Right to Be Cold: One Woman's Fight to Protect the Arctic and Save the Planet from Climate Change* (Minneapolis, MN: University of Minnesota Press, 2018).

[32] Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology From the Open Hearth to the Microwave* (New York: Basic Books, 1983); Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon Books, 1982); Suellen Hoy, *Chasing Dirt: The American Pursuit of Cleanliness* (New York: Oxford University Press, 1995); Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge, Mass.: Harvard University Press, 1998); Kathleen M. Brown, *Foul Bodies: Cleanliness in Early America* (New Haven: Yale University Press, 2009).

What do we learn from laundry? Racialization as a Driver of Ecological Transformation

Why historicize laundering? Another reason is that, quite simply, laundering needs explaining. Two generations of historians have argued convincingly that domestic tasks like canning, baking, sewing, and child-rearing moved from household to factory floor in the early twentieth century. Domestic work, they argue, was industrialized via the rise of a mass market in the early twentieth-century and further commercialized via mid-century federal programs defining citizenship in increasingly consumerist term. Technological change and federal programs are central to these explanations of household industrialization.[33]

Laundering, by contrast, followed a different path. The earliest industrial washing plants appeared at least fifty years earlier—in the 1870s—than their analogs in the canning or ready-wear industries. By the 1920s, industry estimates put between one-quarter and one-third of households sending their laundry out to steam laundry plants.[34] Further, washing work, unlike other domestic tasks, largely returned *to* the household in the form of the washing machine, just as activities like canning and sewing were fully exiting. Why?

The key can be found in the racial politics governing household spaces. Racial anxieties were central to the industrialization of housework. In hotels, hospitals, and prisons of the 1850s and 1860s, a density of mixing bodies and mixing racial identities created demand for high-

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[33] The literature on the twentieth-century construction of mass consumption is vast, but some product-specific volumes include the following: Anna Zeide, *Canned: The Rise and Fall of Consumer Confidence in the American Food Industry* (Oakland: University of California Press, 2018); Deirdre Clemente, *Dress Casual: How College Students Redefined American Style* (Chapel Hill: The University of North Carolina Press, 2014); *Producing Fashion: Commerce, Culture, and Consumers,* Regina Lee Blaszczyk, ed. (Philadelphia: University of Pennsylvania Press, 2008); Jonathan Rees, *Refrigeration Nation: A History of Ice, Appliances, and Enterprise in America* (Baltimore: Johns Hopkins University Press, 2013); Pamela Simpson, *Cheap, Quick, and Easy: Imitative Architectural Materials, 1870–1930* (Knoxville: University of Tennessee Press, 1999). On the construction of "consumer" as a political identity protected by federal laws and agencies, see Lizabeth Cohen, *A Consumers' Republic: The Politics of Mass Consumption in Postwar America* (New York: Vintage Books, 2003). On the building of a mass market, see also Susan Strasser, *Satisfaction Guaranteed: The Making of the American Mass Market* (Washington: Smithsonian Institution Press, 1989).

[34] "L.N.A. Discontinues Radio Broadcasting" *Starchroom Laundry Journal* 37, no. 3 (March 15, 1930), 102.

capacity mechanized washing devices and chemical cleaners that would inspire their smaller in-home analogs five decades later. In the decades following the close of the Civil War, intelligence offices (employment agencies connecting workers with families seeking paid domestic help) and white homemakers began asking, for the first time, for information about the racial identities of the help they sought to hire to take on the brutal work of washing. As steam laundries expanded to serve household as well as hotels in the 1880s through 1920s period, owners invoked explicitly racist stereotypes when marketing their services to white homeowners too frequently choosing non-white hired help over steam laundry services. Race, in other words, was central to the project of industrializing and commercializing domestic work. Laundry, because it was the earliest household task to move into a fee-for-service marketplace, exemplifies this trend more overtly than did subsequent activities like canning, cleaning, and childcare help. By the 1890s, domestic work had become racialized work. This dissertation traces the construction of that norm, and the racialization of the ecological knowledge systems central to mid-nineteenth century homemaking. Racialization of expertise was the first step in making that knowledge obsolete.[35]

In its reliance on racialized labor, washing was the bellwether anticipating a broader industrial trend. But for the first three decades of the early twentieth-century, it was also an activity marked by some norms that made it an aberration rather than representative. These

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[35] Andrew Urban, *Brokering Servitude: Migration and the Politics of Domestic Labor During the Long Nineteenth Century* (New York: New York University Press, 2018); Evelyn Nakano Glenn, *Issei, Nisei, War Bride: Three Generations of Japanese American Women in Domestic Service* (Philadelphia: Temple University Press, 1986); Catherine Ceniza Choy, *Empire of Care: Nursing and Migration In Filipino American History* (Durham: Duke University Press, 2003); Tera W. Hunter, *To 'Joy My Freedom: Southern Black Women's Lives and Labor After the Civil War* (Cambridge, Mass., Harvard University Press, 1997); David M. Katzman, *Seven Days a Week: Women and Domestic Service in Industrializing America* (New York: Oxford University Press, 1978); Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996); Elizabeth Ross Haynes, "Negroes in Domestic Service in the United States: Introduction" *The Journal of Negro History,* Vol. 8, No. 4 (Oct., 1923): 384-442; Heidi Irmgard Hartmann, "Capitalism and Women's Work in the Home, 1900-1930," ProQuest Dissertations and Theses; 1974; ProQuest Dissertations & Theses Global, Accessed January 2, 2019.

early twentieth-century decades saw appliance-sharing between neighbors who would later define social status via individual appliance ownership; the normalization of mending garments rather than their disposal; wooden household appliances built for repair rather than disposal; and the construction of experimental collective housekeeping arrangements. In these "interim" decades of industrialization, laundering was partially representative of a more collectivist path that was foreclosed in the post-World War I period. But during these early twentieth-century decades, uncertainty about the future of housework made it a field wide with possibilities that included collective housekeep arrangements, relaxed cleanliness standards, repairable wood-based appliances, and early attempts to organize domestic workers.[36]

By the 1920s, an emergent and global commercial chemical industry was refuting collectivist norms and hastening the obsolescence of nineteenth-century knowledge systems. The Cincinnati-based behemoth Procter & Gamble exemplified the larger trend. From its 1837 start as a soap company to its 1930s flourishing as a laundry detergent and homecare goods producer, the company built unprecedented reach industrializing domestic work. Its chemists built soaps and synthetic scents with help from German industrialists; its subsidiaries extruded artificial silk, mixed fluorescent dyes, and sprayed anti-rust coatings on metal appliances bound for household use. P&G's most profitable brand, Tide, was the first-to-market synthetic laundry detergent of its kind built in the post-World War II period. Capitalizing on a new corporate strategy of hired brand managers, the company flooded grocery stores with household products promising a washday miracle. The trend had been set: by the end of the twentieth century, Procter & Gamble enjoyed global name recognition and boasted sales to four out of five households on the planet.[37]

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[36] Dolores Hayden, *The Grand Domestic Revolution: A History of Feminist Designs for American Homes, Neighborhoods, and Cities* (Cambridge, Mass.: The MIT Press, 1981).

[37] Davis Dyer, Frederick Dalzell, and Rowena Olegario, *Rising Tide: Lessons from 165 Years of Brand Building at Procter & Gamble* (Boston: Harvard Business School Press, 2004).

Brand recognition had replaced nineteenth-century knowledge systems, bringing no political gains for domestic workers but effecting devastation on upstream and downstream ecosystems.

In this sense, laundering is a seemingly mundane household process that offers new insight into a larger historical phenomenon. The racialization of domestic workers preceded the industrialization of household work. The Civil War gutted the nineteenth-century separate spheres ideal, but also jettisoned attempts to dignify, value, or protect domestic work. With black and brown hands disproportionately doing domestic work by the early twentieth century, commercial alternatives promising to "save labor"—but really make the household white again—gained new appeal for those of economic means.[38]

Racialization hastened the obsolescence of knowledge systems built to manage non-human nature in the household. In this sense, historicizing laundering helps make obvious the ecological costs of devaluing domestic work and non-white workers, both. It may not surprise us that a century of chemical innovation sprang up in part to respond to century-old racial anxieties. But what should surprise us is the technical sophistication of nineteenth-century workers collecting drippings and darning socks. One central premise of this dissertation is that recovering nineteenth-century domestic voices can offer us concrete tools for moving today towards a more ecologically and socially just vision of private life in the twenty-first century. Ecological stewardship can begin in the household—but only when we recognize that that space

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[38] David R. Roediger, *The Wages of Whiteness: Race and the Making of the American Working Class* (New York: Routledge, Chapman & Hall, 1991); Tera W. Hunter, *To 'Joy My Freedom: Southern Black Women's Lives and Labor After the Civil War* (Cambridge, Mass., Harvard University Press, 1997); Joan S. Wang, "Race, Gender, and Laundry Work: The Roles of Chinese Laundrymen and American Women in the United States, 1850-1950" Journal of American Ethnic History, Vol. 24, No. 1 (Fall 2004): 58-99.

has always been political, has always been in flux with the natural world, and has too long been overlooked.[39]

Paths Forward: Finding Nature in the Washtub

This dissertation aims to make visible the ecological relationships shaping the meaning of cleanliness and transformed by debates over social order over the last 150 year. My dissertation begins in the washroom and then moves outward: to the steam laundry plant, the washing machine test center, the Fifth Avenue advertising studio, and especially the commercial chemical laboratory. My goal throughout is to make visible the technological and cultural debates transforming how domestic workers saw, used, valued, and discarded of the non-human in domestic spaces.

To tell the history of cleanliness, my dissertation tracks the flourishing of five technologies that transformed the meaning of this social norm, primarily in the U.S., over the past 150 years: washtubs, commercial steam laundry facilities, washing machines, synthetic fabrics, and detergents. That clean clothes should be fragrant, soft, brightly colored, and easily made clean is a 20th-century invention. Cleanliness in the nineteenth-century U.S. was odorless; bleached white; starched stiff; and a day-long labor to obtain. My dissertation tries to understand how and why the sensory markers changed so completely, and to evaluate the ecological impacts witnessed not only upstream and downstream, but in the space of the household itself.[40] Industrialization has wrought some very intimate ecological effects.

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[39] Thoreauvian notions of escape, or "opting out," continue to pervade environmentalist thinking. See Shannon Hayes, *Radical Homemakers: Reclaiming Domesticity from a Consumer Culture* (Richmondville, NY: Left to Write Press, 2010); Sharon Astyk, *Depletion and Abundance Life on the New Home Front* (Gabriola Island, B.C.: New Society Publishers, 2008); Barbara Kingsolver, *Animal, Vegetable, Miracle: A Year of Food Life* (New York: HarperPerennial, 2008). For a critical review of these works, see Valerie Padilla Carroll, "The Radical Possibilities of New (Feminist, Environmentalist) Domesticity: Housewifery as an Alternodernity Project" *Interdisciplinary Studies in Literature and Environment* 21 vol. 1 (Winter 2016): 51-70.

[40] "Domestic Art of Laundry," J. Walter Thompson & Co. Social Index™ Series (New York: JWT, June 2005).

Chemical technologies, in addition to much-studied mechanical technologies, were the form that industrialization overwhelmingly took in the household over the past 150 years. As commercially-produced lye; fabric dye fixative; cellulosic fabrics; petrochemical fabrics; petrochemical detergents; fabric softeners; fluorescent additives; and synthetic scents: these forces of industrialization functioned alongside the in-home washing machine and electric dryer to transform the meaning of cleanliness. To ignore domestic nature is to misunderstand the reasons that chemical technologies, as well as mechanical technologies, were so marketed, so marketable, and so widely adopted by homemakers of means.[41]

Focusing on domestic work reveals a different facet of industrialization than we see when examining its effects on factory workers, office workers, farmers, or miners. Historians over at least the past four decades have driven home some key facets of industrialization's impacts. Industrialization is a story about the deskilling of workers and the institutionalization of wage work, with only mixed implications, at best, for working-class peoples. It is a story about the increasing toxicity of our production systems, with implications for worker health and the health of the natural world.[42]

Industrialization, this dissertation maintains, is overwhelmingly a story about the rewiring of our senses by an increasingly distant set of experts. These changes have come with increasingly

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[41] Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology From the Open Hearth to the Microwave* (New York: Basic Books, 1983); Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon Books, 1982); Suellen Hoy, *Chasing Dirt: The American Pursuit of Cleanliness* (New York: Oxford University Press, 1995); Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge, Mass.: Harvard University Press, 1998).

[42] I join with other environmental historians who have examined the rise of toxicity in the household. See, for example: Michelle Mart, *Pesticides, a Love Story: America's Enduring Embrace of Dangerous Chemicals* (Lawrence, Kansas: University Press of Kansas, 2018); Paul David Blanc, *Fake Silk: The Lethal History of Viscose Rayon* (New Haven: Yale University Press, 2016); Jeffrey L. Meikle, *American Plastic: A Cultural History* (New Brunswick, N.J.: Rutgers University Press, 1995); Regina Lee Blaszczyk, *The Color Revolution* (Cambridge, Mass.: MIT Press, 2012).

destructive downstream implications. It was chemists at DuPont and Procter & Gamble who refuted nineteenth-century domestic workers equating cleanliness with odorless. Their 1930s attempts to build brand loyalty and integrate malodorous raw materials into the soap-making process integrated essential oils and synthetic scents into laundry detergents that, today, interact with reproductive systems of aquatic life and pose unknown hazards for human health. It was chemists at Courtaulds and the American Viscose Company who refuted nineteenth-century notions that cleanliness was starched stiff, introducing form-holding qualities alongside pliability, elasticity, and fine denier counts—softness—to the synthetic fabrics extruded through their industrial spinnerets. We are only now learning that such synthetic fabrics accumulate as plastic microfibers clogging shorelines, fish bodies, and higher trophic levels. The ecological costs of new cleanliness standards as multiple, and worrisome.[43]

Any supposed democratization gains had by a century of chemical innovation—the creation of cheaper alternatives to silk stockings, the selling of more affordable household appliances—proves incorrect in the face of the realized financial costs of these technologies. Today, clothes dryers consumer as much energy as clothes washers, refrigerators, and dishwashers combined. Virtually every new construction project in states like Oregon and Washington containing appliances, the normalization of in-unit appliances can drive up the selling cost of new construction by as much as $5.00 per square foot. Shared washing appliances, either as basement in-unit devices or laundromats, are on the decline, with implications for

[43] Mark Anthony Browne, et. al., "Accumulation of Microplastic on Shorelines Worldwide: Sources and Sinks" *Environmental Science & Technology* 45 no. 21 (Sept 6, 2011): 9175-9179; DOI 10.1021/es201811s; Matthew Cole et. al., "Microplastics as contaminants in the marine environment: A review," *Marine Pollution Bulletin* 62, no. 12 (Dec. 2011): 2588-2597; DOI 10.1016/j.marpolbul.2011.09.025; Stephanie L. Wright, et. al,. "The physical impacts of microplastics on marine organisms: A review" *Environmental Pollution* 178 (July 2013): 483-492; DOI 10.1016/j.envpol.2013.02.031; David K.A. Barnes, "Accumulation and fragmentation of plastic debris in global environments," *Philosophical Transactions of the Royal Society B-Biological Sciences* 365, No. 1526 (July 27, 2009): 1985-1998; DOI 10.1098/rstb.2008.0205.

families unable to afford the cost of their own washing machine—or an apartment with the square footage to accommodate such a device.[44]

Above all, the transformation of the sensory meaning of cleanliness has come with implications for our individual sensory experiences of the natural world right where we live—for our experiences of inhabiting our own bodies. Over the past century-and-a-half, commercial chemists have rewired our sensory expectations. That our seemingly biological understanding of cleanliness has been constructed—and constructed for profit—should give us pause. By writing the history of as mundane a topic as laundry, I hope my project invites readers to ask about more than their drudgery of the work. What are the smells, tastes or other sensory experiences I want as a part of my daily life? What political systems shape seemingly apolitical personal experiences?

"To affect the quality of the day, that is the highest of arts." So wrote the naturalist Henry David Thoreau in the opening pages of his two-year experiment at Walden Pond, reflecting on the motivations for his solitary sojourn.[45] Of late, much has been made of Thoreau's supposed habit of carrying his dirty garments from his Walden cabin to his parents' house in Concord, for help washing them. Though it was precisely this assertion from Thoreau that most resonated

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[44] "Characteristics of New Single-Family Houses Completed" and "Characteristics of Units in New Multifamily Buildings Completed," *2015 Characteristics of New Housing,* U.S. Department of Housing and Urban Development, U.S. Department of Commerce (Washington, D.C.: Government Printing Office, 2015).

[45] Henry David Thoreau, *Walden* (New York, Thomas Y. Crowell & Co. [1854], 1910); 117. Several editions of the work transcribe the line as "To effect the quality of the day, that is the highest of arts," swapping out the verb, "affect," for the noun, "effect." I take the latter as typographical error. See also Laura Dassow Walls, *Henry David Thoreau: A Life* (Chicago: University of Chicago Press, 2017). Dassow makes brief mention of Thoreau's habit of walking the four miles from his Walden cabin to Concord, where he would eat with his parents and sisters and accept help doing his washing. Dassow notes that critiques of his narrow view of self-sufficiency has been used by critics to censure him in a way that it is never used against the countless other nineteenth-century male writesr to doubtless relied on domestic help to get their writing done. "No other male American writer has been so discredited for enjoying a meal with loved ones or for not doing his own laundry. But from the very beginning, such charges have been used to silence Thoreau." (195) For a more generous reinterpretation of Thoreau that nudges the solitude of the writer aside in favor of a view which positions him as generously and relentlessly interdependent on his family, see Rebecca Solnit, "Mysteries of Thoreau, Unsolved: On the Dirtiness of Laundry and the Strength of Sisters" *Orion,* May-June 2013, 18-23.

with me early in this project, I prefer now the words of the Wisconsin homemaker Doris Hanson to express the quotidian experience of domestic nature whose erosion I most worry about. "I just love the smell of fresh clothes from the line," Hanson recalled to the oral historian Fran Leeper Buss in 1983. "I used to enjoy hanging things on the line, stretch them out to see how pretty they looked. It is kind of a silly thing, but …"[46]

What happens to the quality of the day when the smell of clothes fresh from the line becomes outmoded rather than integral? It is on so mundane a question such as this one that this project ruminates.

[46] Doris Hanson, Interview with Fran Leeper Buss, December 4, 1983 in *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Fran Leeper Buss, ed., Wisconsin Historical Society: Mss 809 2M/44/F3-4.

Chapter One: Tubs, 1842-1880s
Or, How to Clean

Introduction

Nineteenth-century cleanliness norms were as simple as the garments they governed were complicated. Be it chambrays or calicoes, burlap or broadcloth, norms dictated that clean garments should be odorless, starched stiff, and bleached white. The labor to produce them should take a full day, likely a "Blue Monday"— so named for the norm of weekly Monday washing on which domestic workers would adding a blue tint to wash water to ensure white garments came out white rather than yellow-tinged.[47] Since at least the late eighteenth century, cleanliness communicated something about an individual's moral rectitude, as in the admonishment from Methodist minister John Wesley in a 1778 sermon, "'Cleanliness is indeed next to godliness.'"[48] By the middle of the nineteenth century, cleanliness communicated more than moral rectitude: it also communicated an individual's intelligence, socioeconomic status, and claim to national belonging.[49]

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[47] Strasser, *Never Done,* 76; Beecher, *A Treatise on Domestic Economy,* 162.

[48] *Word and Phrase Origins*, Fourth ed., Robert Hendrickson, ed., (New York: Infobase publishing, 2008), 183. Editor Robert Hendrickson notes that in the text of John Wesley's original sermon, the minister puts quotation marks around the phrase as if to suggest he had borrowed it from elsewhere, verbatim or in an alternate form. I retain Wesley's quotations here. Hendrickson also notes that an earlier version of the phrase can be found in the writings of the rabbi Phinehas ben Yair, appearing in the Talmud in the following form: "The doctrines of religion are resolved into carefulness; carefulness into vigorousness; vigorousness into guiltlessness; guiltlessness into abstemiousness; abstemiousness into cleanliness; cleanliness into godliness." Here 'cleanliness' is literally next to 'godliness.'

[49] Catharine Beecher's *Treatise on Domestic Economy* (1845) includes an entire chapter devoted to the topic of cleanliness. She opens that chapter with the following conflation of cleanliness and intelligence, a thin veil for socioeconomic class: "The importance of cleanliness, in person and dress, can never be fully realized, by persons who are ignorant of the construction of the skin, and of the influence which its treatment has on the health of the body. Persons deficient in such knowledge, frequently sneer at what they deem the foolish and fidgety particularity of others, whose frequent ablutions and changes of clothing, exceed their own measure of importance." (188) See Beecher, "Chapter IX. On Cleanliness," *Treatise on Domestic Economy*, 118-121.

Producing garments that adhered to these norms, however, was anything but simple. Seasonality and regional ecology ran directly counter to attempted universal domestic ideals because nature varied. Ironed sheets required starch made from hardwood ash that was plentiful in Massachusetts but much rarer in the Plains territories of Wisconsin, Iowa, and Minnesota. Discard fat that could be cleaned and stored for six months in the cool basements of northern latitudes turned rancid more quickly under the humid conditions of South Carolina, Georgia, and Alabama. In Plains territories like Ohio, Iowa, and Indiana, workers spoke of plants like buckeyes and soapwort that produced suds during times of year when one had run out of lard with which to make soaps. What clean meant to its doers, and its beneficiaries, was not fixed across the year, nor was it universal across a still-becoming nation.[50]

In mid-nineteenth century households with slaves or servants, and in those without, domestic work was marked by an interdependence of processes. Discard fat from cooking became stock for soap making; worn sheets were torn down to be made into pillow cases, quilts, medical gauze, or cleaning rags. Similarly, a domestic worker might churn butter while the washboiler was heating up, or mend while the roast baked. Given this interdependence, the separation of washing work from the other tasks in this dissertation is a distinction that would have puzzled nineteenth-century domestic workers.

Focusing on washing as one domestic process of many, however, comes with a key attribute: it reflects the burden that nineteenth-century social critics perceived washing to be,

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[50] Eliza R. Stansbury Steele, Letter, July 19, 1840, in *Summer Journey in the West. New York* (NY: John S. Taylor, 1841), 239-255; Francis R. Paige, Diary entry, June 25, 1862; Cairns Collection of American Women Writers, Memorial Library, University of Wisconsin-Madison; Amanda Welch Beach, (1810-1893), Diary, January 18, 1870. Cairns Collection of American Women Writers, Department of Special Collections, Memorial Library, University of Wisconsin-Madison; Sarah Jane Goding, (1814-1894), Diary, 1868. Cairns Collection of American Women Writers, Department of Special Collections, Memorial Library, University of Wisconsin-Madison.

above all other household chores. Solving the problem of washing, according to at least one writer, meant "solv[ing] the American housekeeper's hardest problem."[51]

One week in the 1868 diary of the homemaker Sarah Jane Goding demonstrates both the overlapping nature of different type of domestic work within a given day, and the extraordinary amount of time afforded to washing. Washing that could not be finished on Monday spilled into Wednesday, with ironing finished on Saturday.

> Saturday, April 18, 1868. We baked and filled a feather bed. Adams went to Dixfield. Dana went to help Mr. Deshon and Mr. Wormell move their buildings.
> Sunday 19. Mrs. Haskell was burried [sic] yesterday.
> Monday 20. **I commenced to wash.** Mr. and Mrs. Holmes came in the forenoon and took dinner. Mrs. Deshon spent the P.M. Dana got the oxen shod.
> Tuesday, April 21, 1868. We were sewing. Adams and Dana were hauling stone from the town farm.
> Wednesday 22. **I finished washing.** H and Aunt Leunt spent the afternoon here. I churned.
> Thursday 23. We cleaned the buttery in the afternoon. Adams and Dana ploughed the garden.
> Friday, April 24, 1868. Betsy Jane cleaned the west chamber. We finished binding a bed quilt.
> Saturday 25. I worked on Dana's frock. B.J. done the work. **Ironed** and washed the floors.[52]

One other characteristic should be apparent. That Goding employs a "we" rather than an "I" indicates the multiple hands involved in the work process. Other diaries from the 1860s and 1870s mention the children, extended family, or neighbors assisting with housework.[53]

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[51] Beecher, *The American Woman's Home* (1869), 334.

[52] Sarah Jane Goding, (1814-1894), Diary, 1868. Cairns Collection of American Women Writers, Department of Special Collections, Memorial Library, University of Wisconsin-Madison. Bold text added for emphasis. Note that where handwriting made spelling obscured, particularly of names, I have substituted first initial. I have retained the author's spelling of words throughout because they do not detract from comprehension.

[53] For example, diarist Amanda Welch Beach writes of doing the wash in her 1870 diary. Her son Willie and her neighbor also aided in the work. "Mr. Whitney said I could take their washing machine so Willie went and got it and we got our washing done before ten, I think I should like one ever so much. Willie has been sowing some lettuce today." Amanda Welch Beach, (1810-1893), Diary, 1870. Cairns Collection of American Women Writers, Department of Special Collections, Memorial Library, University of Wisconsin-Madison. For more on the role of household technologies in mechanizing parts of the domestic work that would have previously been the task of a husband or child, such as gathering wood, hauling water, or collecting ashes, see Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983).

Formal collectivization was one solution that social critics proffered in response to this, the American housekeeper's hardest problem. Neighborhood laundries, Catharine Beecher extolled, might save both money and individual labor. "If all the money that each separate family spends on the outfit and accommodations for washing and ironing, on fuel, soap, starch, and the other requirements, were united in a fund to create a laundry for every dozen families, one or two good women could do in first rate style what now is very indifferently done by the disturbance and disarrangement of all other domestic processes in these families."[54]

But Beecher and others also saw commercialization as a plausible and necessary solution "In France, no family … does its own washing," Beecher noted for writers eager to compare the young U.S. against imagined Old World analogs. She continued, "[T]he family's linen is all sent to women who, making this their sole profession, get it up with a care and nicety which can seldom be equaled in any family." Paying for laundering help could help free some of the burden.[55]

How many households in the mid-nineteenth century U.S. relied on paid laundry help? By the 1870s, likely between one quarter and one third were hiring paid washing help. The number and racial identity of individuals entering specifically service work gained federal attention in the wake of the U.S. Civil War. 1870 was the first year that U.S. Census agents collected data on the occupations of working women. The 1870 U.S. Census reported a mere 58,683 laundresses working in others' homes. But the census simultaneous reported an additional 901,954 individuals working as housekeepers and servants.[56] Interpreting that data with the

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[54] Beecher, *The American Woman's Home* (1869), 334.

[55] Beecher, *The American Woman's Home* (1869), 334.

[56] *Ninth Census of the United States* (Washington, D.C.: Government Printing Office, 1875).

benefit of hindsight, U.S. Women's Bureau statisticians in 1940 rate of change for women entering laundry services between 1870 and 1910 was more than double the rate of population growth in the U.S. Stated differently, in 1870 there were 679 persons for every paid washing worker in the U.S.; but 1910, this number had declined to 152.[57] In 1870, historical context suggests that a large number of the servants and housekeepers would have been expected to at least have some hand in the wash process. Further, in 1870 there was one paid domestic worker per every 40 individuals in the U.S. Given both of these facts, we can conservatively assume that washerwomen were serving ten to fifteen of these individuals.[58]

The sum of these figures is an image of washing work in the 1870s as tending towards increased commercialization, with pay-for-service arrangements becoming an increasing norm. But before we can consider how the work would change, first it is necessary to understand how ecology and social standard combined to shape what the work was.

I. Washing Work as Second-Class Work

What did homemakers and domestic workers think of their work? The meaning of the work varied based on the economic position of the worker—and also the seasonal changes incurred as bodily burden. "Just finished my morning's work, churning and the like," wrote 19-year-old Francis R. Paige in her 1862 diary. "I'm heartily sick and tired of work," the New York diarist lamented. "[W]ish I could run away for a few weeks and get rested." Physical exhaustion

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[57] "Number of persons in population for each woman in laundry and related work," in Janet M. Hooks, *Women's Occupations Through Seven Decades*, Women's Bureau Bulletin No. 218, U.S. Department of Labor (Washington, D.C.: Government Printing Office, 1947), 145.

[58] Janet M. Hooks, "Chart X.—Women in Selected Service Occupations, 1870-1940," and "Trends in Service Occupations," *Women's Occupations Through Seven Decades*, Women's Bureau Bulletin No. 218, U.S. Department of Labor (Washington, D.C.: Government Printing Office, 1947), 136-146.

was a recurring sensation named by homemakers like Paige, and also a reality for paid domestic help and slaves. Women wrote privately of aching shoulders, fingers rubbed raw, and swollen feet. Seasonal changes in temperature and shortages in the ingredients necessary to clean linens—water, fat, hardwood ashes, and firewood chief among them—also exacted a bodily toll. "Cold as Greenland today and such a searching wind," Paige wrote in January 1862. "I've had trying times this Monday, come near freezing in putting out clothes."[59] Housework was labor; this labor could be brutal.

Work arose from the distance between ordered social norm and uncooperative non-human nature. Workers internalized ecological changes under the name domestic work. The most rudimentary of these changes were to weather. "We tried to wash again to day but the pump was froze up so we could not get any water," sighed the diarist Carrie Ball in her 1879 journal, describing a weekly washday hindrance to cleaning in Midwestern winter.[60] Workers spoke of shoulders sore from hauling water, hands raw from caustic lye, and headaches from French chalk and ox-gal. These were not idle laments from individuals who, at least according to one nineteenth-century physician, constituted the class of "fragile American miss[us]" keeping house.[61] No, rather, these were testimonies from workers encountering nature on a daily basis and wrestling it to match social expectation. Knowing and managing nature was domestic work.[62]

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[59] Francis R. Paige, Diary entry, January 13, 1862; Cairns Collection of American Women Writers, Memorial Library, University of Wisconsin-Madison.

[60] Carrie Ball, Diary entry, January 5, 1879, Cairns Collection of American Women Writers, Cairns Manuscripts—Ball.

[61] Edward H. Clarke, *Sex in Education; or, A Fair Chance for Girls,* Fifth ed. (Boston: Rand, Avery, & Co. [1873] 1875), 168.

[62] Environmental historians have written some about domestic work as ecological work. See, for example, Nancy C. Unger, *Beyond Nature's Housekeepers: American Women in Environmental History* (Oxford: Oxford University Press, 2012); Virginia J. Scharff, ed. *Seeing Nature Through Gender* (Lawrence: University Press of Kansas, 2003). Much of the

Some mid-nineteenth century homemakers spoke of their work with equanimity. The reasons for this even-keeled regard for the work were often tied to cooperation from the non-human world. "This morning finds the ground all frozen and it looks quite bare and dry, it is pleasant with light south wind," reported the diarist Amanda Welch Beach with apparent satisfaction that it was not snowing. Her 1870s entries evidence an even-keeled regard for the work of cleaning in spring and fall. "[H]ung out my cloths [sic] and got them drying nicely."[63] Other women spoke with satisfaction about the brightness of the freshly whitewashed walls; the smell of sun-dried sheets; the speed with which they had pieced together a new shirt. The diaries of nineteenth-century homemakers offer the impression that the routine of housework was precisely that: routine, and work. Neither of these facts made the labor singularly damnable for its doers, nor singularly satisfying. Domestic work was always both.[64]

Individual experience, unfortunately, did little to alter the nineteenth-century structures governing domestic work and the rights afforded to its doers. Within a mid-nineteenth century United States, commercial laundry work remained unpaid or poorly paid, legally unprotected, and uncounted in U.S. Census Bureau until 1870. The lack of economic and legal protections for commercial laundry workers left paid doers economically precarious and personally vulnerable to overwork and sexual assault. Though historians disagree as to whether unpaid domestic work

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literature on domestic work and ecological expertise can be found in the sizable literature on food preparation; see John Soluri, *Banana Cultures: Agriculture, Consumption, and Environmental Change in Honduras and the United States* (Austin: University of Texas Press, 2005); Nicolaas Mink, "It Begins in the Belly," *Environmental History* 14 (April 2009): 312-322. Neil Prendergast, "Raising the Thanksgiving Turkey: Agroecology, Gender, and the Knowledge of Nature," *Environmental History* 16, no. 4 (2011): 651-77. http://www.jstor.org.ezproxy.library.wisc.edu/stable/23049856.

[63] Amanda Welch Beach, (1810-1893), Diary, January 18, 1870. Cairns Collection of American Women Writers, Department of Special Collections, Memorial Library, University of Wisconsin-Madison.

[64] See, for example, Carrie Ball, Diary, (1879); S. Elisa Sleight, Diary (1845); Frink, Martha. (1858-1890). Diaries; Webster, Celestia. (1866-1867). Diaries; Carll, Emma Maria, 1854-1944. (1875). Diary; Flint, Verna Treadwell. (1870-1883). Diary. *Adeline and Julia: Growing up in Michigan and on the Kansas Frontier: Diaries from 19th-Century America,* edited by Janet C. Coryell and Robert C. Myers, eds., Michigan State University Press, 2000.

was foundational to a nineteenth-century wage-labor economy, or a work form remaining outside of capitalism, they are in agreement on one assessment: the invisibility of the work only exacerbated the vulnerability of workers.[65]

Two complementary nineteenth-century principles made laundry work second-class work. One was of these principles was coverture, the nineteenth-century legal doctrine by which the material interests of a married woman were assumed to be represented ("covered") by the actions of her husband. Once married, a woman was assumed to owe her husband domestic and reproductive labor in return for financial support. Coverture had powerful legal implications, narrowing everything from the capacity of an unmarried woman to pursue paid work to the ability for a widow to claim her deceased husband's property.[66] In addition to coverture, a second nineteenth-century principle also shaped the economic position of domestic workers: the ideal of separate spheres. More social prescription than legal doctrine, this Victorian ideal located paid work and political activity in a so-called "public sphere" of the marketplace or city hall. Those activities that were seen as the antithesis of political and economic work were viewed as possible only in the domicile, and the terrain of women: childrearing, moral instruction and emotional labor chief among them. By positioning pecuniary and political activity as antithetical to homemaking, the ideal of separate spheres rendered homemakers apolitical and non-economic

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[65] Jeanne Boydston, "The Woman Who Wasn't There: Women's Market Labor and the Transition to Capitalism in the United States," *Journal of the Early Republic* 16, no. 2 (Summer 1996): 183-206; Estelle B. Freedman, *No Turning Back: The History of Feminism and the Future of Women* (New York: Ballantine Books, 2002); Gerda Lerner, *The Creation of Patriarchy* (New York: Oxford University Press, 1986); Ariela Dubler, "In the Shadow of Marriage: Single Women and the Legal Construction of the Family and State" *Yale Law Journal* 112, No. 7 (May 2003): 1641-1715.

[66] Estelle Freedman, *No Turning Back: The History of Feminism and the Future of Women* (New York: Ballantine Books, 2002); Ariela R. Dubler, "Wifely Behavior: A Legal History of Acting Married," *Columbia Law Review* 100, No. 4 (May 2000): 957-1021; Hendrik Hartog, *Man and Wife in America: A History* (Cambridge, Mass.: Harvard University Press, 2000). Hartog makes the point that coverture as a principle governed not just the options and behaviors available to women performing the role of wife, but also those actions available to men performing the role of husband. His book reinforces the point that gender roles never singularly affect one single gender.

actors. Those engaged in paid domestic work, by extension, represented a perversion of social norm only understandable in terms of lower social and moral stature. In legal, economic, and social terms, a nineteenth-century female worker could expect be an ideal wife and mother or a waged worker, but not both. Coverture and a separate spheres ideal ensured her subservient position.[67]

In addition to coverture and the separate spheres ideology, one final logic governed nineteenth-century washing workers: racial hierarchy. Assumptions about the "fit-ness" of an individual for laundry work was informed by an individual's legible ethnicity. Race operated in tandem with gender to create a role called "domestic worker" for nineteenth-century women seeking viable income. One need look no further than the tropes caricaturing nineteenth-century domestic help to understand that race was always mentioned when describing a domestic worker: the Chinese washman, the Irish washerwoman, the black Mammy, the Mexican steam laundry worker, and the white housewife were each identities constructed to distinguish between respectable homemakers and deplorable domestic workers.[68]

So entrenched were the dictates of race that white female social critics, by the late nineteenth century, both blamed non-white immigrants for the supposed loss of domestic work's stature and celebrated the "gains for woman"—meaning white women—made possible by the outsourcing of domestic production to commercial facilities staffed by those self-same immigrants. By the 1890s, a perceived dearth of eligible domestic workers—an unattainable

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[67] Cathy N. Davidson, Lawrence Buell, Amy Kaplan, et. al., "NO MORE SEPARATE SPHERES!" *American Literature 70* (Sept. 1998): 443-606.

[68] Evelyn Nakano Glenn, *Issei, Nisei, War Bride: Three Generations of Japanese American Women in Domestic Service* (Philadelphia: Temple University Press, 1986); Catherine Ceniza Choy, *Empire of Care: Nursing and Migration In Filipino American History* (Durham: Duke University Press, 2003); Tera W. Hunter, *To Joy My Freedom: Southern Black Women's Lives and Labor After the Civil War* (Cambridge, Mass., Harvard University Press, 1997).

ideal—had a name: "the servant problem." Trying to explain why, by 1897, so few white women were entering into domestic service, the Vassar College historian and Bureau of Labor Statistics researcher Lucy Salmon lamented, tellingly, "[D]ifficulty is presented to the American born [sic] girl when she realizes that she must come into competition with the foreign born or colored element."[69] The term "the servant problem" named what was in fact a problem of racialized labor categories in flux, not a dearth of help.

Against a backdrop of exploitation and vulnerability, nineteenth-century domestic workers nonetheless built forms of expertise that made incrementally more tolerable their political and economic roles. This expertise concerned how to manage non-human nature that was always shaping cleanliness, alongside social prescript. In hard wash water, moldering fat, and wheat starch, the non-human quietly bent social prescript away from easy stabilization.

II. Nature as co-author of cleanliness: Water

Nineteenth-century domestics interacted daily with the natural world. Cleanliness was impossible to obtain without it. The simplest example of this knowledge could be found in domestics' ability to distinguish between hard and soft water. In areas where bedrock dissolved into creek or well water, the resultant mineral-laden water was referred to as "hard." For a washerwoman, identifying hard water was crucial: a gummy curd would form from a reaction between soap and hard water that would float on the top of wash water and cling to clothes. "Soft water is indispensable to the washerwoman," exhorted nineteenth-century domestic advice

[69] Lucy Maynard Salmon, *Domestic Service* (New York: The MacMillan Company, 1897); viewed as Lucy Maynard Salmon, *Domestic Service* in "American Women: Images and Realities" series (New York: Arno Press, 1972), 147.

guides. For workers, this advice needed little explanation; the problems caused by hard water were physically evident each time one washed.[70]

Because water hardness was a localized phenomenon—wells dug on two adjoining lots might yield waters with markedly different mineral content—domestic advice guides from the nineteenth century included myriad instructions for how to test and handle water one wished to wash with. Wash water, in other words, was produced, not collected. According to Catharine Beecher, hard water could be softened with the addition of lye or soda; too much, however, would "injure the hands and clothes." Rain water provided a welcome alternative when lye was not to be had. And regardless one's water hardness, the layout of one's pump, reservoir, and washroom were crucial for mitigating labor. "Every woman should use her influence to secure all these conveniences; even if it involves the sacrifice of the piazza, or 'the best parlor,'" Beecher intoned.[71] The water needed for washing should shape the layout of house around it.

Hard water was a particular problem in the contested territories that would become U.S. west. There, limestone, sandstone, and shale dissolved into mountain streams and wound up in washtubs. Across the Rocky Mountain territories, workers spoke with frustration about mountain streams filled with water so mineral-laden that it "took all our strength and a great portion of our soap, besides," to launder garments that, even after washed, would "not look well."[72] A "somewhat sulphery [sic]" taste and smell indicated that one had made camp near a "spring of

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[70] Sarah Josepha Buell Hale, *The Ladies' New Book of Cookery* (New York, H. Long & Brother, 1852), 445.

[71] Beecher, *Treatise on Domestic Economy*, 235.

[72] Diary of Myra Fairbanks Eells, May 1838, in *Elkanah and Mary Walker, Pioneers Among the Spokanes* (Caldwell, ID: Caxton Printers, 1940), 81. Labor historians and historians of technology have long argued that so-called menial labor has required intellectual as well as physical acumen. It is only in the last decade that these historians have joined with sociologists to create a new language for describing this skill.

hard water."[73] Travelers learned to identify and name the new water types they were encountering.

Particularly for Anglo travelers moving west by covered wagon, the habit of washing once per week became an important way of asserting one's ties to eastern familiar in the face of unfamiliar ecological terrain. That racial hierarchy was also less fixed in unincorporated territories heightened the importance of cleanliness and, thus, knowledge of water types. Cleanliness norms that communicated respectability. As such, Anglo diarists and letter-writers emphasized their washing practices both in diaries written for self and in letters sent home to East Coast family. Noted diarist Margaret Ann Frink, traveling westward by covered wagon in 1850, "If we could have had our own way, this would have been a day of rest in reality, as well as in name; but such it was not to be. … [T]he weekly laundry, had to be attended to."[74] Ecological reality shaped decisions about where to camp, when to linger, and when to move on. "We will remain in camp today to wash, and rest the cattle," wrote Boston-borne settler Amelia Steward Knight in August 1853, four months into what would be a five-month journey to settle in Oregon Territory with her husband and eight children—one born two weeks before the end of their journey. Ecological, translated into functional domestic terms, remained a particular focus of her attention. "It is 18 miles to the next water. Cotton wood and willows to burn" would enable Knight to boil her linens. For Frink and Knight, as for many white women moving west, weekly washing became a means of emphasizing the endurance of one's connection to a socially ordered world left behind.[75]

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[73] Diary of Mary Stewart Bailey, August 24, 1852, in *Ho for California! Women's Overland Diaries from the Huntington Library,* Sandra L. Myres, ed. (San Marino: Huntington Library, 1980).
[74] Diary of Margaret Ann Alsip Frink, July 14, 1850, in *Covered Wagon Women: Diaries & Letters from the Western Trails, vol. 2*: *1850,* Kenneth L. Holmes, ed. & comp. (Lincoln, NE: University of Nebraska Press, 1995), 119-126.

[75] Diary of Amelia Stewart Knight, August 25, 1853, in *A Day at a Time: The Diary Literature of American Women from 1764 to the Present,* Margo Culley, ed. (New York: The Feminist Press, 1985), 119.

Hard water in the Rocky Mountain west augmented disruptions as well as opportunities within an unstable social hierarchy. With the 1840s influx of gold rushers to the Sierra Foothills, Mexican women and Chinese men sold washing labor and water knowledge in the informal economy created around temporary mining camps. These commercial workers typically charged $.25 per washed and ironed shirt. In Calaveras County, miner Friedrich Gerstäcker recalled going to collect his wash. Upon finding a huge pile of unmarked clothes, he picked out six shirts of decent quality he wished to take with him; the washing worker remarked that every other customer had done similarly. Commercialized washing, borne of single-gender spaces, also gained meaning from the double difficulty miners found in washing for themselves, and in hard water. In this sense, hard water was not the sole author of commercialized cleanliness practices; but its stubborn presence in the washtub catalyzed commercialization in the Rocky Mountain region.[76]

Outside of the Rocky Mountain region, another ecological hindrance asserted itself seasonally, especially in New England and the U.S. south: the lack of wash water. In Wisconsin, domestic Carrie Ball described how winter conditions curbed attempts to clean clothes in her 1879 diary. "We tried to wash again to day but the pump was froze up so we could not get any water."[77] Frozen pumps were not the only winter condition affecting how often domestics washed, and what they chose to forgo cleaning. Frozen creeks also hindered one's ability to collect sufficient water for the wash; sleet and snow, meanwhile, kept workers from doing wash that could not be hung out to dry. Winter was not the only season that presented problems. In

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[76] Susan Lee Johnson, *Roaring Camp: The Social World of the California Gold Rush* (New York: W.W. Norton, 2000), esp. Ch. 2. "Life Amid the Diggings."

[77] Diary of Carrie Ball, January 3, 1879, Cairns Collection of American Women Writers, University of Wisconsin-Madison Special Collections.

summer, heat also caused an analogous water shortage problem, drying out the creek and well. This meant that, for many domestics, rain water was the chief means of overcoming dirt especially in summer months. "It rained nearly all night … and I have plenty of water again," effused Amanda Welch Beach in June, after more than a week of "hot and dry morning[s]" noted in her 1870 diary.[78] "Rain in the forenoon and clear in the afternoon. Washed some," similarly noted Amelia Steward Knight from mid-way through a five-month overland journey west with her family.[79] Water availability, whether well water or rain, shaped how often domestics washed.

The natural world did not just shape how domestics thought about washing; washing, conversely, shaped how domestics thought about the natural world. The best example of this can be found in the nineteenth-century commonplace practice of collecting rainwater for washing purposes. In contrast to twentieth-century views of clean water as piped water, nineteenth-century domestics prized water falling directly on roofs for its functionality and cleanliness. Rain water never contained mineral content making it hard; further, it fell close enough to the house to spare the work of hauling.[80] Thus domestic advice guides from the 1850s and 1860s urged domestics to prize rain water for washing as superior to anything from the well or creek. In her 1869 social treatise *The American Women's Home,* Catharine Beecher went so far as to advise that the sink, in a Christian home, "has two pumps, for well and for rain-water—one having a forcing

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[78] Diary of Amanda Welch Beach, May 30, June 8, 1870, Cairns Collection of American Women Writers, University of Wisconsin-Madison Special Collections.

[79] Diary of Amelia Stewart Knight, September 16, 1853, in *A Day at a Time: The Diary Literature of American Women from 1764 to the Present,* Margo Culley, ed. (New York: The Feminist Press, 1985), 124.

[80] See, for example, Sarah Josepha Buell Hale, *The Ladies' New Book of Cookery* (New York, H. Long & Brother, 1852), 445; Mrs. E.F. Haskell, *The housekeeper's encyclopedia of useful information for the housekeeper in all branches of cooking and domestic economy* (London: D. Appleton and Co., 1861), 8-12; William Eassie, *Healthy houses: a handbook to the history, defects, and remedies of drainage, ventilation, warming, and kindred subjects* (New York: D. Appleton, 1872), 136.

power to throw water into the reservoir in the garret, which supplies the water-closet and bath-room."[81] Rain water, in this view, was a crucial ingredient of cleanliness rather than an impediment, and a household feature to be cherished.

This view of rain water as resource would begin shifting in the 1880s and 1890s. Infrastructural changes were one driver of changed attitudes toward the natural world. Widespread urbanization and the growth of high-density apartment and tenement buildings meant that, for a growing number of city-dwellers, rain catchments and cisterns were increasingly difficult to access.[82] The rise of municipality-managed water systems combined with public health appeals for indoor plumbing also drove a turn towards taps and against the rain barrel.[83]

Anxieties over the value of domestic work also turned homemakers of means against rain water. By the 1880s, the movement of soapmaking, canning, and other household production to the factory floor threatened an earlier logic valuing white female homemakers for their productive contributions to a household economy. Coupled with the rise of a paid domestic workforce, built in the shadow of slavery, white domestics faced questions about how to distinguish their work from that done by paid non-white workers.[84]

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[81] Catharine Beecher, *The American Woman's Home, or, Principles of domestic sciences* (New York: J.B. Ford and Company, 1869), 35.

[82] Alison K. Hoagland, *The Bathroom: A Social History of Cleanliness and the Body* (Santa Barbara, California: Greenwood, 2018).

[83] Martin V. Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: Johns Hopkins University Press, 2000); Gerard T. Koeppel, *Water for Gotham: A History* (Princeton: Princeton University Press, 2000); Sarah S. Elkind, *Bay Cities and Water Politics: The Battle for Resources in Boston and Oakland* (Lawrence: University Press of Kansas, 1998). On role of social change, particularly immigration, in motivating debates over public water access in the 1830s and 1840s, see Michael Rawson, *Eden on the Charles: The Making of Boston* (Cambridge, Mass.: Harvard University Press, 2006), esp. Ch. 2. "Constructing Water," 75-128.

[84] Glenna Matthews, *"Just a Housewife:" The Rise and Fall of Domesticity in America* (New York: Oxford University Press, 1987); Thavolia Glymph, *Out of the House of Bondage: The Transformation of the Plantation Household* (Cambridge: Cambridge University Press, 2003); Tera Hunter, *To Joy My Freedom: Southern Black Women's Lives and Labors After the Civil War* (Cambridge, Mass.: Harvard University Press, 1997).

Rain water was one casualty of this debate over the changing meaning of domesticity. White domestics across the late-nineteenth and early-twentieth century turned to university training to recreate social distinctions around white femininity. Much of this university training focused on new courses of study suffused with technical sophistication differentiated based on gender. Sanitary engineering, household chemistry, and domestic sciences: for each of these disciplines, practitioners learned to treat rainwater as indistinguishable from the places where it fell.[85] The purity of municipal water sources newly derived from a combination of chemical water testing practices and the fact of their unpeopled surroundings. In New York City's Croton Aquifer; in Boston's Brookline Reservoir; in Chicago's Lake Michigan; and in San Francisco's Hetch Hetchy Reservoir; advocates pointed to the pristine surroundings that made these water sources clean.[86]

Finally, the varietals of wash waters serve as indication of the knowledge needed to make clothes clean. Washerwomen created specific water types for specific cleaning goals. Bran or potato water guarded against garments shrinking; coffee water protected colored calicoes from bleaching. For garments meant to stay white, bluing water kept linens steely white. Flannels, regardless of coloring, required boiling water—"as hot as the hand can bear"—to make them clean. Urged social critic Catharine Beecher in her 1841 *A Treatise on Domestic Economy,* "There is nothing, which tends more effectually to secure good washing, than a full supply of all conveniences; and among these, none is more important, than an abundance of warm and cold

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[85] Sarah Stage and Virginia B. Vincenti, *Rethinking Home Economics: Women and the History of a Profession* (Ithaca: Cornell University Press, 1997).

[86] Melosi, *The Sanitary City*; Carl S. Smith, *City Water, City Life: Water and the Infrastructure of Ideas in Urbanizing Philadelphia, Boston, and Chicago* (Chicago: University of Chicago Press, 2013).

water."[87] As Beecher saw it, water was *the* crucial ingredient of cleanliness. Cleanliness required many types of water. Thus cleanliness required an attentiveness to water, a close knowledge of how it smell, taste, and cleaning capacity might vary across region or across seasons of the year.[88]

In sum, nature shaped nineteenth-century domestic work as geographically and seasonally changing water: as hard water, as seasonal fluxes in water availability, and as rain water prized for its lack of mineral content. Domestic workers built cleanliness norms and skills that accommodated rather than ignored these realities. In a still-becoming nation, social expectation meant a great deal: the norm of weekly washing, the norm of boiling linens, and the expectations that clothes be ironed as well as washed, meant that washing workers internalized social propriety as bodily weariness. But the non-human remained a powerful coauthor of what workers expected cleanliness to look life, feel like, and smell like—and also how much work it would require.

The non-human asserted itself in places other than the wash tub. It pervaded corners of the kitchen long before one had reached for the wash tub: in the soap kettle.

III. Nature as co-author of cleanliness: Fat

At its most rudimentary, nineteenth-century soap making required three ingredients: fat,

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[87] Catharine E Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845), 284. A note on spelling: nineteenth-century publishers routinely misspelled Beecher's name with an e, as 'Catherine.' Where that mistake exists in my sources, I correct it in my footnotes for the current reader, and to contribute to consistent citations moving forward.

[88] Catharine E. Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845), especially Ch. XXVI. "On Washing;" Ch. XXVII. "On Starching, Ironing, and Cleansing;" and Ch. XXVIII. "On Whitening, Cleansing, and Dyeing;" Leslie Eliza, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey and Hart, 1840); Sarah Josepha Buell Hale, *The workwoman's guide: containing instructions to the inexperienced in cutting out and completing those articles of wearing apparel, &c. which are unusually made at home: also, explanations on upholstery, straw-platting, bonnet-making, knitting, &c.*, (London: Simpkin, Marshall, and Co., 1838); Sarah Josepha Buell Hale, *The Ladies' New Book of Cookery* (New York, H. Long & Brother, 1852).

lye, and salt. Fat was soap's backbone, the chief ingredient in any bar or soap jelly. Lye was a clear liquid made by pouring boiling water over hardwood ash. Once made, lye could be mixed with heated fat to produce a floating, gelatinous layer of soap. Salt served as hardening agent. A fistful of the white crystals tossed into a soap kettle helped "salt out" the soap, separating hot liquid soap from remaining lye and other impurities, and helping to ensure that only soap was poured into bar molds or a kitchen soap jar to set.[89] Batches of soap were measured by the kettleful or barrel; a routine soapboil might use 20 to 40 pounds of fat to yield quantities sufficient to last a household three to six months. Soap making was a day-long activity, requiring regular stirring of the soap-lye mixture "till it becomes thick and ropy."[90] Because soap making required a steady boil, the work was hot work; it was not uncommon for domestics to save it for autumn and spring.[91]

Of all the ingredients in soap, fat required the most worker knowledge. We can see this functional knowledge in the specific nomenclature that nineteenth-century domestic workers employed when referring to animal fats. "Lard" referenced the slippery fat from the abdomen of a pig that was most often used for frying. "Suet," by contrast, referred to the hard white fat in the loin of cattle and sheep that cooks used in puddings, pastries, and mincemeat.[92] "Tallow" referred the hardest fats of all, integrated into the kidneys and intestines of an animal that

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[89] Beecher, *A Treatise on Domestic Economy*, esp. 290-291; Leslie, *The house book*; Mrs. Cornelius, *The young housekeeper's friend, or, A guide to domestic economy and comfort* (Boston: Tappan and Whittemore, 1855).

[90] Eliza, *The house book*, 17.

[91] Beecher, *A Treatise on Domestic Economy*; Eliza, *The house book*; Sarah Josepha Buell Hale, *The workwoman's guide: containing instructions to the inexperienced in cutting out and completing those articles of wearing apparel, &c. which are unusually made at home: also, explanations on upholstery, straw-platting, bonnet-making, knitting, &c.*, (London: Simpkin, Marshall, and Co., 1838); Mrs. Cornelius, *The young housekeeper's friend*; Thomas Webster, *An Encyclopaedia of Domestic Economy* (London: Longman, Brown, Green, and Longmans, 1844).

[92] Sarah Josepha Buell Hale, *The Ladies' New Book of Cookery* (New York, H. Long & Brother, 1852).

required clarifying but, when melted down, made the highest-quality soaps and candles. "Drippings" constituted the most general term of all: a catch-all referring to any fat caught in the metal dripping pan designed specifically to save such liquefied cooking grease.[93] The nineteenth-century nomenclature describing different types of fat demonstrate both worker knowledge of animal parts and suitable end uses. Fat was central ingredient in the nineteenth-century household.[94]

Drippings in particular enjoyed an unfortunate feature: they spoiled. In households where members consumed everything from beef to fish, guinea fowl, and grouse, the contents of a drippings bucket could vary wildly. Smooth, liquefied beef fat was poured in along viscous, odorous fish oil; tough bits of gristle might fall in alongside curls of chicken skin. This meant that domestics needed to understand fat—how it heated, how it stored—in order to transform varied and pungent drippings into uniform and odorless raw material suitable for the soap kettle. "Save all drippings and fat, melt them, and set them away, in cakes," advised Catharine Beecher in her 1841 household guide that featured a lengthy section on fat storage. She reminded readers to re-melt discard fat lest it stink up the household.[95] Given the mixture of fats in the drippings bucket, creating "soap-grease" required the cleaning of fat. Cleaned dripping could reasonably be stored for six to nine months, the amount of type that would typically elapse between rounds of

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[93] "Tallow" and "drippings," *Oxford English Dictionary*.

[94] See Catharine E Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845), 290-291; Eliza Leslie, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey & Hart, 1840).

[95] Catharine E Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845); Sarah Josepha Buell Hale, *The Ladies' New Book of Cookery* (New York, H. Long & Brother, 1852).

household soap making. Domestic workers learned to strain cooking fat through a sieve while it was still hot liquid, and to clarify it ever few days by boiling it in a weak lye.[96]

Even after cleaning fat, domestics worried about soap-grease spoilage and the associated stink. "A brown earthen [jar] soon … smells disagreeably," cautioned one domestic writer, instead urging that homemakers use stone jars, which were less porous, for storing soft soap that spoiled when exposed to air.[97] So pronounced were the problems of rancidity from air exposure that, according at least to company mythology, leaders at soap making giant Lever Brothers decided to incur the cost of wrapping individual bars of soap in paper rather than selling it by the pound carved off a large block because wrapping mitigated the spoilage hastened by air exposure.[98]

In addition to handling fat, domestics in the nineteenth century also needed knowledge of how to make lye. Lye was a clear alkaline liquid that would react with fat to form soap. It was, compared to the constant work of cleaning fat, straightforward to make. A domestic worker would collect hardwood ash from the stove, sift out stray pieces of cinder, and pour boiling water over the ash to make lye. In nineteenth-century domestic advice guides, authors emphasized that hardwood ash specifically was the only type that yielded lye. Softwood—pine, spruce, fir,

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[96] Eliza Leslie, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey & Hart, 1840), 14-15.

[97] Mrs. Cornelius, *The young housekeeper's friend, or, A guide to domestic economy and comfort* (Boston: Tappan and Whittemore, 1855), 158. Cleaned fat for soap-making faced competition from other household uses, candle-making, baking, and cooking chief among them. "Fat thus clarified … is as good as lard, to fry doughnuts or biscuits," advised one domestic guide, indicating that fat, thus treated, was still seen as edible. Thus critiques of hygiene habits, often leveled by sanitarians at poorer or non-white individuals, not only reflected class-informed hygiene expectations—but failed to acknowledge that one might face the thankless choice between eating one's valuable fat stock or using it to wash one's laundry. See Mrs. Cornelius, *The young housekeeper's friend, or, A guide to domestic economy and comfort* (Boston: Tappan and Whittemore, 1855), 158.

[98] Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change,* Vol. 1 (London: Cassell & Company Ltd, 1954).

redwood, and the like—would not create usable ash when burned; neither would anthracite coal. Homemaking guides offered advice specified down to the species level. "Oak ashes are best," suggested one 1840s domestic advice guide.[99] "[H]ickory ashes is the best: but good oak ashes will do very well," countered another.[100] Some guides emphasized proportion over ash type in their instructions for how to make lye, since some ashes were understood to be more alkaline. Quantity of production demonstrated one's proficiency as a homemaker, too; lye could be made in quarts at a time. The truly expert homemaker kept a perpetual lye barrel that was frequently replenished with ash and boiling water. Such a barrel was useful for storing discard cooking fat: lye "effectually preserve[s] it from moulding" and meant that soap was always close at-hand.[101]

The ecological expertise required to make lye should draw our attention, but also elicit our skepticism. It was true that quality lye could only be made from hardwood. As such, it is reasonable to suspect that many nineteenth-century domestics could distinguish between hard wood from soft wood, both by sight in the woodbox and in the temperatures they generated in the stove. But outside of prescriptive advice literature, few working domestics mentioned hard versus soft wood availability as ecological reality shaping their work. The one diarist mention of hardwood is the exception that proves the rule. Letter-writers and diarists were silent about wood type *except* where they sought to demonstrate their civility in the midst of unfamiliar terrain. For example, British immigrant Catherine Traill, writing back to family in London about her new life

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[99] "To manufacture Ley, Soap, Starch, and other Articles used in Washing," Catharine Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845), 290-292.

[100] See "How to Make Lye," Leslie Eliza, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey and Hart, 1840), 14-15.

[101] "How to Make Lye," Leslie Eliza, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey and Hart, 1840), 14-15; see also Mrs. Cornelius, *The young housekeeper's friend, or, A guide to domestic economy and comfort* (Boston: Tappan and Whittemore, 1855), who advices: "The best ashes for making soap are the walnut; the next best, maple. Pine and peat ashes are good for nothing but the grass." (184)

in Western Canada, wrote in 1834: "In making ley [lye] for soap, care is taken to use none but the ashes of hard wood, as oak, ash, maple, beech; any of the resinous trees are bad for the purpose, and the ley will not mingle with the fat in boiling, to the great mortification of the uninitiated soap-boiler."[102] Traill's imagined mortification might have been a reality; but her care to mention cleanliness habits recreated in "the backwoods of Canada" tell us something about the social currency of cleanliness. Others nineteenth-century domestic diaries and letters fail to mention dirtiness tolerated because hardwood ash was unavailable. Inference by absence suggests the limited importance of this type of ecological expertise. It reminds us not to conflate prescriptive literature and lived practice.

Nineteenth-century domestics spoke with resolve about the work that was soap making. Their testimonies highlight the reality of the work; that it was important enough to write about, and mundane enough to treat as routine. "Warm, asewing. Mary made a kittle of soap," noted Mary Poor in her 1830 diary, the sole words in the diarist's entry for the day.[103] Diarist Susannah Holyoke Ward offered a similarly assessment in her 1800 journal: "At mamas. Made 3 barrels ½ of soap."[104] These were the sole words that Ward would write that day, and in fact that month. That soap making warranted a mention suggests the importance of soap to household functioning. But in contrast to how some wrote about the burden of doing the weekly wash,

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[102] Catherine Parr Strickland Traill, Letter from Catherine Parr Strickland Traill, 1834, in *The Backwoods of Canada: Being Letters from the Wife of an Emigrant Officer* (London, England: Nattali & Bond, 1838), 292.
[103] Diary of Mary Poor, February 10, 1832, in *The Diary of Mary Poor of Indian Hill Farm* Mariotti, Eva. Boston, MA: Warren F. Kellogg, 1895, pp. 320.

[104] Diary of Susanna Holyoke Ward, August 19, 1800, in *The Holyoke Diaries, 1709-1865* (Salem, MA: Essex Institute, 1911), 215.

nineteenth-century domestics rarely complained about soap making. This suggests its routine nature.[105]

Only one part of the chore elicited frequent worker disgust: using caustic lye. "Lye mixed with drippings made good soap; but the lye odor was … unusually strong in the homemade product," lamented Else Koren with in an 1854 diary entry describing her day's works.[106] Mary Walker, similarly, felt the effects of soap making bodily: "[S]ome irritation of the skin, resulting from working with lye in the making of soap," she noted in an 1839 diary entry.[107] The unpleasantness of lye's harshness explains some of the enthusiasm voiced by Julia Ward Howe, urban resident for whom soap making was becoming an option as commercial options flourished in cities. "[T]he soap-fat merchant … gave me thirty-four pounds of good soap for my grease," Howe effused in 1845. "I was quite beside myself with joy, capered about in the most enthusiastic manner, and was going to hug in turn the soap, the grease, and the man."[108] The unpleasantness of working with caustic lye partially explained why, for those of means, trading fat for grease was preferable to soap making oneself.

Ward's comments also alert us to another reality of soap making: that bar soap—commercial or no—increasingly delineated boundaries around respectability in the nineteenth-

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[105] See also Diary of Sarah Jane Goding, 1868, Cairns Collection of American Women Writers, Cairns Manuscripts—Goding.

[106] Diary of Else Elisabeth Hysing Koren, January 1854, in *The Diary of Elisabeth Koren 1853-1855* David T. Nelson, (Northfield, MN: Norwegian-American Historical Association, 1955), 115.

[107] Diary of Mary Richardson Walker, August 1839, in *On To Oregon: The Diaries of Mary Walker and Myra Eells. Drury,* in *First White Women over the Rockies: Diaries, Letters, and Biographical Sketches of the Six Women of the Oregon Mission Who Made the Overland Journey in 1836 and 1838, vol. 2*, Clifford Merrill, ed., (Glendale, CA: Arthur H. Clark Co., 1966), 166.

[108] Howe, Julia Ward, 1819-1910, Letter from Julia Ward Howe to Louisa Culter Ward Crawford Terry, 1845, in *Julia Ward Howe, 1819-1910, vol. 1.* Richards, Laura E., Elliott, Maud Howe and Hall, Florence Howe, eds. (Boston, MA: Houghton, Mifflin & Co., 1915), 110-111.

century U.S. Anglo diarists in unfamiliar territory pointed to a capacity to make soap as litmus of their enduring civility.[109] Others romanticizing wash habits of a yeoman past to show the capacity of white settlers to protect cleanliness norm in unfamiliar terrain, and also to celebrate their respectable present. "In the early days of Ohio," wrote Eliza Steele in 1840, "when the settlers were in want of many articles of household furniture, they resorted to the buckeye. The covering of the nut can be used as soap[.]" Steele's description, for her, showcased the resourcefulness of past white settlers and also confirmed her comfortable distance from an era of having to use buckeyes in the washtub.[110] By the 1840s, soap was crucial signifier of civility because the bounds of nationhood were so much in flux.

What sensory ends did soap accomplish? For much of the nineteenth century, it was the *absence* of smell in cleaned linens, rather than the presence of a chosen scent, that served as the most consistent olfactory indicator of cleanliness.[111] Soap making was not the only process that was smelly work. Washing was, too. Lye bore a sharp, acrid smell. Ox-gall, the acidic liquid bile from inside a cow's gall bladder, smelled like stomach contents—though also was effective

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[109] Catherine Traill writes a letter to a friend in London in 1832 reporting on a conversation she has with one of her husband's military colleagues, before their setting out to Western Canada. The letter indicates the degree to which domestic processes were central to her understanding of civility. "'Then how are we to spin our own wool and make our own soap and candles?'" she reportedly asked the officer, who replied with the following advice. "'When you are able to kill your own sheep, and hogs, and oxen, unless you buy wool and tallow" -- then, seeing me begin to look somewhat disappointed, he said, "Be not cast down, you will have all these things in time, and more than these, never fear, if you have patience, and use the means of obtaining them. In the mean while prepare your mind for many privations to which at present you are a stranger; and if you would desire to see your husband happy and prosperous, be content to use economy, and above all, be cheerful.'" Catherine Parr Strickland Traill, "Letter from Catherine Parr Strickland Traill, September 11, 1834," in *The Backwoods of Canada: Being Letters from the Wife of an Emigrant Officer* (London, England: Nattali & Bond, 1838), 103.

[110] Letter from Eliza R. Steele, July 19, 1840, in *Summer Journey in the West* (New York, NY: John S. Taylor, 1841), 239-255.

[111] Scenting soap to overcome any of these smells required even more work. To scent soap, a domestic would need to re-melt cooled cakes of soap into pieces and stir in an essential oil like bergamot, almond, or musk. One might justify this extra step for fancy toilet soap; but for humble laundry soap, the time and energy was rarely deemed worthwhile. On scenting toilet soap, see Eliza Leslie, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey & Hart, 1840), 19.

distillate for scouring woolens that soap alone could not clean.[112] French chalk; bluing; starch; even the odor of cooking if one dried indoors during the winter, were all hallmarks of the cleaning process. Wrote one woman in her 1854 diary, about washday, "When that [washing] was done I put on my things to get a little fresh air after the soap and lye odors I have been breathing all day."[113] Because presence of odors marked the washing process, the blandishment of odors marked the conclusion of that process. How scent became an indicator of cleanliness is a subject I will discuss in chapter five of this dissertation, as we watch how commercial chemists used fragrance to build brand identity and redefine cleanliness in the 1930s. For now, the following bears repeating. Nineteenth-century domestics knew a great deal about how to manage the non-human appearing in their washtubs because cleanliness demanded clean fat, hard wood, soft water, and clear drying days. Domestics knew the natural world bodily, viewing waste material from one type of housework as raw material for another. It was this type of thinking that would disappear with the rise of commercial chemistry in the late nineteenth century.[114]

One final wash step sought to order the non-human in the household: starching. Unlike wash water and soap, starch largely not an ingredient of twenty-first century cleanliness. For this precise reason, we examine its importance in nineteenth-century cleanliness prescriptions to remember how much commercial chemists transformed definitions of cleanliness. In the

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[112] Beecher, *A Treatise on Domestic Economy*; Hale, *The Ladies' New Book of Cookery*.

[113] The diary of Else Elisabeth Hysing, February 1854, in *The Diary of Elisabeth Koren, 1853-1855*, David T. Nelson, ed. (Northfield, MN: Norwegian-American Historical Association, 1955), 160.

[114] Susan Strasser, *Waste and Want: A Social History of Trash* (New York: Metropolitan Books, 1999). Strasser points out that what we might today view as frugality or noble reuse was really, for many households, a form of consumption meant to emulate the material wealth of the upper classes. Cultural historians Kathy Newman and Tracy Deutsch build on this point, arguing that consumption itself is misleading because it suggests passivity, thus disguising the work involved to buy, prepare, use, mend, or dispose of any consumer good. See Kathy Newman, *Radio Active: Advertising and Consumer Activism 1935-1947* (Berkeley: University of California Press, 2004); Tracey Deutsch, *Building A Housewife's Paradise: Gender, Politics, and American Grocery Stores in the Twentieth Century* (Chapel Hill: University of North Carolina Press, 2010).

nineteenth century, the ideal garment was not clean after washed; it required starching and ironing.

IV. Nature as co-author of cleanliness: Starch and Humidity

Starch was used to stiffen garments like aprons, calico dresses, and the cuffs and collars of shirts. Stiffening served two purposes. Like washing, starching itself was a labor-intensive process that functioned to make visible one's social status. Those who could afford the expense of multiple garments and their complex washing demonstrated their status bleached white cravats and crisp collars. Starching was a matter of state: wrote Mary Hassal, niece of vice president Aaron Burr, to her uncle in Saint Domingue, on the eve of the Haitian Revolution, "We were then presented to the governor, whose wife is divinely beautiful … [in] a cambric chemise, cut very low in the bosom, an under petticoat of linen, made very stiff with starch."[115] Stiffness in garments were a symbol of status. This expectation pervaded beyond political circles. Sarah Dawson made this point directly in her 1862 diary, where she reports on the chiding she received from elder women in her group home as she rushed out the door into late summer mud. "'Girls! Soap is a dollar and a half a bar! Starch a dollar a pound! Take up those skirts!'" the elder women had reported scolded. Dawson admits in her diary that starched cleanliness was a desirable status to preserve, despite the inconvenience. "We had all started stiff and clean, and it

[115] Letter from Mary Hassal to Aaron Burr, 1802, in *Secret History: or, the Horrors of St. Domingo, in a Series of Letters Written by a Lady at Cape Francois, to Colonel Burr, Late Vice-President of the United States, Principally during the Command of General Rochambeau* (Philadelphia, PA: Bradford & Inskeep, 1808), 105-111.

did seem a pity to let them drag; so up they went."[116] The work that starching required made it a powerful indicator of social status.

Beyond indicating social status, starching also served a utilitarian purpose: to prolong the length of time a garment could be worn before laundering again. Since dirt clung to starch instead of garment threads, starching helped protect starched sections of a garment—the collar at back of one's neck, the cuffs at one's wrists—from absorbing dirt and sweat. "[C]lothes derive great injury from lying in their dirt," chided the Philadelphia advice writer Leslie Eliza.[117] Starching helped protect garments from this damage precisely.[118]

Though one could buy starch, most domestics in the mid-nineteenth century made it at home. Starch, after all, came from common household item: wheat. Domestics made it by soaking hulled wheat in water for several days, long enough to yield soften kernels that could be crumbled by hand into the water. The soak water would then be poured off the top of the starch basin and changed for fresh water, a process that—assuming plentiful water resources—one would continue until the soak water drained off odorless and clear. The remaining white powder in the basin could then be dried and set away for sprinkling on damp clothes to stiffen them. A peck of wheat—equivalent to one-quarter of a bushel or, ground, ten pounds of flour—would yield sufficient starch for approximately six months of household washing.[119]

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[116] Diary of Sarah Ida Fowler Morgan Dawson, August 1862, in *A Confederate Girl's Diary: Sarah Morgan Dawson* Warrington Dawson, introd., (Boston, MA: Houghton, Mifflin & Co., 1913), 139-207.

[117] Eliza, *The house book,* 8. Cuffs and collars were detachable from most nineteenth-century shirts. This meant that the sections most likely to show evidence of one's sweat and oil—the collar at the back of one's neck, the cuff at one's wrists—could be laundered without necessitating the washing of the entire garment.

[118] Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983); Kathleen M. Brown, *Foul Bodies: Cleanliness in Early America* (New Haven: Yale University Press, 2009).

[119] Beecher, *Treatise on Domestic Economy*, 291; Eliza, *The house book;* 20; Diary of S. Elisa Sleight, 1845, Cairns Collection of Women Writers.

The starch-making process included reminders that domesticity was made from the natural world. Like fat drippings, wheat spoiled. This meant that starch would sour if wheat was left to soak too long. If incompletely dried, starch would grow musty and impart clothes with a damp smell.[120] Starch was not always available, either. If a seasonal shortage of wheat presented itself, the question of what to do with that wheat—eat it, or clean with it—surely tipped in the direction of caloric uses. Beyond the making process, the use of starch forced attentiveness to one's surroundings. Humidity dampened the efficacy of starch, literally. "When the thermometer climbs up to 111° in the shade as it did the shade as it did the day before the Fourth, it knocks the starch out of everything," editors of the *American Laundry Journal* cautioned readers.[121] Domestics frequently made note of weather alongside their doing of the starching and ironing, a chore that could expand to fill several days if weather was uncooperative.[122]

V. Racializing Knowledge Systems

Domesticity in the 1840s and 1850s functioned as an ideal tying the unpaid work of keeping house to a crucial political ideal: nation-building. In domestic advice guides, short stories in women's magazines, paintings, copperplate etchings, and even in church sermons, midcentury social critics exhorted "American women" to "feel an interest in the support of the democratic institutions of their Country" via their homemaking labors.[123] The ideal also functioned to

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[120] Beecher, *Treatise on Domestic Economy*, 291.

[121] "Hot Weather News From Greater New York," *The American Laundry Journal* 17 no. 1 (July 1898), 7-9.

[122] For example, see Diary of Carrie Ball, January 8, 1879, Cairns Collection of American Women Writers, University of Wisconsin-Madison Special Collections; Diary of Francis R. Paige, June 7, 1879, Cairns Collection of American Women Writers, University of Wisconsin-Madison Special Collections; Diary of S. Elisa Sleight, October 14, 1848, Cairns Collection of American Women Writers, University of Wisconsin-Madison Special Collections.

[123] Beecher, *Treatise on Domestic Economy,* 25.

purport value without extending legal or economic rights to domestic workers, be they paid or no. In each of these depictions, as in political discourse, the ideal homemaker was marked by her technical competence and her vigor. In the passages that have proceeded, I have also suggested that nineteenth-century domestic workers were characterized by their understandings of the natural world, cultivated by necessity.[124]

But domesticity as an ideal also established one other characteristic in the ideal American homemaker: she was racially white. Such an idea became particularly potent in the racial schisms leading up to the outbreak of the Civil War, and its aftermath. Domesticity as an ideal in the mid-nineteenth century U.S. was constructed via advice literature, fiction, women's magazines, and in the circulation of household goods. It appeared on dishware and in plate-glass etchings. But it gained additional traction across the nineteenth-century because it served as such a potent tool for land-claiming. Idealized imaginings of the "sweet American domicile" were held up to serve as stark contrast to the "uncivilized" living arrangements of native, Caribbean or African peoples. Domesticity needed whiteness.[125]

The Civil War disrupted the ideal of domesticity because it further racialized domestic work. Cooking, cleaning, soap-making, ironing: work that, in the 1840s and 1850s, these tasks had been emblems of white Republican motherhood and the sanctification of the domestic sphere had, by the 1870s and 1880s, become drudgery. The advent of paid help doing domestic

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[124] Estelle B. Freedman, *No Turning Back: The History of Feminism and the Future of Women* (New York: Ballatine Books, 2002); Jeanne Boydston, "The Woman Who Wasn't There: Women's Market Labor and the Transition to Capitalism in the United States," *Journal of the Early Republic* 16, no. 2 (Summer 1996): 183-206.
[125] Kristin L. Hoganson, *Consumers' Imperium: The Global Production of American Domesticity, 1865-1920* (Chapel Hill: University of North Carolina Press, 2007); Amy Kaplan, "Manifest Domesticity" *American Literature* 70 (Sept. 1998): 581-606; *Cultures of United States Imperialism*, Amy Kaplan and Donald E. Pease, eds., (Durham: Duke University Press, 1993); Laura Wexler, *Tender Violence: Domestic Visions in an Age of U.S. Imperialism* (Chapel Hill: University of North Carolina Press, 2000); Mary P. Ryan, *Empire of the Mother: American Writing about Domesticity, 1830-1860* (New York: Institute for Research in History and Haworth Press, 1982); Nancy Cott, *The Bonds of Womanhood: "Woman's Sphere" in New England, 1780-1835* (New Haven: Yale Univ. Press, 1977).

chores was not new; but white homemakers newly fixated on the ethnic identity of hired help as an indicator of capability.

Take for example Phoebe George Bradford, who in her 1836 diaries described the features she found desirable in the woman she hired to help around the house. "Go over early to Tusculum and engage Mrs. Hartman to live with me," Bradford wrote. Unlike peers forty years later, Bradford made no mention of ethnic identity when describing the woman's ability to complete domestic work. Instead, Bradford offered only this assessment: "She is neat in her person and pleasant in her countenance."[126] By the 1880s, the language of "neat" and "pleasant" had been replaced by blatant mentions of the ethnic identity of a worker. Mary Dodge Woodward, a woman living in Dakota territory in the 1880s, consistently noted the ethnic identity of the women she hired to help cook, clean, and feed her children. "A neighbor, a Swedish woman, came to wash the granary bedding. She could speak very little English, so Fred said I was to shout at the top of my voice in broken English," she wrote in June 1887.[127] A year later, in September 1888, she hired a different worker, and again made specific note of the woman's ethnicity. "I was up betimes starting in the new girl that Walter brought yesterday. She is a Norwegian girl named Tilda Olson. She cannot talk much English, but she looks right. She is strong and clean."[128] For some employers, ethnicity functioned as explanation for flouted cleanliness norms rather than existing alongside "strong and clean" appearances. "The city is full

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[126] Phoebe George Bradford, "April 16, 1836" in *Phoebe George Bradford Diaries* W. Emerson Wilson, ed., (Wilmington, DE: Historical Society of Delaware, 1975), 253.

[127] Mary Dodge Woodward, "June 17," in *The Checkered Years: Excerpts from the Diary of Mary Dodge Woodward Written While Living on a Bonanza Farm in Dakota Territory during the Years 1884 to 1889*. Mary Boynton Cowdrey, ed. (Caldwell, ID: Caxton Printers, 1937).

[128] Mary Dodge Woodward, "September 10," in *The Checkered Years: Excerpts from the Diary of Mary Dodge Woodward Written While Living on a Bonanza Farm in Dakota Territory during the Years 1884 to 1889*. Mary Boynton Cowdrey, ed. (Caldwell, ID: Caxton Printers, 1937), 239.

of Chinamen; … I often see them ironing and sprinkling from their mouths," wrote Emily Fitzgerald in 1874 from San Francisco, presumably to friends back east.[129] The sense of ethnic otherness pervaded even those letters authored by white Americans living outside of the U.S. "I soon found out that in all domestic affairs I must learn Italian methods; it was useless to try and teach Pompilia and Filomena our ways," wrote Maud Howe Elliott from Rome in 1894, lamenting the lack of washtubs, washboards, and wringers used by domestic help.[130] Ethnicity was explanation for any number of perceived problems. Even when help was perceived as sufficiently capable, the legible racial identity of a hired domestic hand merited attention.

Individual homemakers were not the only ones who, in the decades after the Civil War, made meaning of a domestic worker's ethnic identity. Domestic placement agencies also concerned themselves with collecting such information from the moment a potential worker was taken in.[131] Concerns about ethnic identity also pervaded popular press writings, causing no small amount of handwringing among white domestics. Writing for the *New York Times* in 1872, one author at least saw fit to name the problem facing homemakers seeking domestic help: Irishness. "The influences that make Patrick and Barney a repeater, a rioter … percolate down to the kitchen and render Bridget and Kathleen impertinent, shiftless, untidy and gad-about," the

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[129] Emily McCorkle FitzGerald, "Letter from Emily McCorkle FitzGerald, July 19, 1874," in *An Army Doctor's Wife on the Frontier: Letters from Alaska and the Far West, 1874-1878*, Abe Laufe and Russell J. Ferguson, (Pittsburg, PA: University of Pittsburg Press, 1962), 27-29.

[130] Maud Howe Elliott, "July 1894," in *Roma Beata: Letters from the Eternal City* (Boston, MA: Little, Brown, & Co., 1904).

[131] Faye Dudden, *Serving Women: Household Service in Nineteenth-Century America* (Middletown, Conn.: Wesleyan University Press, 1983); David M. Katzman, *Seven Days a Week: Women and Domestic Service in Industrializing America* (New York: Oxford University Press, 1978). We can see the obvious importance of ethnic identity in the records of placement agencies, businesses devoted to recruiting and funneling workers into wealthy urban households to work as live-in domestic help. These placement agencies had been operating since the 1830s in urban areas. During intake appointments, placement agents recorded the height, weight, eye color, hair color, and "general disposition" of potential servants; they also made note of their "country of origin." See *Work Engendered: Toward a New History of American Labor*, Ava Baron, ed. (Ithaca: Cornell University Press, 1991).

Times lamented.[132] Theirs could not stay a sentiment confined to the pages of the newspaper. That U.S. Census Bureau agents first began collecting information about the ethnic identity of domestic help in the 1890s, after first beginning to count domestic workers in the 1870s, was no coincidence. The long-range effects of the Civil War's mixing of existing racial hierarchy were making themselves known.

Complicating their self-fashioning was the reality that with the 1860s legal cessation of slavery, domestic work was re-racialized as non-white. This meant that, by 1890, U.S. Census agents were collecting data on numbers of domestic workers, and their racial identity, in a way that had been irrelevant just thirty years earlier. In the 1850s and 1860s, homemakers were white. Help was not. By the 1870s, the fact of paid workers in households and domestic production being exported to factories meant that the social position of the imagined homemaker was uncertain. Her identity, like that of the steam laundry owner, was uncertain. Thus Census numbers and steam laundry public rhetoric tells us much more about the shifting political importance of asserting racial categories as they do about the actual ethnic or racial identities that paid laundry workers were claiming.

Further, by the 1880s, brick-and-mortar laundry services had sprung up in the more populous western cities alongside in-home commercial offerings more common in eastern and West Coast cities. These commercial establishments emulated the work done by hand laborers thirty years earlier, but scaled up the size of the operation in an attempt to capture the annual summer rush of settlers moving west. As with their predecessors twenty and thirty years earlier, Anglo settlers in the 1880s wrote of frequenting commercial washing facilities as a means of demonstrating civility in the face of unfamiliar racial orders and ecological hindrances to making

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[132] "Domestic Servants" *New York Times*, July 7, 1872; as quoted in Enobong Branch, *Opportunity Denied: Limiting Black Women to Devalued Work* (New Brunswick, N.J. : Rutgers University Press, 2011), 54.

clothes clean. Traveling west through Wyoming Territory in 1888, Anglo settler Mrs. Hampton noted, "We washed a few pieces in a bucket, sent some to the laundry and packed away what we thought could be dispensed with." The decision was as much about feared scarcity of resource as it was about demonstrated civility. "Laid in supplies for fear of a snow storm, or to last until we reach Laramie."[133] By aggregating washing work in commercial facilities, the ecological vocabulary of hard and soft water was moving from individual domestics into the minds and bodies of commercial workers. It was with these workers, always racialized, that such vocabulary would become erased.

Conclusion

Virtually every material entering the nineteenth-century household required work to make usable. Foodstuffs needed cleaning, chopping, and preservation. Wool required carding, spinning, weaving, and felting. Even a manufactured product like calico still generated work: cutting and sewing, yes, and also the maintenance work of washing, mending, and re-dyeing. Domestic work blurred the lines between production and consumption.[134]

Homemakers and domestic workers made skilled choices about how to meet household needs. They do so by naming the natural world to delineate different end use (lard, suet, tallow, drippings), making usable household goods out of discard materials (lye, starch, bran water, ox-gal), preserving spoil-prone ingredients (canning, salting, saponifying), and by re-making household tools into other useful goods (mending, patching, quilting, braiding). In doing so, homemakers and domestic workers did more than demonstrate skill; they also left behind a

[133] Diary of Mrs. Hampton, October 9, 1888, in *Covered Wagon Women: Diaries & Letters from the Western Trails, vol. 11: 1879-1903,* Kenneth L. Holmes, ed. & comp. (Lincoln, NE: University of Nebraska Press, 1995), 155.
[134] Strasser, *Never* Done (1982); Cowan, *More Work for Mother* (1983).

robust document base evidencing their ecological expertise, specifically because domestic work demanded they have a capacity to transform ecological flux into steady social standard.

This chapter has focused on one single domestic process: washing linens. To demonstrate both the expertise required to do washing work, and the role of the non-human in shaping the meaning of cleanliness, I have tracked how nineteenth-century homemakers managed three ingredients integral to the wash process: water, fat, and wheat. Making order out of these ingredients was necessary in order to make clothes clean, per nineteenth-century standards: bleached white, starched stiff, odorless, and laborious to create. These physical qualities communicated the social respectability of the wearer.

By inviting environmental historians to treat households as workscapes, I have tried to highlight more than the knowledge possessed by domestic workers who daily confronted messy nature. I have also tried to understand for whom, under what political and social conditions, sensory enjoyment of domestic work was a realizable possibility. This is not to justify the exploitation and injustice built into the second-class category of work called domestic. But it *is*, following the cues of historians like Tera Hunter, Nan Enstad, and Jay Cook, to suggest something subversive and worth noticing in pleasure itself.[135]

I have also sought to make obvious that seasonality and regional difference dictated the availability of wash water, as well as other ingredients of cleanliness like soap, starch, ox-gall, and firewood. In this direct sense, nature pervaded households that were only ever ostensibly domesticated. The non-human was an author of cleanliness; the norm was not just an product of social expectation mapped onto one's garments. For domestic workers specifically, cleanliness

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[135] Hunter, *To 'Joy My Freedom*; Nan Enstad, *Ladies of Labor, Girls of Adventure* (New York: Columbia University Press, 1995); Jay Cook, *The Arts of Deception: Playing With Fraud in the Age of Barnum* (Cambridge, Mass.: Harvard University Press, 2001. Most formative of my thinking on this subject has been Kate Soper, *Troubled Pleasures: Writings on Politics, Gender, and Hedonism* (London: Verso, 1990).

required a balance between that which was physically possible for a worker and that which was possible within a state of ecological flux.

Chapter Two: Steam, 1870s-1930s
Or, Who Does the Wash?

Introduction: How to Make Laundry White

For a visitor to an 1890s steam laundry, humidity would have dominated one's first impression. Steam was pervasive. It poured out of barrel-sized industrial washers every time workers pried opened their doors. It billowed off the hot metal mangles that workers used to press bedsheets and curtains. It seeped under the door of the clothes-drying room. It even leaked out of the starch-boiling barrel in the corner of the facility. When U.S. Census Bureau statisticians, in 1909, chose a term to designate the commercial washing services they were counting for the first time in 1909, it was no accident "steam laundry" was the designation chosen over possibilities like "commercial laundry," "wash plants," or "laundry factories." Steam was the distinguishing feature of the facilities.[136] It was also the mechanical energy source powering industrial-scale washing machines. Steam, that great symbol of industrial progress, was impossible to ignore as a key ingredient of industrial washing.

But steam came with problems, namely those of public perception. Steam laundry owners found themselves responding to two deeply embedded biases held by individuals who, they maintained, would otherwise be customers. One, steam remained steeped in an association with miasma, an early nineteenth-century theory that suggested illness spread via exposure to damp air—sewer gas, fog, basement off-gassing, and, yes, steam. Though the popularization of germ

[136] By 1920, the Census Bureau had changed their nomenclature, instead referring to commercial washing facilities as "power laundries." For description of the 1909 census, see U.S. Census Bureau, "Power Laundries" *Census of Manufacturers, 1920* (Washington, D.C.: U.S. Government Printing Office, 1920), esp. 1026.

theory in the decades following Louis Pasteur's 1857 naming of the germ eroded scientific adherence to miasma theory, the association between clamminess and ill health pervaded in popular practice well into the early twentieth-century.[137] Wrote one visitor to a steam laundry plant in 1897, on the sensation of confronting the fetid, humid air that literally enveloped him, "It seems to cling to one's lips till one *tastes* it."[138] Steam laundry owners worried that a bias against steam would keep customers away.

Second, laundry owners worried that white homemakers saw steam plants as further eroding homemaker authority. Particularly in a moment in which the Victorian ideal of domesticity was itself threatened by the export of domestic productive functions to the factory floor, the further adoption of steam laundry methods came with questions from white women for whom homemaking had been a social and economic identity. "[H]ome life … has been robbed by taking away the creative side," lamented the Massachusetts Institute of Technology chemist Ellen Richards, thinking of idealized self-sufficient homemakers of yore and the threats industrialization posed to their expertise. "There was always something to *do; n*ow there is only something *to be done.*"[139] Steam power and, more specifically, the industrialization of nineteenth-century household practices, threatened to undermine the symbolism built around white homemaking.

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[137] Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge, Mass.: Harvard University Press, 1998); Peter C. Baldwin, "How Night Air Became Good Air" *Environmental History* 8 no. 3 (July 2003): 412-429; *Melanie A., Kiechle, Smell Detectives: An Olfactory History of Nineteenth-Century Urban America (Seattle: University of Washington Press, 2017.)*

[138] As quoted in Thomas Oliver, *Dangerous Trades: The Historical, Social, and Legal Aspects of Industrial Occupations as Affecting Health, by a Number of Experts* (London: John Murray, 1902), 671. Emphasis original.

[139] Ellen H. Richards, "Home Economics in Elementary and Secondary Education," *Journal of the Proceedings and Addresses of the Forty-Sixth Annual Meeting,* National Education Association, Cleveland, Ohio (June 29 – July 3, 1908), 490-491.

Finally, steam laundry owners worried that entering into the work of doing the wash threatened their racial and gender position. Nowhere was this anxiety more apparent than at their annual convention. In 1898, businessmen attending the 15th Annual Laundryowners' National Association Convention smeared on blackface and sashayed in calico dresses down the deck of the steamship Island Queen. One day into a three-day conference, audience members whooped and hollered as seven pairs of business partners, reconstituted as romantic couples, mince-stepped their way through a "plantation walk" competition. The panel of judges included outgoing Association president A.B. Richards, and the prize for the best couple was a cake so large that it "filled a washtub." The sugary confection sported decorations apropos to the group's shared profession: a shirt, a collar and cuffs, and a wooden washing board.[140] The event showcased the fragility of steam laundryowners' racial position, and their best attempts to construct white masculinity in domestic work.[141]

Despite hurdles of public perceptions, businessmen beginning in the 1880s and 1890s reconstituted themselves as steam laundry owners. They bet on the contention that at-scale commercial washing facilities would render household-scale washrooms obsolete. In 1909, the first year that the U.S. Census Bureau collected statistics on steam laundering in the U.S., more than 5,000 steam laundries were operating nationally. The densest concentrations of facilities were in the nation's most populous cities: 226 in Chicago, 126 in New York City, 92 in

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[140] "The Convention from Start to Finish, Pictured from the Humorous Side," *American Laundry Journal* 17, no. 3 (Sept 1898): 5-23.

[141] On spectacle and the political-psychological work of racial parody, see *Burnt Cork: Traditions and Legacies of Blackface Minstrelsy,* Stephen Johnson, ed. (Amherst: University of Massachusetts Press, 2012); W. T. Lhamon, *Raising Cain: Blackface Performance from Jim Crow to Hip Hop* (Cambridge, Mass.: Harvard University Press, 1998).Philip J Deloria, *Playing Indian* (New Haven: Yale University Press, 1998); David R. Roediger, *The Wages of Whiteness: Race and the Making of the American Working Class* (New York: Routledge, Chapman & Hall, 1991).

Philadelphia, and 87 in San Francisco.[142] The industry employed 125,000 individuals, relied on $69 million in invested capital, and netted $104 million in sales. Figures such as these made steam laundry, relatively speaking, a small industry in the eyes of the Census. The lumber industry, by contrast, boasted eight times the number of mills; employed five times the number of workers and generated nearly 1,000 times the value.[143] Steel, cotton, sugar, coal, even silk—each of these raw production industries easily outstripped the service sector called steam laundering.

Steam laundering's closest industry analogs could be found in the commercial production of goods like soap, canned tomatoes, candles, bread loaves, and hats. These objects, once produced free by household labor—homemaker or slave—now increasingly were the work of paid laborers working at scale in industrialized spaces.[144] Canning serves as useful example. In 1909, the U.S. Census of Manufacturers reported just over 5,000 steam laundries facilities operating nationally versus 3,767 canning plants; 124,000 workers engaged in the laundering industry versus nearly 72,000 in canning; 123,000 horsepower used to wash versus 81,000 used to can; $69 million invested as capital in steam laundries versus $119 million in capital invested in canning facilities; and $104 million in annual sales versus $157 million in annual canned goods sales. California, New York, and Maryland were the top three canned goods producers, accounting for nearly a third of the total annual value added by manufacturers. New York, Illinois, and California were the top steam laundering states, presumably driven by urban centers in each of these cities; together buyers in these states accounted for nearly a third of steam

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[142] "Steam Laundries" in *Thirteenth Census of U.S., taken in year 1910: Volume X. Manufactures, 1909: Reports for principal industries [with detailed data on establishments, employment, operations, and finances; by industry, State, and metropolitan district]. Washington, D.C.: Government Printing Office, 1913.* (Washington, D.C.: U.S. Government Printing Office, 19XX), 887-891.

[143] Table 1. "Lumber Industry, Including Customer Mills: 1909," 13th U.S. Census Vol X. Manufacturing, p. 487

[144] "Table 1. Soap Industry summary statistics," 13th U.S. Census Vol X. Manufacturing, p. 667.

laundry service sales nationally.[145] Canning, like laundering, seemed poised to exit the household for the shoproom floor.

Although domestic work like canning, soap-making, sewing, and baking commercialized between 1880 and 1930, washing laundry followed the opposite trajectory. Though steam laundry facilities expanded across the first three decades of the twentieth century, by 1947 a majority of households in the U.S. owned an in-home electric washing machine. It was the personal washing machine—what the midcentury economist John Kenneth Galbraith would dub a "wife-operated and –maintained … apparatus"—rather than the steam laundry delivery truck that became the symbol of midcentury domesticity and middle-class prosperity.[146] Except in limited form as dry-cleaning, the steam laundry industry had folded by the post-war period.

Why did washing work fail to commercialize, as had parallel examples of nineteenth-century household production like canning, soap-making, and sewing? Historians of technology and cultural historians have, over the past decade, offered a number of explanations. For several, steam's demise came as what was technologically feasible butted up against what was culturally desirable. By the 1930s, commercial laundry services—with five-day wait times, with questionable quality of cleaning, with an inability to reliably wash multiple family bundles

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[145] A challenge of using Census data is its tendency to obscure unpaid workers doing laundry work, homemakers and housewives chief among them. Census statisticians acknowledged this fact openly and without any sense of justification needed. "The term 'gainful workers,' as used in the printed instructions to enumerators and in this report," wrote Census Director William J. Harris to reviewers, "includes all workers, except women doing housework in their own homes, without salary or wages, and having no other employment, and children working at home, merely on general household work, on chores, or, at odd times, on other work." To adopt a distinction between paid and unpaid work in this chapter would be to replicate what historians and feminist economists have argued are sexist assumptions about the economic importance of women's work. As such, throughout this chapter, I try always to talk about "laundry work" as a category including *both* paid and unpaid workers. Both, ultimately, contributed to the labor of cleaning and caring for garments worn every day. For the statistical justification for not counting unpaid workers, see "Occupational Statistics," in *Thirteenth Census of U.S., taken in year 1910: Volume X. Manufactures, 1909: Reports for principal industries [with detailed data on establishments, employment, operations, and finances; by industry, State, and metropolitan district]* (Washington, D.C.: Government Printing Office, 1913), 15.

[146] John Kenneth Galbraith, *Economics and the Public Purpose* (Boston: Houghton Mifflin Company, 1973), 239.

together and then re-separate them out for return—left consumers dissatisfied. Timed with rising labor costs for steam laundry workers and federally-subsidized electrification and credit lines aimed at consumers, in-home washing machines became both cost-competitive and socially desirable exactly as steam laundries were stumbling.[147] Other scholars expand this answer by historicizing cleanliness itself, arguing that a "culture of cleanliness" took root in the 1920s and 1930s U.S. Furthered by private interests paying for print advertising, this culture meant that by mid-century, Americans had learned to conflate sparking toilet bowls and pressed blouses with middle class respectability. Washing machine ownership was merely a ticket to social acceptance and full economic citizenship.[148] Whether focused on cultural or technological drivers of change, scholars are unified in a binary view of washing's history: it was *either* in-home washing done by a homemaker *or* commercial washing done in a steam plant. Why the latter failed to replace the former is the focus of scholarly work.

This chapter builds on existing scholarship but breaks from it in one crucial regard: it argues that steam laundry proprietors were one of multiple commercial actors vying for customers across the early twentieth century. Door-to-door washerwomen, laundresses, hand-washers, and paid domestic servants constituted widespread and active commercial alternatives to steam laundries. In a post-Civil War U.S., wealthy homemakers—and, increasingly, those of middling means—had multiple commercial options, not just steam, when choosing how to do their wash. Thus the conflation of "commercial laundry" with "steam laundry" typified in U.S.

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[147] Arwen P. Mohun, *Steam Laundries: Gender, Technology, and Work in the United States and Great Britain, 1880-1940* (Baltimore: The Johns Hopkins University Press, 1999); for a similar explication of cultural values dampening rates of appliance adoption, see Joy Parr, "What Makes Washday Less Blue? Gender, Nation, and Technology Choice in Postwar Canada" *Technology and Culture,* Vol. 38, No. 1 Special Issue: Gender Analysis and the History of Technology (January 1997): 153-186.

[148] Suellen Hoy, *Chasing Dirt: The American Pursuit of Cleanliness* (New York: Oxford University Press, 1995); Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon Books, 1982); Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology From the Open Hearth to the Microwave* (New York: Basic Books, 1983).

Censuses of Manufacturers, and replicated by historians, contain classist and racist assumptions about what "the" commercial laundry industry looked like in the early twentieth-century U.S.

A more accurate portrait of early twentieth-century commercial washing work can be found by reading domestic worker testimonies and oral histories alongside formal Census counts. According to the U.S. Census from 1910, half a million individuals labored as Census-designated "launderers and laundresses." These were self-employed workers washing in others' houses or taking in others' dirty garments to wash in their own homes. These were also businessowners operating hand- rather than steam-powered laundries. William Faulkner offers one portrait of these workers in his 1931 short story, "That Evening Sun Go Down." "[O]n Monday morning the quiet, dusty, shady streets would be full of Negro women with, balanced on their steady turbaned heads, bundles of clothes tied up in sheets," Faulkner wrote, reminding us of the extent to which entering into domestic work racialized an individual – a topic we discussed in the previous chapter.[149] In contrast to Faulkner, domestic workers themselves offered a more nuanced portrait of the labor market they inhabited and shaped: an economy in which skill, age, manners, and skin color shaped whether you were a higher-status laundress or "merely" a washerwoman. Recalled Laurlean Davis, domestic worker in Washington, D.C., "Ora was a laundress, not a washwoman. You see, first a laundress wasn't no old woman. She'd be up here with small kids, like that. … A washwoman would be down home. Just washing for money with no set people."[150] Such distinctions remain invisible in Census counts, but we get one sense of scale. According to Census figures themselves, approximately four times as many workers were self-employed hand workers—"launderers and laundresses"—as were commercial steam

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[149] William Faulkner, "That Evening Sun Go Down" *The American Mercury* 22, no. 87 (March 1931), 257.

[150] Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996), 142. See also Rebecca Sharpless, *Cooking in Other Women's Kitchens: Domestic Workers in the South, 1865-1960* (Chapel Hill: University of North Carolina Press, 2010).

workers. Yet these numbers of commercial workers are largely unreflected in histories of technology describing the shift as simply one from in-home washing to steam then back to the household.

Beyond the launders and laundresses written out of Census counts of "the" commercial laundry industry, nearly 3.5 million workers were engaged in "domestic and personal service" in 1909. According to Census explanations, this category included such varied occupations as barbers, bartenders, boarding house keepers, hotel keepers, janitors, laundresses, porters, saloon keepers, servants, and waiters.[151] How many of these did laundry work? An estimate can be difficult, though it is clear that these individuals were not included in the Census of Manufacturer's report from 1909 that 124,000 workers were engaged in steam laundering. Again, listening to domestic workers themselves is telling. "Every other day was washday," recalled the domestic servant Velma Davis, describing her experience of working alongside her mother in a white landowner's house in Nelson Country, Virginia.[152] Davis's comments remind us that, for a large number of these 4 million Census-counted domestic servants, laundry was but one part of their larger jobs. Their numbers would appear nowhere in Census counts of commercial laundry workers, but their work was irrefutably commercial, and replacing the labor of individual homemakers doing the wash.

The sum of this survey is a very different portrait of commercial washing at the turn of the twentieth century than historians have offered. An estimated 125,000 workers labored in commercial steam plants; as many as 500,000 more worked as commercial laundresses and washerwomen; countless more—as many as 3.5 million—worked in houses as domestic servants.

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[151] "Table 14. Number of Persons 10 Years of Age and Over Engaged in Principal Occupations, Classified by Sex, 1910," *Thirteenth Census of U.S., taken in year 1910: Volume IV. Population, 1910: Occupation statistics* pg. 53.

[152] Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996), 32.

And how many homemakers still did their own wash, and that of their families? Again, this figure is difficult to say. But one outcome of this alternate portrait is to ask about a different type of historical change than historians have yet asked. Why did steam laundries fail? Why did washing returned to the household in the mid-twentieth century, unlike other types of domestic production? Instead, this chapter asks: Given that the household and the steam laundry, in the post-Civil War period, were increasingly workplaces for a paid domestic labor force, why did most forms of commercial work fold in favor of the homeowner-operated washing machine? Why, to put a finer point on it, did washing transformed from work racialized as non-white—in the steam laundry, or done by hired help—to work appropriate for wealthier white women to do themselves?

Steam laundry owners, particularly their marketing strategies driven by their own racial anxieties, were key figures in a transition from washtub to washing machine. From their very inception as "an" industry in the 1870s, steam laundry owners constituted themselves in direct opposition to their primary business competition: washerwomen, domestic servants, laundresses, and hand launderers. We saw in the previous chapter how these workers, alongside their becoming-white employers, were racialized by stepping into the domestic service labor market. Steam laundry owners, by contrast, constituted their industry first and foremost in the language of race. The primary mission of these advocates was to make washing appear to be white work – to distinguish steam laundry facilities from those of their competitors not just in technological terms but also racial terms. Steam laundry owners, despite relying on racialized labor to staff the washrooms and dryrooms of their facilities, actively encouraged customer biases that saw non-white peoples as dirty and dangerous. And this dissertation argues that steam laundry owners were successful. By the 1930s, the idea that one would do one's own wash, rather than hire it out, became not just technologically and financially feasible but, crucially, socially imaginable. The

washing machine was the device that would answer this demand. Ironically, steam laundry owners had helped create this demand themselves.

I. Origins: Industrial Washing in Hotels, Hospitals, and Prisons, 1850s-1880s

Businessmen wanting to open steam laundries in the 1870s and 1880s took cues from institutions who had already built infrastructure for washing at scale: hotels, hospitals, and prisons. At these institutions, proprietors and wardens mechanized washing work as early as the 1840s and 1850s. One motivation for early washing machine adoption was accommodating a swelling number of users with changing expectations of cleanliness. In these facilities, a density of human life as well as the steady turnover of users sleeping on sheets, coughing into institution-issued gowns, and wiping mouths on napkins meant that washing was a near daily activity. At hotels and hospitals in the 1840s and 1850s, then at ports and rail terminals in the 1860s, and finally in prisons in the 1870s and 1880s, proprietors invested in mechanical and chemical aids to scale up the washing process.[153]

Hoteliers were the earliest to invest in at-scale washing apparatuses because they were the institutions who saw the greatest density of moneyed customers buying cleanliness as a form of social distinction. In the early nineteenth century, hoteliers and innkeepers might wash sheets once per week and assure travelers that the sheet "had only been used a few nights" or "had only

[153] See, for example, "Duties of the chief matron of laundry department," Ocmulgee Hospital (Macon, GA: Burke, Boykin & Co., c. 1864), HathiTrust, https://hdl.handle.net/2027/emu.010002634809; "51st Annual Report of the Inspectors of the State Penitentiary for the Eastern District of Pennsylvania for the year 1880," Richard Vaux, et. al., inspectors (Philadelphia: McLaughlin Brothers, 1881), esp. Comegys Paul, "Physicians Report," p. 47-60. See also *The Advent of Steam: The Merchant Steamship before 1900,* Conway's History of the Ship series, Robert Gardiner, ed., (Annapolis, MD: Naval Institute Press, 1993); Molly W. Berger, *Hotel Dreams: Luxury, Technology, and Urban Ambition in America, 1829–1929* (Baltimore: Johns Hopkins University Press, 2011); Andrew K. Sandoval-Strausz, *Hotel: An American History* (New Haven: Yale University Press, 2007).

been slept in by very genteel people."[154] By the late 1840s and 1850s, hoteliers were wooing guests with promises of crisp sheets and the option to have one's travel-sullied clothing cleaned in-house. "Steam laundries are connected with all the large hotels," marveled British traveler Isabella Lucy Bird in Boston, reporting back to an audience of London social elite. At Bird's estimation, American hotels typified the admirable qualities of mid-century innovation as applied to hospitality. In addition to laundering sheets and towels of hotel guests, in-house laundry services also offered to wash the clothes of the road-dirty traveler, in record time and to great social effect. "[T]he possessor of one shirt might always pass as the owner of a half a dozen, for, while taking a bath, the magic laundry would reproduce the article in its pristine glories of whiteness and starch."[155] Notably, the building out of laundry facilities timed with the expansion of luxury hotels building parlors, restaurants, lobbies, and other socials spaces in which guests might mingle. In such a social context, laundered garments communicated status.[156]

Because hotels were laundering guest garments alongside institution-owned linens, preservation of fabrics was also a motivation for washing machine purchase. The move from handwork to mechanized work belied a belief that laundryworkers were unduly rough in their handling of garments. "[T]he Washing Machine purchased of you in 1873 … is capable of washing from five to six thousand pieces per day," wrote proprietors at The Windsor, a hotel on Fifth Avenue in New York. "As to solidity and simplicity of construction, … wear and tear on

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[154] Quotations from Frances Trollope, *Domestic Manners of the Americans* (London: 1839), 276; James Stuart, *Three Years in North America* (New York: J. & J. Harper, 1833), 316, as quoted in Paton Yoder, *Taverns and Travelers: Inns of the Early Midwest (*Bloomington: Indiana University Press, 1969), 146 – 48.

[155] Isabella Lucy Bird, *Englishwoman in America* (London: John Murray, 1856), 102-103.

[156] Andrew K. Sandoval-Strausz, *Hotel: An American History* (New Haven: Yale University Press, 2007).

clothes, etc., etc, we have no hesitation in saying that in our option it has no equal."[157] Similar sentiments populate hotelier H.D. Parker's review of the eight-tub washing machine purchased for the Parker House in Boston. "We wash, daily, about five thousand pieces, and sometimes more, including bundle washing … without tearing the clothes or breaking the buttons," Parker reported in 1862, in response to inquiries about his satisfaction with the machine. [158] Keeping guest garments in pristine condition was a priority for hotels. Further, for both hospitals and hotels, extending the lifespan of bedsheets and tablecloths came with the benefit of reducing institutional operating costs. Added C.H. Nichols, Superintendent of the Government Hospital for the Insane in Washington, D.C., the Shaker washing machine "does not tear nor otherwise injure the fabric of *old* garments, or those of the *most delicate texture.*"[159] For these proprietors, preserving institution-issued garments or bedding mattered as much as the cost of labor.

By the 1870s, prisons had joined ranks with hotels and hospitals in installing washing facilities on-site. Minimizing the cost of labor had been an earlier motivation, as in the case of the St. Charles Hotel in Pittsburgh. "Our washing is about 1,000 pieces per day. One girl tends the machine, and the labor is reduced to a pastime," reported Harry Shirls, proprietor.[160] But at prisons, the cost of labor was a non-issue where inmates constituted a steady and free labor source. So at prisons, the impulse to extend the lifespan of institution-owned garments was a primary motivation. Effused John Birmingham, Warden at the Western State Penitentiary in

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[157] Hawk, Waite & Weatherbee, Testimonial, November 16, 1876, in "Improved Shaker Washing Machine" (Concord, N.H.: Charles C. Pearson & Company, 1877), 15; Pamphlet collection, Wisconsin Historical Society, Madison, Wisconsin.

[158] H.D. Parker & Co., Testimonial, January 23, 1862, in "Improved Shaker Washing Machine" (Concord, N.H.: Charles C. Pearson & Company, 1877), 15; Pamphlet collection, Wisconsin Historical Society, Madison, Wisconsin.

[159] C.H. Nichols, Testimonial, January 20, 1859, in "Improved Shaker Washing Machine" (Concord, N.H.: Charles C. Pearson & Company, 1877), 15; Pamphlet collection, Wisconsin Historical Society, Madison, Wisconsin.

[160] Harry Shirls, Testimonial, February 24, 1863, in Hamilton E. Smith, *The Principles of Washing Illustrated by the Hydraulic Clothes Washer, Superior to Any in Use* (New York: J. Ketcham & Co., 1866),

Pittsburg, "My object in putting up the machine, after having seen it in operation, was *to save the fabric*, *which it has fully accomplished*."[161] Fewer torn garments meant a lower operating cost. At prisons, unlike in hotels, mechanization was about prizing machine over human hands when protecting garments.

In addition to enabling washing at scale, steam-powered washing devices also appealed to prison wardens responding to public criticism. Some raised questions about their ability to rehabilitate inmates for post-prison life. Others criticized prisons as endangering the health of those communities living nearing the walls of the prison. Particularly as a series of cholera outbreaks swept several American cities in the early 1880s, investments in washing apparatuses were much more about improving public perception than about protecting bottom line. Across the 1880s and 1890s, prisons had taken up the rhetoric of sanitation to communicate their capacity to assert order, both for the sake of prisoners and to protect those living nearby. "The health of the prisoners in this Penitentiary is remarkably good," wrote Richard Vaux, President of the Board of Philadelphia's Eastern State Penitentiary in 1892 in a notably effusive tone. "The sanitary condition of the Institution is most excellent. There is no essential improvement needed to better it."[162] As evidence for this assessment, Vaux pointed to infrastructure throughout the Penitentiary: the "majority of rooms with yards attached" for prisoners to exercise in; the piping system carrying human waste away from each cell; the whitewashed walls; the incandescent lightbulb lit until 9pm each evening; and the "wooden bedstead [and] straw mattress" in each cell. Vaux also described the prison's laundry facility at length: a 25-by-25-foot room, with an even larger drying room attached and a boiler room between the two, powering both. "There are

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[161] John Birmingham, Testimonial, November 14, 1862, in Hamilton E. Smith, *The Principles of Washing Illustrated by the Hydraulic Clothes Washer, Superior to Any in Use* (New York: J. Ketcham & Co., 1866), 18.

[162] *63rd Annual Report of the Inspectors of the State Penitentiary for the Eastern District of Pennsylvania, for the Year 1892* (Philadelphia, PA: Allen, Lane & Scott, 1893), 106.

at least 4000 pieces of clothing washed each week," he reported of the 1104-inmate facility. To emphasize the seriousness with which sanitation was treated, Vaux even explained the individuation facilitated by the prison's washing system: "[E]ach article is marked with the convict's number, and his clothes and bedding are returned to him."[163]

Vaux's emphasis on garment ownership was intended to showcase humane treatment of inmates as well as institutional practices guarding against disease. But his comments also point to one feature that shared by all nineteenth-century institutions who built mechanized laundry facilities: their linens that were identical. Hotels, hospitals, and prisons had sheets of uniform texture and largely uniform size. Hospital gowns, nurse uniforms, and surgeon's caps were, similarly, circulated between patients or employees of a given institutions. An 1878 inventory of property at Michigan State Prison reinforces this view that inmate garments were interchangeable. Size, color, or texture were irrelevant, as was the gender of the wearer:

> 67 convict's caps, new, 15¢ … 10.05
> 866 convict's caps, old, 10¢ … 86.60
> 3 convict's coats, new, $3.25 … 9.75
> 878 convict's coats, old, $1.62½ … 1,426.75
> 6 pairs convict's pantaloons, new, $3.00 … 18.00
> 907 pairs convict's pantaloons, old, $1.50 … 1,360.50
> 61 pairs web suspenders, new, 160 doz. … 8.13
> 314 pairs web suspenders, old, 10¢ … 31.40
> 189 cotton shirts, new, 35¢ … 66.15
> 1850 cotton shirts, old, 12½¢ … 231.25
> 1400 under shirts, old, 15¢ … 210.00[164]

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[163] *63rd Annual Report of the Inspectors of the State Penitentiary for the Eastern District of Pennsylvania, for the Year 1892* (Philadelphia: Allen, Lane & Scott, 1893), 110-112.

[164] "Inventory of Property Belonging to Michigan State Prison on Hand, September 30, 1879," *Annual Report of the Inspectors of the State Prison of the State of Michigan, for the Year 1878* (Lansing: W.S. George & Co., State Printers and Binders, 1879), 40.

As this list shows, facilities set up their washrooms to launder interchangeable garments and linens.

This feature—interchangeable linens—would distinguish hotels, hospitals, and prisons, from the late nineteenth-century opportunists who tried to use these institutions as models. The imagined customer of the 1880s urban steam laundry was a gentleman depositing five shirts, with collars and cuffs, to be washed and starched; when the number of customers had expanded to twenty, fifty, one hundred gentlemen—how was one to keep track of the owner of each collar and cuff? And there was a further problem: when customers included families dropping off everything from lace negligees to wool suits and velvet curtains, how did one wash each of these differently textiles separately and reassemble the bundle? Business success brought with it additional complications. Scaling up, when serving multiple customers rather than a single institution, was no simple task.

II. Expansion: Industrial Washing for Urban Customers, 1870s-1890s

Businessmen first began opening commercial steam laundries in the 1870s and 1880s.[165] Because of the high capital cost of constructing and operating steam facilities, virtually all were located in urban areas with sufficient population to provide a steady demand for washing services. In New York, Philadelphia, Chicago, and San Francisco, individuals reconstituting themselves as "laundrymen" purchased warehouse space, paid workers to haul in wash boilers, purchased industrial-sized wringers and mangles, and hired a staff.

[165] A few East Coast cities were exceptions to this chronology. Philadelphia, for example, was home to one steam laundry as early as 1859. See S. E. Cohen, *Ladies Philadelphia Shopping Guide and Housekeeper's Companion for 1859* (Philadelphia: King and Baird, 1859).

By the 1870s, three machines had become integral to institutional-scale washing: steam-powered washing machines; wringers; and steam-heated mangles. Each of these devices was designed to use steam power to replace some human labor previously required to complete a single step of the wash process. Steam-powered washing machines were wooden or metal barrels that could be filled with soapy water and linens, then rocked by a belt attachment to a steam engine. Such devices were intended to replace the human work of either pounding textiles in upright wooden barrel or scrubbing garments against a ribbed washboard. Wringers were crucial for the second step of washing. Made of rubber rollers pressed together by an adjustable clamp and turned with a geared handle, these devices used pressure to force wash water out of rinsed linens. These devices alleviated the work of wringing wet linens by hand. The mangle was the final step in use at large-scale facilities. A complement to the hand iron, steam-heated mangles were essentially press beds where heated metal cylinders dried and pressed flatware like bedsheets and tablecloths. Intended as an ancillary but not replacement for the hand iron used on collars, cuffs, and shirts, mangles ensured steam laundries returned to customers the garments for which starched stiffness was the meaning of cleanliness.[166]

For any investment in devices, workers were still crucial to laundry operation. Facilities would employ anywhere from ten to more than one hundred workers. These workers had specific roles within the processes—pick-up, washing, finishing, delivery—that made up a wash process. But throughout each part of the cleaning process, non-human nature was powerful co-author of work. Drivers piloted horse-drawn carts around a city, collecting bundles from individuals, households, and hoteliers or steamship owners with whom a steam laundryowner

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[166] "Improved Shaker Washing Machine" (Concord, N.H.: Charles C. Pearson & Company, 1877), 15; Pamphlet collection, Wisconsin Historical Society, Madison, Wisconsin; Hamilton E. Smith, *The Principles of Washing Illustrated by the Hydraulic Clothes Washer, Superior to Any in Use* (New York: J. Ketcham & Co., 1866); Providence Tool Company, *Price List of Hardware, Clothes-Wringers, Ship-Chandlery, Etc.* (Providence, R.I., 1973), 46-52.

had contracted. These individuals were often the most public face of a commercial steam laundry, and so owners emphasized cleanliness of driver appearances and their carts. After a driver delivered a carload of soiled bundles to the washhouse, workers referred to as "markers" tagged incoming clothing with indelible ink or sewn-on metal tabs to indicate owner of the clothing, then sorted garments by fabric type and color. Some markers interacted with customers, issuing receipts and addressing complains. Their appearance and their manners were also a concern for laundryowners.

Behind the front provided by the driver and the markers, washing became a much more messy, laborious, and humid process. With sorted piles in-hand, washing workers shook linens free of sand and soil before dumping them into steaming hot washbaths. In some facilities, laundryowners directing workers to wash garments only once before rinsing and finishing the piece; in more expensive facilities, owners directed workers to treat garments with as many as nine washes, each distinguished by the water temperature, chemical treatments, and degree of agitation.[167] Regardless of an individual facility's washing practices, washing was frequently as destructive a practice as that which followed it: wringing. Steam-powered centrifugal extractors alleviated some of the laborious wringing work required of workers at a non-industrial scale, but industrial machinery created other problems. Extractors did not distinguish between sturdy canvas and delicate silk, or between plain bedsheets and garments adorned with buttons or ribbons. Thus the step of wringing garments out, coupled with the prior step of agitating them in

[167] Chas Dowst, *The Laundry* (Chicago: National Laundry Journal, 1882); *The Laundry Text Book: A Classification of the Best Articles Published in the National Laundry Journal During 1898 and 1899* (Chicago: Dowst Bros.' Co., 1901); *Laundry Management: A Handbook for Use in Private and Public Laundries,* Weale's Scientific & Technical Series, 4th ed. (Crosby, Lockwood and Son, 1902).

sudsy water, could leave items stretched, torn, or otherwise damaged even if the workers proceeded with great skill and care.[168]

The next and final step of the wash process was arguably the most skilled work: finishing. Finishing consisted of starching and ironing dry damp garments. Cuffs, collars, skirts, blouses, as well as flatware like table linens and bed sheets, all needed ironing. And all of them except the bed linens took starch. In the humid washhouse, as in the homes of customers, cleanliness was indicated by crisp, starched stiffness. This was the end goal towards which workers labored.[169] Steam laundry staffs were identical in one capacity, regardless of geographic location: women outnumbered men. By the 1890s, female laundry workers outnumbered males approximately seven to one, a proportion that had narrowed from an 1870s divergence of ten to one. In this same twenty-year period, the total number of laundry workers nationally quadrupled from 61,000 to 240,000.[170] The slight narrowing of a gender disparity and the expansion in number of counted workers between 1870 and 1890 was almost entirely driven by the expansion of steam laundry facilities. Within the commercial sector, male workers took roles like that of driver, laundry chemist, machinist, engineer, and steam laundryowner. The work of doing the wash remained stubbornly gendered female, even in an industrial context; steam laundries employed

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[168] Mohun, *Steam Laundries*, 70-94.

[169] Chas Dowst, *The Laundry* (Chicago: National Laundry Journal, 1882); *The Laundry Text Book: A Classification of the Best Articles Published in the National Laundry Journal During 1898 and 1899* (Chicago: Dowst Bros.' Co., 1901); *Laundry Management: A Handbook for Use in Private and Public Laundries,* Weale's Scientific & Technical Series, 4th ed. (Crosby, Lockwood and Son, 1902). An excellent description of the washing process can also be found in Arwen P. Mohun, *Steam Laundries: Gender, Technology, and Work in the United States and Great Britain, 1880-1940* (Baltimore: The Johns Hopkins University Press, 1999). See especially Chapter 3. "Inside the Laundry."

[170] "Table. Occupations: Number of Persons in the United States 10 Years of Age and Over in 1870, 1880, and 1890 Engaged in Specified Occupation, Classified By Sex," *Eleventh Census of the United States: Special Report on Occupations* (Washington, D.C.: Government Printing Office, 1896), 11.

male workers in roles already deemed masculine, rather than introducing any new gender roles.[171]

By the 1880s, a core group of steam laundryowners were advocating for industry cohesion. They envisioned building a "laundry fraternity" that could further their shared commercial interests—and, crucially, distinguish themselves from peer commercial workers doing the wash. From the very inception of the idea, whiteness was at the heart of how laundryowners conceived of professional cohesion. As early as 1879, editors of the *National Laundry Journal* opined the threat, "at once dangerous and illegitimate," posed by the "Heathen Chinee." The problem was as much one of future threat to profits as it was of current competition. "Just so soon as they are reinforced by a sufficient number of their countrymen to fully occupy the field, laundry prices among their kind will fall to one-fourth of what they now are, and still the Mongolian will continue to grow rich," authors warned readers. Chinese workers would outbid steam laundries. To prevent such a threat, a professional society must be organized along "thoroughly anti-Chinese" lines.[172]

The Laundryowner's National Association would be the trade group to grow out of organizing efforts. Formally founded in 1883, the objective of the organization was "to bring about a better acquaintance of all persons engaged in the laundry business throughout the country[.]"[173] The practiced form of this mission, however, extended only to include steam laundryowners. Drivers, markers, washerwomen, mangle operators, or any other type of worker was not included in their vision. This narrowness is easily captured in the changing name of the

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[171] Mohun, *Steam Laundries* (1999), esp. "Ch. 4: Women Workers and the Laundry Industry."
[172] C.A. Royce, "Chinese Competition" in *The Steam Laundry and Its Methods: Essays Read at the Laundrymen's National Conventions* (Chicago: National Laundry Journal, 1894), 103.

[173] "Laundry Associations of the United States" *American Laundry Journal* 17, no. 1 (July 1898): back cover.

group through its multiple iterations: "Laundryowner's National Association;" "Laundrymen's National Association;" and eventually "Laundryowner's National Association of the U.S. and Canada." The emphasis was always on ownership; and the emphasis was always on the minority male workers making up the Census category "laundresses and launderers."[174]

The second half of the group's mission statement was similarly indicative of its narrow conception of membership. The L.N.A. operated to further "the adoption of and maintenance of such plans as shall tend to the mutual benefit and protection of all its members."[175] The 1898 Convention agenda details those issues of concern to members: the Chinese threat. Laundryowner C.A. Royce offered L.N.A. convention-goers a transparent business prescription: collectivize to advertise against Chinese laundries. In New York City, Royce had found that hand laundries were handling one-fourth the sales that steam laundries were seeing, a figure that rose to 50% if one cut out ironing work that hand laundries had never specialized in doing. "Therefore there is no good reason why laundrymen should not be awake to the consequences of Chinese competition," Royce observed. He recommended the group mail circulars to potential customers, encouraging they be "thoroughly anti-Chinese" in their buying habits.[176] But establishing a coherent anti-Chinese advertising effort could only be accomplished with the strength and resources of a unified front. The success of "the" laundry industry, Royce in effect

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[174] Determining when exactly organizational names changed can be difficult, but trade publications provide some benchmarks. The group's earliest instantiation, "Laundryowner's National Association," is named in the pages of the *National Laundry Journal* (1879) and publications from the National Laundry Journal Press. The group's second instantiation, as the "Laundrymen's National Association," can be seen mentioned on the pages of the *American Laundry Journal* in 1898, along with named officers. Finally, the expanded title, "Laundryowner's National Association of the U.S. and Canada" can be seen mentioned in the *Starchroom Laundry Journal* published in the 1930s.

[175] "Laundry Associations of the United States" *American Laundry Journal* 17, no. 1 (July 1898): back cover.

[176] C.A. Royce, "Chinese Competition" in *The Steam Laundry and Its Methods: Essays Read at the Laundrymen's National Conventions* (Chicago: National Laundry Journal, 1894), 103.

argued, depended on the firmness with which steam laundryowners established their white identity.

III. Making Laundry Sanitary: 1898 – 1931

The depth of steam laundryowners' racial anxiety can be found in the adamancy of their insistence otherwise. From even before the 1898 Annual Convention had begun, attendees participated in active and continual jokes fixated on racial position. Departing together from Philadelphia for the overnight train ride to Cincinnati, laundryowners reportedly steamed out of the Mid-Atlantic city issuing mock-Indian war-whoops of "Heile, heilo, heile, heilo." In addition to the blackface "plantation walk" on the first night of the Convention, participants play-acted ethnic identities throughout the four days together: squirt gun fights had as "real bad Indians;" miming as "pig-tailed Mongolian[s];" performing pirouettes for the Convention talent show dressed as a "French ballet girl;" promenading as a black female mammy "in plantation costumes;" and dumping so many ice cubes into one unsuspecting attendee's bunk that he tumbled from bed "look[ing] like a Shanghai rooster that had been in cold storage for thirty days." Convention attendees chortled when, on the afternoon before the Convention began, one of their members became smitten with "a pretty Blue Grass belle" who promptly "paralyzed" her suitor with the revelation that she was a domestic servant—presumably a status that rendered her undesirable for courtship. Race- and gender-based parody pervaded the Convention from before it had begun until well after attendees had returned home.[177]

[177] "The Convention from Start to Finish, Pictured from the Humorous Side," *American Laundry Journal* 17, no. 3 (Sept 1898): 5-23.

Parody was the device steam laundryowners use to distinguish themselves from the ethnic groups they were mocking.[178] Commercial steam laundryowners were anxious about their racial position because, from their very instantiation as "an" industry, steam laundryowners had never been the only commercial actors offering washing services. In the Rocky Mountain West, mining camps had been active sites of commercial washing work, albeit unmechanized, as early as the 1840s. Mexican, indigenous, or African-American women, as well as Chinese men, accepted clothing from miners in exchange for pay on a piece-by-piece basis.[179] In Plains states, with relatively slow immigration and open hostility between settler and indigenous populations, washing work fell to Swedish, Norwegian, or German immigrant women who sought the extra income.[180] By the 1880s, West Coast cities like San Francisco and Seattle, as well as inland cities like Chicago, had become places where a growing number of Asian immigrants capitalized on stereotypes of their "fitness" for domestic work, opening hand laundries.[181] Particularly in the wake of the Civil War, many individuals found themselves in the economic position of needing to accept low-wage work, no matter how precarious. In the U.S. South, African-American women constrained by slavery and its outgrowth, sharecropping, turned to domestic service as one of

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[178] On spectacle and the political-psychological work of racial parody, see Philip J Deloria, *Playing Indian* (New Haven: Yale University Press, 1998); David R. Roediger, *The Wages of Whiteness: Race and the Making of the American Working Class* (New York: Routledge, Chapman & Hall, 1991).

[179] Susan Lee Johnson, *Roaring Camp: The Social World of the California Gold Rush* (New York: W.W. Norton, 2000), esp. Chapter 2, "Domestic Life in the Diggings."

[180] See, as example, Mary Dodge Woodward, *The Checkered Years: Excerpts from the Diary of Mary Dodge Woodward Written While Living on a Bonanza Farm in Dakota Territory during the Years 1884 to 1889* (Caldwell, ID: Caxton Printers, 1937), 175, 183, 239, 246.

[181] Kornel S. Chang, *Pacific Connections: The Making of the U.S.-Canadian Borderland* (Berkeley: University of California Press, 2012); Paul C. P. Siu, *The Chinese Laundryman: A Study of Social Isolation*, John Kuo Wei Tchen, ed. (New York: New York University Press, 1987); Moon-Ho Jung, *Coolies and Sugar Cane: Race, Labor, and Sugar in the Age of Emancipation* (Baltimore : Johns Hopkins University Press, 2006).

their few employment options. Washing was work for black or brown hands.[182] Between 1890 and 1910, an estimated two thirds of laundry workers were African-American, with that number reaching nearly 90% in the U.S. south. Some of these women worked in steam laundries. But a much greater number operated as for-hire laundresses.[183] By the 1870s, businessmen building steam laundry facilities were entering a labor market and cultural landscape where their services were far from the only option available to potential customers. Racial parody became their means of assuring themselves of their differentness from their competition.

In addition to using parody to build shared whiteness, steam laundryowners also invested in formal professional infrastructure. In 1883, steam laundryowners founded a national professional society, the Laundrymen's National Association.[184] At a regional level, they invested in the printing and circulation of five separate trade journals: one based in Chicago, another in Ohio, a third operating out of New York, and two late additions—founded in 1910 and 1914, respectively—based in Atlanta and San Francisco.[185] Alongside the founding of a professional society they convened an annual three-day convention, augmented by regional gatherings scattered across the calendar year. By the 1890s, the Laundrymen's National Association has not only created elected roles but a formal Committee on Credentials that was responsible for assessing and inducting new members into the National Association.[186] In sum, the aim of both

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[182] Tera Hunter, *To Joy My Freedom: Southern Black Women's Lives and Labors After the Civil War* (Cambridge, Mass.: Harvard University Press, 1997); Irene Ledesma, "Texas Newspapers and Chicana Workers' Activism, 1919-1974, *Western Historical Quarterly* Vol. 26, No. 1 (Autumn 1995), 309-331.

[183] Jenny Carson, "Laundry" in *Encyclopedia of U.S. Labor and Working-Class History, Vol. 2,* Eric Arneson, ed. (New York: Routledge, 2007).
[184] G.D. Crain, Jr., *Crain's Market Data Book and Directory Class, Trade, and Technical Publications* (Chicago: G.D. Crain, Jr.), 1920.

[185] G.D. Crain, Jr., *Crain's Market Data Book and Directory Class, Trade, and Technical Publications* (Chicago: G.D. Crain, Jr.), 1920.

[186] Committee on Credentials, "Report," in "Official Proceedings," Fifteenth Annual Convention; Cincinnati, OH; Sept 12-14, 1898; *American Laundry Journal* 17, no. 3 (Sept 1898): 27-29. The text of the bylaws of the organization

parody and profession-building was to establish what one Convention reporter tellingly termed a "laundry fraternity" – a cadre of white masculine figures who could profit doing domestic work.[187]

By 1898, two decades of fraternity-building seemed to be yielding results. Membership in the L.N.A. had swelled past the 1,000-person mark, remaining all male and racially homogeneous. Regional conferences and regionally-circulating trade journals augmented the cohesion-building work done at the national level. If profits had plateaued or declined in parts of the U.S., no conference sessions fretted over downturns. Instead, the tone of the conference was optimist. Pointing to growing number of conference attendees over the past decade, as well as recent American military wins in the Philippines and Puerto Rico that promised to bring new customers, President A.B. Richards effused to listeners, "I congratulate the trade on the healthy conditions of the laundry business during the past year and on the splendid prospects for the future."[188]

One cloud hung over the otherwise hopeful convention hall, however: public skepticism about the cleanliness of steam laundry facilities themselves. An 1897 article in the *Journal of Health* had caused a public stir. "Even the steam laundry, claiming to be the best of the class, and which cater to refined patronage, do not always observe hygienic conditions, consequently the health of patrons is imperiled in many ways. Often the restrictions of space prevent proper drying, and

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offered no explicit directive about racial or gendered criteria. Instead, bylaws treated the discretion of the Committee as sufficient, as in Sec. VI (b): "Committee on Credentials. The duty of this Committee is to examine and report upon all applications for membership that may be referred to them." "Bylaws" as included in C. A. Royce, *The Steam Laundry and Its Methods: Essays Read at the Laundrymen's National Conventions* (Chicago: National Laundry Journal, 1894), 322.

[187] "Making Ready for the Trade Convention," *American Laundry Journal* 17, no. 1 (July 1898): 11-17.
[188] A.B. Richards, "President's Remarks," in "Official Proceedings," Fifteenth Annual Convention; Cincinnati, OH; Sept 12-14, 1898; *American Laundry Journal* 17, no. 3 (Sept 1898): 29-30.

frequently the water used is so germ laden that the seeds of disease are planted to propagate in the future and bring many ills in their train."[189] Steam laundries were not alone in facing such criticisms. Slaughterhouses, dairies, and even public fruit vendors faced public scrutiny as the popular reception of germ theory gained traction in increasingly urban areas. Beginning in the 1890s, Public Health Departments in cities like New York, San Francisco, and Boston commissioned studies of wash water; cities also began passing municipal ordinances mandating the registration and regular inspection of any commercial laundering facility, steam-powered or otherwise.[190] But such measures only fanned public worry rather than put easing biases.[191]

Steam laundry owner did not singlehandedly create public perceptions that racially non-white groups carried disease more frequently than their Anglo counterparts. But they benefitted materially by feeding such fears. Further, steam laundry facilities did struggle with some problems unique to the industry. The size of washboilers and washing machines meant that steam laundry facilities would wash together dirty garments generated by five, ten, or even twenty households in a single batch of wash water. Further, to cover the high capital cost of building a steam facility, some owners contracted with steamships, hospitals, or hotels generating linens that they would then launder alongside bundles collected from individuals and households. Mixing—of linens, intimate garments, soils—was integral to the work of doing the steam wash.

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[189] As quoted in A.B. Richards, "President's Remarks," in "Official Proceedings," Fifteenth Annual Convention; Cincinnati, OH; Sept 12-14, 1898; *American Laundry Journal* 17, no. 3 (Sept 1898): 30.
[190] Joel A. Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, Ohio: University of Akron Press, 1996). See, for example, "Registration and Sanitation of Laundries, City of Montgomery, Ala.," in *The Modern Laundry Guide: A Collection of the Best Articles Published in the National Laundry Journal During the Past Two Years* (Chicago: The National Laundry Journal, 1905), 392-393.

[191] Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge, Mass.: Harvard University Press, 1998); Nayan Shah, *Contagious Divides: Epidemics and Race in San Francisco's Chinatown* (Berkeley: University of California Press, 2001).

"Sanitation" became a keyword for talking about cleanliness in the late nineteenth- and early twentieth-century U.S. In the hands of steam laundryowners, "sanitation" was a business proposition proffered to prospective customers as an antidote to mixing. It implied control and separation. As such, "sanitation" was also a bludgeon wielded against commercial washing competition like black washerwomen, Chinese hand launderers, and domestic servants. "Sanitation" to 1880s and 1890s steam laundryowners meant the use of mechanical methods that, for cost reasons, could not be replicated in the household: steam-powered wash boilers, water extractors, cuff and collar starchers, and drying rooms. But it also meant whiteness, both of workers and of clothing. Steam laundry-owners spent the first three decades of the twentieth century trying to convince customers that racial order demonstrated cleanliness in their washing facilities. They spoke about such order in the thinly-disguised language of sanitation and industrial wash methods distinguishing steam washing methods from racialized commercial alternatives.

Steam laundryowners projected to customers imagined racial order. In virtually all publicity materials, laundry workers were depicted as female and white. Bangor Steam Laundry in Maine, for example, circulated postcard advertisements that depicted buxom laundry workers with rosy cheeks, French heels, and corsets.[192] Escabana Steam Laundry in Michigan, similarly, printed on all customer receipts an image of white women workers laboring in a parlor-like workspace. The image communicated cleanliness and recognizable domestic order. It depicted ideal washerwomen as white maids, the workers who customers wanted to imagine were handling their most intimate garments.[193]

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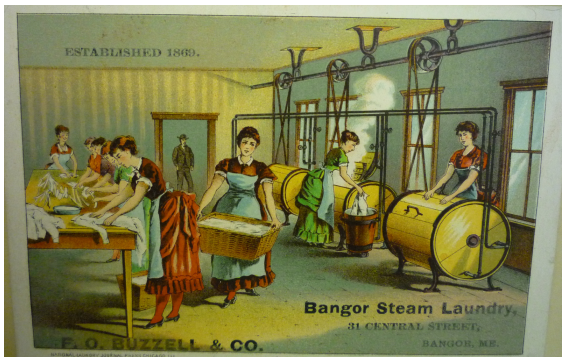
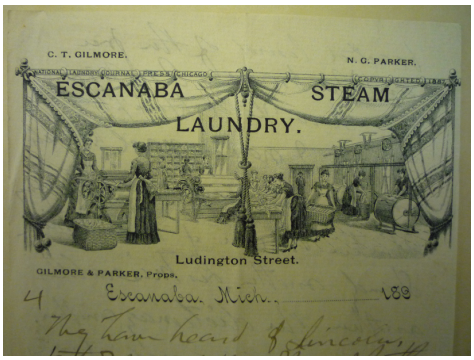
[192] "Bangor Steam Laundry" in "Commercial Steam Laundry," Box 1, Warshaw Collection of Business Ephemera, National Museum of American History, Smithsonian Institutes, Washington, D.C.

[193] "Escabana Steam Laundry" in "Commercial Steam Laundry," Box 1, Warshaw Collection of Business Ephemera, National Museum of American History, Smithsonian Institutes, Washington, D.C.





Source: "Commercial Steam Laundry," Box 1, Warshaw Collection of Business Ephemera, National Museum of American History, Smithsonian Institutes, Washington, D.C.

Steam laundryowners also tried to shape consumer perceptions by hiring white workers as drivers. These were the workers most frequently interacting with customers, the face of the business. "[W]e must be extremely careful whom we employ as a driver," chastened laundryowner C.A. Royce to readers of his 1898 advice guide. "Surely the conditions of the labor market are not such that we must take what we can get and be content." Royce emphasized choosiness. Owners should select drivers with a well-kempt appearance, who frequently wiped the exterior of their laundry carts, who wrote accurate customer receipts, and who agreed to let a contract guide their relationship with steam laundry owner. But Royce's strongest emphasis fell along non-contractual lines. "Usually honorable men are obtainable," he affirmed, explaining that "honorable" drivers would not change employers at will, nor deliver their existing customer rolls to a new steam laundry owner offering a higher cut of profits. "[T[he new employer, if honorable," Royce added, "will not stoop to obtain patronage in that way."[194] In using such language, Royce and other editors revealed the assumption at the heart of their business-building: that white masculinity conferred legitimacy.

[194] C. A. Royce, *The Steam Laundry and Its Methods: Essays Read at the Laundrymen's National Conventions* (Chicago: National Laundry Journal, 1894), 18.

The differential treatment for drivers versus other laundry employees is revealing of the white masculine identity that steam laundry owners tried to build in the 1890s and early 1900s. From a steam owner's perspective, it was important to hire white male drivers to collect and drop off laundry from customers because such individuals would serve as respectable faces of the business. And if drivers and steam laundry owners shared a racial and gender identity inside a labor market so associated with non-white female workers, then the bounds of behavioral expectation were different between owners and drivers than between owners and workers. By this logic, laundryowners fantasized that drivers could be expected to share codes of conduct and professional practices that owners were certain was impossible to find in, say, the "dangerous and illegitimate … Heathen Chinee." Summary dismissals of drivers without notice should be avoided; but firing a washerwoman or mangle operator at will was simply smart business practice.[195] That the terms of social relation fell so predictably along racial lines is perhaps unsurprising. But the vociferousness with which steam laundry owners defended their whiteness reminds us of the fragility of that identity when tied to domestic work, and in a moment when racial identity and gender norms were in flux.

Beyond projecting an image of an all-white staff, steam laundry leaned heavily on print media to emphasize the stark contrast between their own whiteness and that otherness of business competitors. Racial caricatures pervaded both trade journals and advertising circulars. An image of black children holding watermelons and sitting on the back of an alligator served as end piece to a trade journal article on the "Hygienic Value of Steam Laundry."[196] "Man can iron two shirtee all same" read an advertisement for a hand iron, illustrated by a drawing of a dancing

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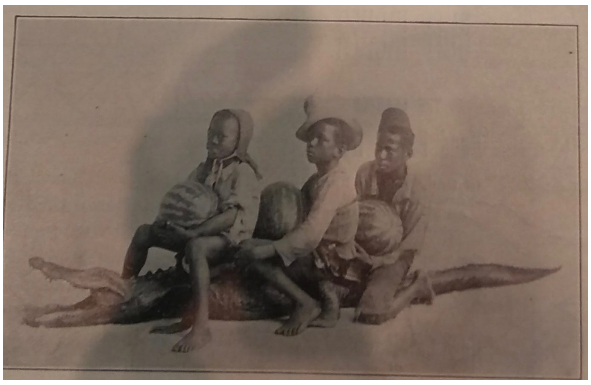
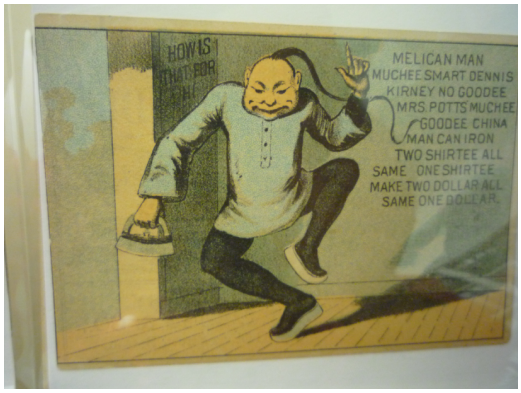
[195] "Exploye's [sic] Contract and Driver's Bond," C. A. Royce, *The Steam Laundry and Its Methods: Essays Read at the Laundrymen's National Conventions* (Chicago: National Laundry Journal, 1894), 316-317.

[196] "Hygienic Value of Steam Laundries," *American Laundry Journal* 17 no. 1 (July 1898), 27.

worker sporting long black topknot, slanted eyes, and Mandarin collared shirt.[197] A strong sense of otherness pervaded such depictions. In particular, these images stood in stark contrast to the depictions of self that laundrymen offered each other and customers: photographs always featured them presiding in formalwear over committees or their local laundrymen's chapter.[198]





Sources: *American Laundry Journal* 17 no. 1 (July 1898), 27; "Laundry Machinery and Accessories" collection, Folder "Enterprise Manufacturer Co., Philadelphia," Warshaw Collection of Business Ephemera, National Museum of American History, Smithsonian Institutes, Washington, D.C.

Source: *American Laundry Journal* 17 no. 3 (Sept. 1898), 23.

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[197] "Laundry Machinery and Accessories" collection, Folder "Enterprise Manufacturer Co., Philadelphia," Warshaw Collection of Business Ephemera, National Museum of American History, Smithsonian Institutes, Washington, D.C.

[198] See, for example, "Photograph of Delegates and Ladies Attending Fifteenth Annual Convention of the L.N.A., at Cincinnati, O., Sept. 12-14, 1898," *American Laundry Journal* 17 no. 3 (Sept. 1898), 23; "Local Officers and Chairmen of the Committee in Charge of the Arrangements for the Cincinnati Convention," *American Laundry Journal* 17 no. 1 (July 1898), 13; "Wm. Q. Lloyd, Treasurer," *American Laundry Journal* 17 no. 3 (Sept. 1898), 25.

Local Officers and Chairmen of the Committees in Charge of the Arrangements for the Cincinnati Convention.*

Wm. Q. Lloyd, Treasurer.

Source: *American Laundry Journal* 17 no. 1 (July 1898), 13; *American Laundry Journal* 17 no. 3 (Sept. 1898), 25.

With racial identities imagined into being, steam laundryowners turned to their washing processes to further publicly justify the cleanliness of their linens. In the 1890s, steam laundry proprietors pointed to the new mechanized and chemical methods that would render the washboard obsolete. The steam-powered agitator, tetrapol soap, benzene solvents, the dry room: in the words of advertisements, these wash aids were "better," "stronger" and especially "more pure" than in-home analogs. Though they might leave workers with raw red hands, headaches, and nausea, they also guarded—so steam laundryowners maintained—against the potential for disease to transfer from a worker to a garment, or from one bundle of linens to another.[199]

To each other, descriptions of washing process were, notably, were rendered in racial as well as technological terms. "Last winter we had a partial epidemic of smallpox in our city among the colored people, and to fortify myself in my business, not knowing but that possibly we might have a case occur during the run of the disease, I consulted an eminent specialist in Atlanta," reported a laundryowner named Mr. Beck at the 1898 Convention, an eye to both the racial identity of his hired workers and that of the business competition found in local black

[199] C. A. Royce, *The Steam Laundry and Its Methods: Essays Read at the Laundrymen's National Conventions* (Chicago: National Laundry Journal, 1894). On worker exposures, see Thomas Oliver, ed., *The Dangerous Trades: The Historical, Social, and Legal Aspects of Industrial Occupations as Affecting Health by a Number of Experts* (London: John Murray, 1902); Rheta Childe Dorr, *A Woman of Fifty* (New York: Funk and Wagnalls Company, 1924).

washerwomen and laundresses. Beck continued on to justify the chemical wash aids he had adopted for his laundry in cleanliness terms: "[T]his doctor told me that the chemical bleaches used in the laundry are almost a perfect germicide."[200]

The language was always coded with assumptions about the racial and gender groups who were, and were not, using these chemical methods. "The Chinese are notoriously unsanitary in their habits, as are all eastern people, and yet in no large number of cases has disease been traced to the Chinese laundry," thundered C.A. Royce in a paper presented at the 1898 Convention, in a report responding to a slew of public health officials who had raised questions about the health implications of steam laundries. In an act of logic by induction, he concluded the following before a roomful of nodding audience members, "[I]f, then, the Chinese wash house is not in the main a menace to the public health, certainly the modern steam laundry cannot be."[201]

Industry expansion in the 1910s and 1920s continued to be characterized by an expanding number of chemical wash aids employed in the washing process. A potassium permanganate solution was useful on tea and turmeric; acetic-oxalic acid removed "ordinary" writing ink; sodium bisulfite or sodium bisulfite mixed with zinc could remove fabric dye that had bled from a colored portion of the fabric into a white portion.[202] The disaggregation of the wash processes by stain was not new; but the reagents prescribed to clean fabric were. A functional chemical expertise functioned as the rhetoric of sanitation had a decade earlier: to emphasize

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[200] *The Laundry Textbook: A Classification of the Best Articles Published in the National Laundry Journal During 1898 and 1899* (Chicago: Dowst Bros.' Co., 1901), 444.
[201] C.A.Royce, "Sanitation," paper presented at the 16th Annual Laundrymen's National Association Convention, Cincinnati, Ohio; September 12, 1898, *American Laundry Journal* 17, no. 3 (Sept 1898): 31-35.

[202] "Procedure Chart for the Removal of Stains from Wash Goods," in Harvey Gerald Elledge and Alice Lucille Wakefield, *The Conservation of Textiles,* 2nd ed., (La Salle, Ill.: Laundryowners National Association, 1923).

distinctions between white laundry owners and their workers. "The people who have to do the practical work of the washroom and the starchroom are ordinary uneducated working people who will be pretty certain to make a painful mess of any complicated system," urged one advice guide. Professional steam laundry owners were now distinguished based on race, gender, and expertise.[203]

By the 1920s, the Laundryowners National Association had mounted a national advertising campaign that would endure through the early 1930s. This print advertising showcased white homemakers enjoying leisure time thanks to the commercial laundry. "Let the Laundry Do It," read the accompanying tag line, though the interior steam laundry itself was never displayed in advertising.[204] Instead, if washing facilities appeared at all, it was as watercolor renderings of a driver, in pressed jacket and cap, dropping off a bundle of clothing. And if other commercial services were mentioned, they were only referred glibly. "The clothes are MUCH CLEANER" read on advertising copy, showing a glossy-haired housewife pulling folded clothing out of a box. "'I'll never give up a seventh of my life to the drudgery of chaperoning a home laundress!'" the homemaker exclaims. "'The modern laundry gets the clothes so much cleaner—with less wear and tear.'" The implications of the advertisement were clear: handwashing, specifically by non-white hands, could not make clothes as clean.[205]

Across the late 1920s, steam laundryowners remained quietly optimistic about the work done to secure their racial position and economic position in the eyes of a buying public. The steam laundry industry enjoyed modest but steady growth between 1909 and 1929: a tripling of

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[203] C.F. Townsend, *Chemistry for Launderers, Also for Cleaners and Dyers* (Chicago: Dowst Bros. Company, 1910), 10.
[204] See, for example, the "Let the LAUNDRY do it" advertising campaign, *Ladies Home Journal* 47 no. 1 (Jan. 1930): 134; *LHJ* 47 no. 2 (Feb. 1930): 121; *LHJ* 47 no. 3 (March 1930): 140; *LHJ* 47 no. 4 (April 1930): 129; *LHJ* 47 no. 5 (May 1930): 108; *LHJ* 47 no. 6 (June 1930): 98.

[205] "Let the Laundry Do It" advertisement, *Ladies' Home Journal* 46, no. 7 (July 1929): 70.

sales, a doubling of individuals working in the field during this same period, and a 20 percent expansion in the number of steam facilities in operation.[206] By early 1929, federal agents collecting statistics for the 1930 U.S. Census were instructed to count only those steam laundry facilities with receipts in excess of $5000—the first time such a size designation had been made since the Census first started collecting steam laundry statistics in 1909. "Power laundries and dyeing and cleaning establishments are not classified as manufacturing plants, but their consumption of fuel and labor makes them important factors in the industrial system," explained LaVerne Beales, chief statistician of manufacturing data, demonstrating the extent to which steam laundries posed a formidable economic sector to statisticians tasked with assessing such economic factors.[207]

Other federal figures mirrored this assessment. Data from the Bureau of Home Economics, a division of the U.S. Department of Agriculture, suggested that an estimated two-thirds of middle-income and well-to-do urban women nationally were sending washing out.[208] Even in places like Rhode Island, hardly an example of urban density, 40 percent of women surveyed in 1929 were paying for laundry help.[209] If rates of commercial adoption had, three

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[206] Sales receipts increased from $157 million in 1909 to $541 million in 1929. Numbers employed increased from 124,000 workers in 1909 to 260,000 workers in 1929. Number of facilities increased from 5,186 operations steam laundry facilities to 6,776 steam laundries in 1929. Sources: "Table 1. Steam Laundries: Summary for the United States," *Thirteenth Census of U.S., taken in year 1910: Volume X. Manufactures, 1909: Reports for principal industries*, Bureau of Census, U.S. Department of Commerce (Washington, D.C.: Government Printing Office, 1913), 887; and "Table No. 885. Power Laundries, Cleaning and Dyeing Establishments, and Rug-Cleaning Establishments—Summary: 1919 to 1935," *Statistical Abstract of United States for 1940*, Bureau of Census, U.S. Department of Commerce (Washington, D.C.: Government Printing Office, 1941), 890.

[207] "Fifteenth Census of U.S.: Manufactures, 1929, Volume II. Reports by industries," as included in the *Fifteenth Census of the United States,* Bureau of Census, U.S. Department of Commerce (Washington, D.C.: Government Printing Office, 1933), 11.

[208] *Household Management and Kitchens*, Effie I. Raitt and Abby L. Marlatt, Chairmen, President's Conference on Home Building and Home Ownership series, Vol 9, (Washington, D.C.: National Capital Press, Inc., 1932), 64.

[209] M. Whittemore, and B Neil, *Time Factors in the Business of Homemaking in rural Rhode Island* (R.I. Agriculture Experimental Station Bulletin: 1929), 221. Most of these surveys were taken on a state-by-state basis, an often instigated by local home economics clubs or other women's clubs.

decades earlier, been concentrated in urban areas on East and West coast, buying habits had moved in-land and to more rural areas. In Texas, 18 percent of surveyed farms were sending laundry to a commercial facility.[210] In densely populated Massachusetts, 64 percent of women's club participants reported sending all or part of their wash to a commercial facility.[211] A consumer trend seemed to be taking place at a national scale: in both U.S. north and south, in both urban and rural areas, laundry-washing work continued to move from the home and into steam laundry facilities.[212]

"That measure of profit which can only come through an ever-increasing volume of business," editors of the *Starchroom Laundry Journal* wrote in February 1929.[213] By their own estimation, steam laundries served 25 percent of the population in the U.S. An additional 27 percent of Americans made up "the potential market of the industry—people who are able to afford laundry service and who live within the business territory of a modern power laundry, but who for various reasons have their laundry work done otherwise."[214] Hired washerwomen, laundresses, and hand services constituted some of these other options. Steam laundryowners once again resolved to secure customers.

But then October 29, 1929 hit.

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[210] J. E. Waggoner, *Electricity on Texas Farms* (Texas Engineering Experimental Station Bulletin, 1928), 35.

[211] See Newton Federation of Women's Clubs, *A Laundry Survey* (Boston: Laundryowners Bureau of Boston, 1928).

[212] Though 1920s and 1930s economists did not directly invoke earlier social critics, two verbs would have been much on their mind: commercialization and collectivization, the two alternatives to individual homemaker labor that had garnered attention during the consumer culture turn of the previous forty years. It was in 1887 that the socialist novelist Edward Bellamy had predicted kitchenless houses and communal eating facilities in his fanciful work of social critique, *Looking Backward: 2000-1887,* 40 years earlier. Edward Bellamy, *Looking Backward, 2000 – 1887,* (Boston: Ticknor and Company, 1888). For histories of attempts by working mothers to produce alternatives to their labors, see Dolores Hayden, *The Grand Domestic Revolution: A History of Feminist Designs for American Homes, Neighborhoods, and Cities* (Cambridge, Mass.: The MIT Press, 1981).

[213] W.E. Fitch, "Why the National Advertising Campaign," *Starchroom Laundry Journal* 36, no. 2 (February 15, 1929), 188.

[214] "L.N.A. Discontinues Radio Broadcasting" vol. 37, no. 3 (March 15, 1930), 102.

IV. Fractures in the Logic: Commercial Washing Services Fold, 1931-1946

By the early 1930s, the steam laundry industry saw itself cratering. In March 1930, trade officials canceled the nation-wide radio advertising campaign it had begun in early October 1929. Editors of the industry publication, *The Starchroom Laundry Journal*, pivoted from publishing human interest pieces and spotlights on new chemical laundering technologies to articles that focused exclusively on how to boost sales. "Visitor's Week Increased the Laundry Volume," reported one industry writer from Brooklyn, New York.[215] "A cost survey every two years," advised a laundryowner in Kansas City, Missouri, provided just the "jolt" laundryowners needed to confront "bad habits" and mindlessly incurred costs.[216] "Meet … Home Laundry Competition with Thrifty Service," advised laundryowner J. Neal Wheeler. Commercial laundries began offering to wash 12- and 14-pound bundles—average for a four-person family wash—at cut rates of less than a dollar. This weekly service would return all clothes clean, with sheets ironed and the remainder of the bundle clean but wet.[217]

Boosting sales depended on more than making internal changes at the laundry. Steam laundryowners also took a near anthropological interest in understanding the mindset and processes adopted by the two groups that they saw as their biggest sources of competition: African-American laundresses and housewives in homes with electric washing machines. The mass migration of African Americans out of the U.S. south in the early twentieth century, and the subsequent changing cultural ideas about race, explained the timing of these exacerbated

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[215] Frank V. Faulhaber, "Visitors' Week Increased the Laundry Volume," *Starchroom Laundry Journal* 39, no. 2 (Feb. 15, 1932), 34-36.

[216] John Spense, "A Cost Survey Every Two Years," *Starchroom Laundry Journal* 39, no. 2 (Feb. 15, 1932), 36-37.

[217] J. Neal Wheeler, "Meet Home Laundry Competition with Thrifty Service," *Starchroom Laundry Journal* 39, no. 4 (April 15, 1932), 10-16.

fears over competition. Beginning in the mid-1930s, *Starchroom Laundry Journal* editors published extensive interviews with representative individuals of each population. The device laundryowners used to denigrate their competition differed starkly between what were assumed to be racially and socioeconomically distinct groups. When writing about the business practices of black washerwomen, laundryowners spoke continually in the language of cleanliness. Their reports often featured voyeuristic photos of backyards and washkettles where washerwomen did their work, and gleefully reported that such workers wiped sweating brows with the same linens they were washing. "Sanitation and education are the answers to the Southern washerwoman problem," wrote *Starchroom* editors in 1934. What they meant by sanitation was whiteness. This definition echoed the racialized rhetoric of three decades earlier, when a generation of steam laundry workers had jovially played Indian and worn blackface.[218]

In the economic constraints of a Depression-era United States, home washing machines began to attract the attention of steam laundryowners. These mostly came as scant mentions in articles with optimistic titles like "What the New Position of Women in Society Means to You." ("[W]oman's new position makes it possible for the laundryowner to increase his business to an extent hitherto undreamed of," was the answer of both the L.N.A. and its collaborating partner in the Laundry Research Department at Procter & Gamble.)[219] Other articles compared the cost of sending one's laundry to a steam facility to the calculated "true facts" of washing with an electric washing machine. When including the cost of machine repairs, electricity for lights as well as washing, and gas for heating the water, L.N.A. argued that the cost of home washing

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[218] "Washerwoman Competition in Texas," *Starchroom Laundry Journal* 41, no. 3 (March 15, 1934), 59-60.

[219] "What the New Position of Women in Society Means to You" (no author), *Starchroom Laundry Journal* 38, no. 1 (January 15, 1931), 78.

totaled $1.26 per week—and noted that "not a cent has been charged for housewife's time."[220] Compared with commercial proprietors offering "96¢ for a 12 pound bundle!" or "Thrifty service … at 7¢ or 8¢ a pound!" the economics were, in L.N.A.'s mind, obvious.[221]

Instead, steam laundryowners saw their most acute competition existing in the form of racialized labor that, despite decades of advertising otherwise, had remained an active business threat. Black women became the face of business competition. Beginning in 1934, industry leaders began published articles of a strikingly new sort on the pages of the Starchroom Laundry Journal. "Here's Magnolia of Macon," declared one headline from March, its half-page illustrative photograph showing a beaming black woman, elbow-deep in a wash basis, grinning from beneath a head wrap.[222] "The Washerwomen of Various States Tell How They Get the Business," declared another headline, its photograph a similar invocation of the Mammy stereotype of sturdy, happy, and dutiful domestic help.[223] Beginning in 1934 and flowering across the pages of its monthly publication, the L.N.A.'s Starchroom Laundry Journal featured interview after investigative interview on black washerwomen, primarily those living in the U.S. south, on strategies used to attract and retain customers.

Reconciling a cognitive contradiction—diminishing the value of black washerwomen while admitting their savvy as market competition—pushed steam laundryowners toward a host of strategies. One means of diminution was to render all interviewee voices in a pigeon form of

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[220] J. Neal Wheeler, "Meeting Home Laundry Competition with Thrifty Service" *Starchroom Laundry Journal* (April 15, 1932), 10-14.

[221] For these cost figures, see Laundry Service Associates, "Now Your Week's Laundry only 96¢ for a 12 pound bundle" Advertisement, *Chicago Daily News* (February 16, 1927), as cited in J. Neal Wheeler, "Meeting Home Laundry Competition with Thrifty Service" *Starchroom Laundry Journal* (April 15, 1932), 14; "The Editors' Page: The Way Out" *Starchroom Laundry Journal* (April 15, 1932), 2.

[222] "Here's Magnolia of Macon," *Starchroom Laundry Journal* 41, No. 3 (March 15, 1934), 56.

[223] "'How I Beats the Laundries:' The Washerwomen of Various States Tell How They Get the Business"

Southern dialect. "I takes in washin' an' I takes in all I can git, an' I likes it!" steam laundryowner J.F. Tweedy reported washerwoman Emma Bryant as enthusing, invoking a stereotype of black femininity not only as desperate economically but also voracious in sexual appetite.[224] In other places, articles report with both satisfaction and worry that washerwomen accepted low-balling price quotes without questioning the terms. "Through having their prices driven down by hard bargain-driving customers, they end up receiving 25 per cent of the commercial laundry price," observed one author.[225] Tweedy reports one such concrete example observed while visiting Bryant's Better Home Laundry. The businessowner, a black woman named Emma Bryant, seemed to be doing a steady trade. Bryant's desperation for work was precisely that ingredient which made her most pitiable—and the greatest economic threat. "In nearly every case we found that washerwomen's list prices averaged just about half the prices charged by power laundries," he concluded soberly.

Starchroom reporters sought to maintain the cognitive contradiction of serious competition from black female laundresses by rendering them as pitiable businesswomen, so desperate as to make outlandish claims. Virtually all of the interviews reported on the pages of the *Starchroom Laundry Journal* conclude with the same derisive punch line: the woman being interviewed, after describing her washing habits and business model at length to an interviewer, concluded the conversation by asking for business.[226]

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[224] J.F. Tweedy, "Business is Rushin'" *Starchroom Laundry Journal* 41 no. 4 (April 15, 1934), 22-24. Starchroom Laundry Journal is bristling with such articles in this period. See also: March: "'How I Beats the Laundries:' The Washerwomen of Various States Tell How They Get the Business." April: "Washerwomen Advertise in the Carolinas;" "We Outsell the Laundries;" "Laundry Errors Help the Washerwomen."

[225] J.F. Tweedy, "Sanitation is the Answer to the Washerwoman Competition" 41 no. 4 (April 15, 1934), 20.

[226] Polly Paris, "Laundry Errors Help the Washerwoman" *Starchroom Laundry Journal* 41, no. 4 (April 15, 1934), 30-32.

Most pointedly of all, commercial laundry owners pointed to sanitation as the characteristic distinguishing commercial facilities from washerwomen services. In photographs of neighborhoods and reports on the distance between the backyard work area and the trash heap, L.N.A. leadership implored members to share such observations with their customers, concluding, "We cannot help but think that a large percentage of people would go back to the power laundries if they had any inkling of how their clothes were handled and of the sanitary conditions surrounding the work."[227] For the Laundryowners National Association, sanitation "was *the* answer to washerwoman competition." [228]

How did this economic and racial desperation, manifest in the language of cleanliness, change business practice? At Tweedy's San Antonio business, route-salesmen began carrying cardboard placards showing photographs of individual washerwomen, the facilities in which they washed, and their names and addresses. Route-salesmen, individuals who doubled as deliverymen and the most public face of any commercial laundry, were instructed to share these placards with potential customers met on the route or with customers voicing an interest in switching to a washerwoman's services. In other scenarios, appeals to the intelligence of the customer warped into outright lies. "Do you know that our city health officers tells [sic] that approximately one-half of our negro population is diseased?" one steam laundryowner tells his local clergyman, whose large family produced a wash that would bring in $8.50 weekly for the facility. That business owner reportedly added in conversation to the clergyman, "[O]f that number a frightening large percentage has highly contagious, horrible, venereal diseases." After letting the minister consider this statement, Tweedy adds, "Now to be truthful, this story we have

[227] J.F. Tweedy, "Sanitation is the Answer to the Washerwoman Competition" 41 no. 4 (April 15, 1934), 19-22.

[228] J.F. Tweedy, "Sanitation is the Answer to the Washerwoman Competition" 41 no. 4 (April 15, 1934), 19-22, emphasis added.

told you is a fiction, but it could very easily be true"—and reported to fellow steam laundryowners that the clergyman had switched his business to the steam laundry by the next day.[229]

V. Views from the Margins: Washerwomen Struggle to Stay in Business, 1930s-40s

How did an individual like Emma Bryant understand her work and commercial role, in her capacity as owner of Bryant's Better Home Laundry in San Antonio and 60-year-old black woman? How did she attract and retain customers? What was her respond to the L.N.A. businessmen visiting her home? Historical context throws into stark relief what we can imagine would have been Bryant's fear, coupled with quiet glee, at the sandy-haired man swinging down from the cab of a San Antonio laundry truck. How had he started the conversation? "Excuse me, Ma'am. I'm the sales manager of Texas Steam Laundry on the corner of Broadway and Nacogdoches. Maybe you know of us? Do you mind if I ask you a few questions?"

We know from Bryant's self-reporting in the *Starchroom Laundry Journal* that she was nearly 60 years old, had a husband, and at least one grown daughter who was also married and living nearby. The family was of enough means to own a car—an 11-year-old Chevrolet—and their own home. But beyond those proffered details, it is the larger context of a 1930s San Antonio fill out our understanding of Bryant's business decisions and the racial structures shaping her options.[230]

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[229] Tweedy, "Sanitation is the Answer to the Washerwoman Competition" (April 1934), 22. Jenny Carson also argues that racial hierarchies shaped compensation even within steam laundries, not just between steam and hand laundries. In 1930, a Women's Bureau survey found that white female laundry workers made a median rate of $16.10 per week, versus $8.85 per week for black women workers. See Jenny Carson, "Laundry" in *Encyclopedia of U.S. Labor and Working-Class History, Vol. 2,* Eric Arneson, ed. (New York: Routledge, 2007).
[230] J.F. Tweedy, "Business is Rushin'" *Starchroom Laundry Journal* 41 no. 4 (April 15, 1934), 22-24.

Though overt racism had rendered "rational market forces" never hers to claim, meaning a black domestic worker never appeared as a rational market actor, Bryant nonetheless invoked these very market forces to explain to her interviewer the source of her apparent success. "I'se told that us washerwomen is gitin' so much business dat de big laundries is beginnin' to suffah," *Starchroom* reports her saying directly to the white man standing at her door, fedora in hand. "While I regrets exceedin'ly to heah such …"—can you hear the mockery filtering through here?—"I believes in live an' let live."[231] "Live and let live:" colloquial description of the invisible hand and its workings in the San Antonio market.

Did Bryant continue invoking market rationality as the source of her business success? If she had, she would have mentioned a veritable cascade of personal practices that exposed the inefficiency of commercial methods, blithely offered advice that would be as close as she'd come to insulting this businessman who likely conceived of himself as a paragon of economically rationality and washing expertise. As Bryant would point out, however, that business sense had led to some strange washing choices at his plant: the use of generalized detergents that worked less effectively than her low-alkali homemade variety in southern Texas water, some of the hardest in the country; the use of caustic reagents and electricity to sanitize and dry white linens that could, by contrast, simply be hung in the sun; and the confusion of ink markets, colored tags, and separate bins to distinguish between family bundles that the modest scale of Bryant's operation guarded against mixing.[232]

This is not to overestimate Bryant's glee at meeting Tweedy, nor the commercial benefits of workplace expertise. Bryant lived and worked in a San Antonio where Jim Crow was not just

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[231] J.F. Tweedy, "Business is Rushin'" *Starchroom Laundry Journal* 41 no. 4 (April 15, 1934), 22-24.

[232] See especially March: "'How I Beats the Laundries:' The Washerwomen of Various States Tell How They Get the Business."

political disenfranchisement or the threat of violence, but everyday reality instantiated in space with physical demands felt corporally. City infrastructure investments meant in-home plumbing was absent from many parts of the historically black and Hispanic neighborhoods on the east side of San Antonio, leaving centralized water pumps the only source for wash water. Annual average rainfall in San Antonio—only limitedly useful, since averages disguise radical differences year to year—is 30.51 inches, which is nearly 9 inches less than the national average and 5 inches fewer than the Texas average. This meant that securing safe, dependable water was difficult.[233] Was the water spigot a foot from Bryant's yard? a block from Bryant's yard? How far did Bryant have to haul water for her business? Electrical lines were also largely absent in racially segregated neighborhoods, leaving families like the Bryants without the infrastructure to support electrified washing machines, wringers, or irons even if they could muster the necessarily capital. A lack of paving, particularly those narrow thoroughfares known as San Antonio alleyways, meant that foot and automobile traffic kicked up red-brown Texas dust exactly where bleached-white linens were stretched across fence posts and tree branches to dry.[234] In access to water, electricity, and clear air, racially motivated under-investments in public infrastructure created obstacles to Bryant's washing that her white commercial competitors did not face—and not merely for reasons of private capital.[235]

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[233] Rebecca Sharpless, *Fertile Ground, Narrow Choices: Women on Texas Cotton Farms, 1900-1940* (Chapel Hill: University of North Carolina Press, 1999).

[234] See also "West Side" photograph, San Antonio Public Library, SAPL007-031, as published in Frank S. Faulkner, Jr. *Historic Photos of San Antonio* (Nashville, Tenn.: Turner Publishing Company, 2007), 174; Rueben M. Perez and Dr. Citlali M. Zentella, *'Laredito:' The Forgotten Neighborhood West of San Pedro Creek* (San Antonio: Privately Published by Reuben M. Perez, 2013); Audrey Granneberg, "Maury Maverick's San Antonio" in *Survey Graphic: Magazine of Social Interpretation* Vol. XXVIII No. 7 (July 1939): 420-426

[235] Jim Crow thrived in early twentieth-century Texas in formal politics, as well as infrastructure: the state legislature in 1907 declared that all forms of transportation for the public must include separate coaches, compartments, or seating, and that amusement parks and pools could refuse to admit black patrons. They also barred the adoption of children across racial lines. In Fort Worth, a mere 250 miles north of San Antonio, city ordinance made it unlawful for white and black individuals to engage in sexually intimate activities within city limits. Disenfranchisement of

In the article, Bryant identifies her husband and married daughter as sources of help: her husband picking up and delivering bundles in their 11-year-old Chevrolet for customers who didn't prefer "cash and carry;" and her daughter assisting with both the washing and the rendering of homemade soap on which the family would also save money.[236] One can imagine the humiliation experienced at turning what had once been piecemeal supplemental work into family business whose profits—$3.75 per week to $6 per week, in contrast to pre-depression demand that topped out at 21 washings and $23 per week—needed to support two generations and two families.[237] So read critically, the interview also highlight the precarity of an income built on at-home washing.

Overt racism and local ecology exacerbated the economic precarity of washing workers. In the U.S. South, for example, slavery and its replacement in the tenant-farmer system meant that it was black and Chicana women who found employment taking in piecemeal washing.[238] But their ability and willingness to do the wash was itself seasonal because washing alone could hardly yield sufficient income. In the fertile Blackland Prairie area of central Texas, for example,

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blacks in Texas more generally took place via the outright barring of blacks from participating in primaries until the Supreme Court ruled this measure unconstitutional in 1944. As if a statement of entrenched principles, a black San Antonian named C.A. Booker filed on July 10, 1932 for an injunction to force party officials to allow him to vote in the July 23 primary. The then-San Antonio mayor, Maury Maverick, despite describing himself as an outspoken "champion" of civil rights and a liberal, sprang into action to have the injunction overturned, revealing the depth of white patronizing attitudes towards black voters who, regardless of education level, were seen as better represented by white politicians. See Bruce A. Glasrud, "Chapter Four. Time of Transition: Black Women in Early Twentieth-Century Texas, 1900-1930," in *Black Women in Texas History*, Bruce Glasrud and Merline Pitre, eds. (College Station: Texas A&M University Press, 2008), pp. 99-128; Judith Kaaz Doyle, "Maury Maverick and Racial Politics in San Antonio, Texas, 1939-1941," in *African Americans in South Texas History,* Bruce A. Glasrud, et al., ed., (College Station, Texas: Texas A&M University Press, 2011).

[236] J.F. Tweedy, "Business is Rushin'" *Starchroom Laundry Journal* 41 no. 4 (April 15, 1934), 22-24.

[237] "'How I Beats the Laundries' Washerwomen of Various States Tell How They Get the Business," *Starchroom Laundry Journal* Vol. 31, No. 3 (March 15, 1934), 54-58. Figures vary widely on how much one could earn as a laundress.

[238] Rebecca Sharpless, *Cooking in Other Women's Kitchens: Domestic Workers in the South, 1865-1960* (Chapel Hill: University of North Carolina Press, 2010).

a crop-lien system built on corn and cotton production meant that as autumn harvest time set in, laundry-workers would switch to picking cotton for a period of several weeks because the work, of equal physical difficulty, paid marginally more.[239] Thus it was not uncommon for a female worker to shore up seasonally variant agricultural work with washing work. The University of Texas economic Ruth Allen reported in 1931 that many female farm workers conceived of their year in terms of heterogeneous sources of work. One interview subject described her years as follows:

> 3 weeks—12 hours per day—chopping cotton.
> 4 weeks—12 hours per day—hoeing cotton.
> 19 weeks—12 hours per day—picking cotton.
> 15 weeks—8 hours per day—plowing.
> 10 weeks—8 hours per day—cultivating.
> 4 weeks—10 hours per day—making molasses.
> 5 weeks—10 hours per day—picking up pecans.
> 52 weeks—1/2 hour per day—chopping wood.

Allen adds, "In addition, she washes for hire one day out of each week, making five hours."[240] Studies such as this one emphasized the degree to which the supply of washing labor in farming territory, but even via seasonal influxes to a city like San Antonio, was a seasonal phenomenon because it was so tied to agriculture. Demand for washerwomen's services also varied seasonally. In cities like San Antonio, Houston, Dallas, and—to a limited extent—Abilene, the need for washing services varied with a seasonal influx of military, oil, and cattle workers.[241]

For those Texas women who did find work in centralized steam laundry facilities, conditions made the work far from an obviously preferable alternative to the seasonality of piece-

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[239] Rebecca Sharpless, *Fertile Ground, Narrow Choices: Women on Texas Cotton Farms, 1900-1940* (Chapel Hill: University of North Carolina Press, 1999).
[240] See Ruth Allen, *The Labor of Women in the Production of Cotton,* University of Texas Bulletin no. 3134, 8 September 1931, pp. 98-99.

[241] Judith Kaaz Doyle, "Maury Maverick and Racial Politics in San Antonio, Texas, 1939-1941," in *African Americans in South Texas History,* Bruce A. Glasrud, et al., ed., (College Station, Texas: Texas A&M University Press, 2011).

meal work. Though organizing at central steam facilities was rare among workers, in large part because of objection from management, at least one strike documented strike in Texas highlights the brutality of this type of work. Mexican women workers began organizing a local chapter of the International Laundry Workers Union in El Paso in October 1919. Soon after initiating this process, a manager at Acme Laundry fired two workers, sparking a strike of nearly five hundred workers from the six laundries in El Paso just a few days later.[242]

The relative advantage of a crop-lien system meant that the number of farmers in the Blackland area north of San Antonio rose steadily between Reconstruction until 1930; by 1920, almost three-quarters of all farms in the Blackland Prairie were operated by tenants.[243] For women like Bryant who chose to move out of a tenancy cropping system, constrained economic opportunity in nearby San Antonio might have pulled as much as rural violence and the never-get-ahead reality of tenant farming would have pushed. Cities in central Texas mushroomed in size in the first half of the twentieth century: San Antonio jumped from 53,000 residents in 1900 to 253,000 by 1940, just as Austin quadrupled between 1900 and 1940, and Dallas increased sixfold in that same period.[244] To an even greater degree than tenant farming, washing work was a labor system governed in rural areas by racial structures tightly constrained expectations for who would do the work. Texas historian Rebecca Sharpless argues that particularly in the U.S.

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[242] Such stories demonstrate the possibility of labor organizing and activism, but also the difficulty of doing so when laundry work was split between centralized facilities and piecemeal workers. Irene Ledesma, "Texas Newspapers and Chicana Workers' Activism, 1919-1974, *Western Historical Quarterly* Vol. 26, No. 1 (Autumn 1995), 309-331. For more on historic obstacles to organizing domestic labor within and beyond the commercial laundry industry, see Premilla Nadasen, *Household Workers Unite: The Untold Story of African American Women Who Built a Movement* (Boston: Beacon, 2015).

[243] Rebecca Sharpless, *Fertile Ground, Narrow Choices: Women on Texas Cotton Farms, 1900-1940* (Chapel Hill: University of North Carolina Press, 1999).

[244] Rebecca Sharpless, *Fertile Ground, Narrow Choices: Women on Texas Cotton Farms, 1900-1940* (Chapel Hill: University of North Carolina Press, 1999), 237.

South, race more than class dictated how working women saw themselves, particularly who saw washing work as an imaginable source of income and who saw it as an activity for an "other." In the crescent ridge, the wives of landlord farmers would complain that wives of white tenant farmers refused to do wash for pay. [245]

Laundry-washing for the Bryant family had bloomed into multi-person employment in the Depression years because of a lack of alternate opportunities for her husband and daughter, rather than a glut of demand for washing. Depression-era New Deal programming that might have brought relief to Bryant and her family, functioned with only very limited efficacy across the color line. The Works Progress Administration—tasked with the explicit charge to employ millions in public works projects—and the National Youth Administration replicated assumptions both about the white male breadwinner and the need to discipline unruly domestics, a category that inevitably mapped onto black women. "Happy and contented workers doing superior jobs for satisfied employers," promised the Houston Training School Program in its promotional material explaining the curriculum for housemaids, nursemaids, launderers, and cooks.[246] Actively not participating in federally funded programming became an exercise in protecting one's dignity. As San Antonio residents S.E. Boone and I.M. Howard of San Antonio remarked to in a letter sent to no less than First Lady Eleanor Roosevelt herself: "They treated us very bad at the WPA office."[247] Would Emma have known Boone or Howard, whose gender we

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[245] See Ruth Allen, *The Labor of Women in the Production of Cotton* (University of Texas Bulletin no. 3134, 8 September 1931).

[246] Negro History Scrapbook, Houston Metropolitan Resource Center, as quoted in Merline Pitre, "At the Crossroads: Black Texas Women, 1930-1954" in *Black Women in Texas History,* Bruce Glasrud and Merline Pitre, eds. (College Station: Texas A&M University Press, 2008), 133.

[247] S.E. Boone and M. Howard to Eleanor Roosevelt, 69, State Series, Texas 693.0 National Archives, as cited in Merline Pitre, "At the Crossroads: Black Texas Women, 1930-1954" in *Black Women in Texas History,* Bruce Glasrud and Merline Pitre, eds. (College Station: Texas A&M University Press, 2008), 133.

can only guess at? On this the historical record is silent—but we can guess that her experience, had she managed the four-mile trek from her east San Antonio home to the downtown WPA office, might have been exercise in foisting one's personal convictions and economic desperation against the prospect of certain humiliation.

In the face of federal disinterest, did Bryant see herself as a political agent? Barred from voting by both their race and gender, black women of means in the U.S. South formalized their own means of political engagement despite disbarment from heavily female organizations like the Women's Christian Temperance Union (WTCU) and the Texas Equal Suffrage Association that had formed in San Antonio in 1912. Though outside the south the WTCU was an imperfectly integrated organization, southern black women established a separate branch called the Thurman WCTU after its first national president, Lucy Simpson Thurman. Groups like the Texas Association of Colored Women's Clubs (1905) and the Negro Women Voter's League of Galveston provided alternate outlets for political engaged black women whose race disbarred them from analogous organizations.[248] Was Bryant a member of a church or faith-based community? Did neighbors serve as a primary social and civic outlet, in addition to her blood family? San Antonio's black population comprised 8% of the city's population, a figure that contributed to the complicated racial landscape of a nearly-border city.

Many black southern women like Bryant would have known community through their local Baptist or Methodist church, or through local socials and "singings." Particularly outside of urban areas, however, high rates of illiteracy and the slow spread of telephones made communication difficult. Children's Bureau sociologists work in Central Texas's cotton regions of

[248] Bruce A. Glasrud, "Chapter Four. Time of Transition: Black Women in Early Twentieth-Century Texas, 1900-1930," in *Black Women in Texas History,* Bruce Glasrud and Merline Pitre, eds. (College Station: Texas A&M University Press, 2008), pp. 99-128.

Hill and Rusk Counties, for example, reported that many rural women they interviewed most noticed the loneliness of rural life. "I jes' sets 'round the house and gets up and walks 'round the yard and looks at the chickens," reported one unnamed woman, when asked what she did when not tending house chores.[249] So perhaps Bryant drew inspiration or salve from the blues stylings of Texas singers Emma Wright, who lamented, "Everything I done is gone too fast."[250] Or perhaps phrases of poetry from El Paso poet Bernice Love Wiggins accompany Bryant to bed. Writing of a pianist named "Miss Annie" whose playing had captured her ear, Wiggins imagined herself at the piano. "Maybe den she'll start to strummin'" wrote in her 1925 poetry collection *Tuneful Tales.* "Dis ole world gits full ob song birds / An' yo' heart fill up wid bliss."[251]

For Bryant, whose voice we can never hear beyond the pages of *Starchroom Laundry Journal*, period black female artists from Texas serve as one window into self-perception. Neither a poet like Bernice Wiggins nor a washerwoman Emma Bryant could ignore the critiques leveled at black femininity by Southern tradition that, increasingly by the 1930s, sought to recreate racial

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[249] Ellen Nathalie Matthews and Helen M. Dart, *The Welfare of Children in Cotton-Growing Areas of Texas*, U.S. Department of Labor, Children's Bureau Publication No. 134 (Washington: Government Printing Office, 1924), 58.
[250] *Territory Singers: Complete Recorded Works in Chronological Order* (Vienna, Austria: Document Records, 1996); Audio Recording. Volume 1 (1922-1928) includes Roberta Dudley, Ruth Lee, Missouri Anderson, Sadie McKinney, Arah "Baby" Moore, Ben Norsingle, Emma Wright, Ada Brown, Bertha Henderson, and Jeanette James. Volume II (1928-1930) includes Ollie Ross, Hattie Burleson, Jewell Nelson, Cleo Gibson, David Pearson, Mel Parker, Horace Smith, and Hattie Snow. Both albums are the project of Johnny Parth, an Austrian producer who has devoted himself and his recording label, Document, to preserving American blues from the first half of the twentieth century, particularly songs performed outside of Chicago and New York. For more historical context and biographical information about individual singers, see Robert Ford, *A Blues Bibliography: The International Literature of an Afro-American Music Genre* (Bromley, Kent: Paul Pelletier, 1999).
[251] Bernice Love Wiggins, "Miss Annie's Playing" in *Tuneful Tales* (El Paso, Texas: 1925), 18. Republished with an introduction by Maceo C. Dailey Jr. and Ruthe Winegarten (Lubbock, Texas: Texas Tech University Press, 2002). Wiggins, born in Austin, Texas in 1897, is notable as a black female poet from this time period who wrote comfortably and with obvious intention in both black dialect and more recognizably formal prose. Wiggins saw herself as a beneficiary of tutelage from her elementary school teacher Alice Lydia McGowan, who she dedicates the book to with these words: "To Miss Alice Lydia McGowan. Thanks for your faith in me. Lovingly, Bernice." (3) Such appreciation and affection for instructors was in part likely learned from her experiences at Douglass High School, whose principal, William Coleman, saw as his mission making El Paso's only African-American high school into an institution fulfilling period notions of "racial uplift." See Maceo C. Dailey Jr. "Introduction," ix-xvi, in the 2002 reprint.

hierarchy using the apolitical language of sanitation. Of an imagined white mistress for which the narrator of Wiggins's poem "Missus Glimm and Me" works, Wiggins writes:

> The Missus Glimm across the way
> Is always neat and clean,
> Jim says she's jus' the tid'est thing
> That he's mos' ever seen.

Anticipating a critique of narrator's own dirtiness, Wiggins follows with an observation about how race has shaped the different burdens on mistress and househelp. "[Missus Glimm] ain't got a whole houseful / To take care of like me," the poem's narrator points out. Neither, the narrator continues, does Missus Glimm have "six healthy girls an' boys" and husband of her own that she is proud to care for, beyond the Glimm household and Glimm farm animals she tends each day. Anticipating the criticisms that white employers would level at black working women like Emma Bryant, Wiggins concludes:

> No, I'm not neat as Misses Glimm,
> I don't have time to be,
> But I'm a mother for Jim's six,
> An' they are proud of me. [252]

Thus the narrator finds solace for her difficult situation: motherhood and partnership is better reward than the leisure time and primping that Missus Glimm enjoys daily.[253]

The U.S. south was not the only place where white social critics conflated racial identity with cleanliness—or a lack thereof. Reported one visitor to a Chinese laundry, on the supposed unsanitary conditions witnessed at the site: "As we gaze about the shop, we notice how dark and dismal it is. The air is heavy with moisture and rather musty, making us feel uncomfortable in a very short while. A counter which appears to have been constructed of plants and crude boards

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[252] Bernice Love Wiggins, "Missus Glimm and Me" in *Tuneful Tales* (El Paso, Texas: 1925), 71-73.

[253] For more on how white women used black femininity to construct their own domain of autonomy, see Thavolia Glymph, *Out of the House of Bondage: The Transformation of the Plantation Household* (New York: Cambridge University Press, 2008).

confronts us and behind the counter are several shelves with package upon package of laundry neatly stacked. Behind the shelves appears to be some lattice work to which is tacked some black cloth—the only separation between the shop and the laundry and sleeping quarters." The quote reveals the double-bind that Chinese workers found themselves in: kept from work paying a sufficient wage to support housing costs, living above or behind one's shop was a cruel necessity. But such economic decisions were quickly interpreted by outsiders as evidence of dirtiness.[254]

In cities like San Francisco and Chicago, L.N.A. members repeatedly wrote of the Chinese hand-laundry that served as another form of competition. The extent of overlap is questionable. L.N.A. members looked to the Chinese hand-laundries sprouting up in areas with apartments and young couples (Rogers Park, Uptown, and Lakeview) and areas with rooming houses sheltering mobile individuals without families, the proverbial "bachelor bundle" (North Clark Street, and West Van Buren Street). The target audience for many steam laundry owners, by contrast, was the single-family house with sufficient disposable income as to pay for "extra" services like starching, steaming, and ironing.

Disparaging descriptions of Chinese hand-laundries undermined the commercial viability of these businesses at times, but more often justified violence against the businessowners. Reporting on a series of petty thefts of hand-laundries, the Chicago-based Chinese-language newspaper *San Ming Morning News*, lamented that small hand-laundries were particularly vulnerable as cash businesses where the proprietor was always present. But regardless of

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[254] Cited as "Private survey document" in Paul C. P. Siu, *The Chinese Laundryman: A Study of Social Isolation,* John Kuo Wei Tchen, ed. (New York: New York University Press, 1987), 43. The richest description of Chicago Chinese laundrywork comes to us from Paul C. P. Siu, sociologist who arrived at the University of Chicago in 1931 and whose unpublished dissertation was discovered by its editor, John Kuo Wei Tchen, while the researcher was compiling materials for the New York Chinatown History Projects in the 1980s. See Paul C. P. Siu, *The Chinese Laundryman: A Study of Social Isolation,* John Kuo Wei Tchen, ed. (New York: New York University Press, 1987). See also Joan S. Wang, "Race, Gender, and Laundry Work: The Roles of Chinese Laundrymen and American Women in the United States, 1850-1950" *Journal of American Ethnic History*, Vol. 24, No. 1 (Fall 2004), 58-99.

habitation, what worried them most was that robberies "even occur … in daytime!"[255] Be it Bryant's Home Laundry in San Antonio or the Wah Lee Hand Laundry in Chicago, being a small business owned by a racial minority left one open to the charge of illegitimacy rendered in terms of lacking sanitation. Such targeting could happen as petty theft, but more often it happened in the seemingly untargeted language of sanitation and the larger generalizations made about the hygiene habits of a particular racial or ethnic group.[256]

V. Conclusion

By the late 1940s, businesses like both Lone Star Laundry and Bryant's Better Home Laundry had closed. Marveled editors of *Consumer Reports* on the pages of its February 1947 issue: "Over 60% of the 31 million wired homes in the United States have electric washers," pointing to the tremendous growth in wartime industry rehabilitated to peacetime purposes. Demand for washing machines was expanding at a sprint. "The accumulated demand is still enormous … [and] the great replacement market is largely untouched," editors argued, an eye to the coming 1950s decade.[257] By 1947, the Nineteen Hundred Company—predecessor to Whirlpool Corporation, and the single largest distributor of washing machines in the U.S.—was shipping 351,000 washing units annually, and leadership celebrated when sales increased fully 78% in the following year to yield sales exceeding $42.5 million.[258]

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[255] *San Ming Morning News,* February 18, 1940, translation, as cited in Paul C. P. Siu, *The Chinese Laundryman: A Study of Social Isolation,* John Kuo Wei Tchen, ed. (New York: New York University Press, 1987);

[256] For more on how ideas of race get taken up in by institutional public health efforts as well as informally in the built environment, see Nayan Shah, *Contagious Divides: Epidemics and Race in San Francisco's Chinatown* (Berkeley: University of California Press, 2001).

[257] "Washing Machines," *Consumer Reports* 12, no. 2 (February 1947), 31-37. Editors quote the following source for their figures on national appliance adoption rates: "Appliance Survey of the U.S." *Electrical Merchandising* (February 1, 1946): 46-48.

[258] John Cooke, *A Century of Achievement, A New Century of Opportunity: Whirlpool Corporation* (Benton Harbor, Michigan: Whirlpool Corporation, 2011).

Environmental and cultural historians have, over the last decade, responded to an older historiography celebrating twentieth-century state-run environmental management with studies showing how these same public officials often used racial logics and fears of epidemic to segregate, separate, and otherwise denigrate racially other groups. Environmental management, particularly manipulation of the urban environment, was a chief tool for racializing immigrant groups and defining whiteness. In early twentieth-century San Francisco, public health officials explicitly disbarred Chinese, Korean, and Japanese residents from accessing public health services because of assumptions that Asian women carried venereal disease and Asian men, eating rice instead of meat, were insufficiently masculine. Race and sanitation work overlapped in early twentieth-century New York in mutually constitutive ways, leaving black and then Latino workers conscribed to dirty and dangerous trash-hauling jobs that reinforced public misperceptions of their undesirable status. The sum of these studies is a sobering picture of urban environmental management in the early twentieth-century U.S., where conservation goals and public health practices developed alongside racist and xenophobic ideals.[259]

This chapter has augmented existing literature to show how private businesses, in addition to public health offices, used race to construct shared sanitation norms in the early twentieth century U.S. These norms, increasingly uniform between urban and rural, coast and in-land, and North and South, were both racial prescriptions, and dictates for how to know and use the natural world. Urban steam laundry facilities made sanitation and cleanliness their business, and in the process rewrote nature visible in domestic processes. Through washing

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[259] Nayan Shah, *Contagious Divides: Epidemics and Race in San Francisco's Chinatown* (Berkeley: University of California Press, 2001); Carl Zimring, *Clean and White: A History of Environmental Racism in the United States* (New York: New York University Press, 2015); Dawn Biehler, *Pests in the City: Flies, Bedbugs, Cockroaches, and Rats* (Seattle: University of Washington Press, 2013); Judith Walzer Leavitt, *Typhoid Mary: Captive to the Public's Health* (Boston: Beacon Press, 1996).

practices, industry-funded research efforts, and advertising, steam laundry proprietors strived to equate whiteness with sanitation and environmental control. Their effect was to make visible and undesirable the sight of hands, especially black or brown hands, touching one's linens. What emerges from this fine-grained study of urban steam laundries is the reminder that sanitation, as it was being worked out in early twentieth-century America, was an idea shaped by human ideas of racial hierarchy mapped onto a physical environment.[260]

Sanitation was not just a constructed cultural norm. It was also a non-human system of water and microbes and soaps and starches made visible in the process of washing. Whiteness, in rhetoric and lived practice, shaped the types of non-human nature that washing workers encountered in their workplaces. In steam laundry facilities, white proprietors made decisions that pushed workers to confront confounding examples of the non-human: chemical cleaning aids that caused dizziness, microbe-laden soiled linens that caused illness, heterogeneous fiber types that required different water temperatures, and adulterated wash water itself. The non-human also existed in the soap stone basins, wooden floors, circulating air, and coal pieces fueling steam laundry machinery. Given an attentive eye, the boundaries between the human and non-human blur—nature pervaded industrial systems.[261]

This chapter examines the ways in which steam laundryowners tried, and failed, to use steam as shorthand for whiteness, and whiteness as a business strategy across the first three decades of the twentieth-century. Steam laundryowners were themselves actors weathering a slew of economic and demographic changes: the twilight of a live-in domestic servant economy, the

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[260] Arwen P. Mohun, *Steam Laundries: Gender, Technology, and Work in the United States and Great Britain, 1880-1940* (Baltimore: The Johns Hopkins University Press, 1999).

[261] Thomas Andrews, *Killing for Coal: America's Deadliest Labor War* (Cambridge: Harvard University Press, 2008); Gunther Peck, "The Nature of Labor: Fault Lines and Common Ground in Environmental and Labor History," *Environmental History* 11 (April 2006): 212-238; Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill and Wang, 1995).

popularization of the first synthetic fabrics, the widespread urbanization of formerly rural populations, and the building of urban sewer systems. In this sense, steam laundryowners were wrestling with more than business competition. Moreover, they were not singularly responsible for creating new sanitation norms. Steam laundryowners tapped and reformed existing biases to demonstrate the superior cleanliness of the clothes they were delivering to customers who may have previously hired washing help or done the work themselves. In this sense, sanitation as a dialogue with customers was no unidirectional exchange. Steam laundryowners relied on and exacerbated existing expectations, both about what practices led to truly clean clothes, and also which racialized populations constituted undesirable alternatives to urban steam laundries. The subsequent chapter on the popularization of the in-home electric washing machine will showcase how non-steam washing workers also strove to shape sanitation norms in their favor.[262]

But even if whiteness was not the sole concern for steam laundryowners, it was a unifying concern. Ideas of whiteness shaped the professional networks, advertising choices, and laundering practices they employed as a community of businessmen. Whiteness shaped which questions steam laundryowners taught consumers to ask when inspecting a starched collar or folded bedsheet. Most importantly, whiteness reinforced a rhetoric that questioned the cleanliness of non-white workers and the desirability of hiring out washing work. Seeded doubts about the desirability of non-white workers would, ironically, sow the seeds of steam laundry's own obsolescence. By the mid-1930s, a growing number of American households, not all white but predominantly so, were purchasing washing machines in order to do the wash at home. The feat that steam washing proprietors accomplished was this, then: making imaginable washing work

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[262] *His and Hers: Gender, Consumption, and Technology*, Roger Horowitz and Arwen Mohun, eds. (Charlottesville: University Press of Virginia, 1998); Carolyn M. Goldstein, *Creating Consumers: Home Economists in Twentieth-Century America* (Chapel Hill: The University of North Carolina Press, 2012); Nina E. Lerman, "Categories of Difference, Categories of Power: Bringing Gender and Race to the History of Technology" *Technology and Culture* 51, no. 4 (October 2010): 893-918.

for upper middle-class homemakers and their husbands, actors who had hired out the work for at least the previous three generations. In the process of reinventing sanitation, steam laundryowners reinforced the calcifying boundaries between unruly nature which was "out there" and domesticated nature—sanitation—which was "right here:" in the wash basin and on the starched collar.

For the first three decades of the twentieth century, steam laundryowners strove to make sanitation the metric of business acumen and social standing. In doing so, they used race as a tool for ordering bodies and environments. They confronted the non-human as it muddied the construction of a racial identity. Race and nature were co-constitutive unruly elements in early twentieth-century America. Steam laundryowners tried very hard to manage both. They would partially succeed—in the processing sowing the seeds of their own un-making. How and why consumers and washing machine manufacturers capitalized on a desire for cleanliness had in terms of workers' racial identity, as well as technological ability, is the subject of the next chapter.

Chapter Three: Agitators, 1900s-1950s, *Or,* Laundry Comes Indoors

Introduction: Washing as Outdoor Work

Despite the proliferation of commercial washing services in the late nineteenth-century U.S., and despite the growing availability of mechanized and chemical wash aids, washing nonetheless remained a type of work distinct from cooking, cleaning, or rearing children in one key regard: it remained overwhelmingly outdoor work. We can see this reality in urban as well as rural places, and largely cutting across class lines. Except for that growing section of the population—25 percent by 1929—who were patronizing steam laundry facilities, washing was work that sent one scurrying between the kitchen and backyard, or basement and alleyway or rooftop. Existing infrastructure made unavoidable contact with the outdoors while doing the wash.[263]

In rural areas, washing work remained an outdoor task for several interrelated reasons. Chief among these was an enduring cultural norm: for many early twentieth-century families, boiling clothes was one key way to achieve cleanliness. "If your white clothes didn't suit you, where we use bleach today, my parents used lye. You put this lye in the water before it got hot, and let it boil," recalled Josephine Hunter, of her childhood growing up in early twentieth-century Tennessee. Boiled cleanliness, as Hunter expected it, was only possible outdoors: "The

[263] Examples abound of early twentieth-century domestic workers discussing their interactions with the natural world. On rural women, see Jean Saul Rannells, Interview with Sadie F. Gilbertson, February 8, 1985 in Darlington, Wisconsin; Jean Saul Rannells, Interview with Thelma Buchholtz, November 15, 1984 in Westfield, Wisconsin; Jean Saul Rannells, Interview with Interview with Clara Johnson, February 16, 1985 in Wiota, Wisconsin; *The Impact of Her Spirit: An Oral History,* Georgia Hoberg, Priscilla Hargraves, Betty Pipkorn, Ruth Dehne, and Lucille Storm, eds., of the Wisconsin Extension Homemakers Council, Inc. (River Falls, Wisconsin: River Falls Journal, 1989). On urban workers, see *Work and Family: Low-Income and Minority Women Talk about Their Lives,* interviews with Fran Leeper Buss Wisconsin Historical Society, Madison, Wisconsin; especially Ann Mathias, Carolita Sanchez, Sara Rios; Consuella Tafolla.

way I was raised, we had a big iron pot that sit out in the summertime in the yard, and you made a fire under this pot."[264] Other domestic workers from the early twentieth century shared this view of backyard as work space. "I remember her [my mother] with a wash pot outdoors where you built a fire around it and boiled your clothes in there," explained Ruth Parsons, of a childhood in rural Mississippi.[265] Added Viola Smith, on how to manage scalding water temperatures, "[W]e'd put them outside and boiled them and punched them with a stick. … Everybody had to boil their clothes. You didn't wash if you didn't boil them." For many turn-of-the-century workers, boiling ensured clean garments.[266]

Boiling at times served more than just a cleaning purpose. For poorer families, boiling was also how one re-dyed clothing to better imitate those of means. "We used to get blueing, stick blueing, indigo, and we'd make our water just as blue, you know, before we put the clothes in and boiled them to hold their color. Cause people was kind of embarrassed if their clothes was wore thin or if they was patched or if they was faded," explained Viola Smith, domestic worker from rural Kentucky.[267] Ann Mathias, raised working-class in Chicago, echoed the sentiment: her brother Tommy had spent time "dyeing a jacket darker so it would look like the other boys' so he could go to the dances."[268] Boiling, in other words, was a norm because both its perceived cleaning function and its dying uses.

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[264] Josephine Hunter, interview by Fran Leeper Buss, October 16, 1979, transcript, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Box 3, Wisconsin Historical Society, Madison, Wisconsin.

[265] Ruth Parsons, interview by Fran Leeper Buss, March 31, 1980, transcript, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Box 4, Wisconsin Historical Society, Madison, Wisconsin.

[266] Viola Smith, interview by Fran Leeper Buss, June 4 and 5, 1979, transcript, *Work and Family: Low-Income and Minority Women Talk about Their Lives*, Box 5, Wisconsin Historical Society, Madison, Wisconsin.

[267] Smith, interview.

[268] Ann Mathias, interview by Fran Leeper Buss, November 27, 1979, transcript, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Box 4, Wisconsin Historical Society, Madison, Wisconsin.

In rural areas, washing also remained outdoor work because many early twentieth-century homes relied on wells or a nearby creek for their wash water. This search for wash water left workers attuned to fluxes in the natural world out their back doors. Workers recognized the difference between hard and soft water, as in the case of Sadie Gilbertson, teacher and domestic worker necessarily equipped with a knowledge of local water minerology because hard water would gum up the wash. "[W]e carried it into the house in a pail … and heated on the range with a little bag of wood ashes in it to soften the water."[269] Other workers came to appreciate—if via distaste—troublesome local ecology because of the washday odors they conferred. "[T]hese big chinaberry trees in our yard … [had] roots were in the well, and it gave the water a real funny taste," explained Mary Robinson, describing her childhood home in Alabama.[270] Most visible of all to domestic workers were ambient changes in outdoor temperature: "I stayed in that spring until that water chilled my blood and I passed out," reminisced Josephine Hunter, describing the process of washing sheets soiled with menstrual blood in early spring temperatures.[271] Via boiling and via collecting wash water, rural domestic workers came in continual contact with the natural world.

In urban areas, washday norms like boiling and washing in soft water also endured, despite growing population densities. In domestic advice guides and articles from women's magazines, early twentieth-century writers still urged homemakers to "let the clothes scald."[272]

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[269] Jean Saul Rannells, Interview with Sadie F. Gilbertson, February 8, 1985 in Darlington, Wisconsin.

[270] Mary Robinson and Mildred McEwen, interview by Fran Leeper Buss, May 23, 1980, transcript, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Box 5, Wisconsin Historical Society, Madison, Wisconsin.

[271] Josephine Hunter, interview by Fran Leeper Buss, October 16, 1979, transcript, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Box 3, Wisconsin Historical Society, Madison, Wisconsin.

[272] Maria Parloa, *Home Economics: A Guide to Household Management Including the Proper Treatment of the Materials Entering into the Construction and the Furnishing of the House* (New York: Century, 1898); 101.

But in urban areas, the need to use a washboiler more often sent hired help or homemakers to the kitchen stove or basement, rather than the backyard. So prominent was this trend that when cities like Boston, Cincinnati, and Duluth issued new public health regulations, they specified that basement rooms could be occupied for no purpose except washing laundry or cooking.[273] For commercial laundresses, the scale of their work might push them out of doors for other reasons: to use the alley as a workspace; and to collect water from the communal pump serving the neighborhood block.[274] In this sense, outdoor spaces only made work more difficult. Alleys were muddy; pumps at ground level meant exhausting climbing of stairs. For fortunate urban dwellers, the wash process was one that could largely be kept indoors, if not hired out. For laundresses, washerwomen, and domestic help, washing pushed one out of doors in unfortunate fashion.[275]

In urban areas, domestics came in most steady contact with the outdoors when hanging their linens out to dry. The desirability of hanging laundry out was itself a point of debate. For some, breezy rooftop spaces were obvious emblem of cleanliness that stood in contrast to the cramped tenement washday. Of the laundry lines he could see from his Chelsea apartment window, the American painter John Sloan remarked, "Sun, wind, scant clothing, blowing hair, unconscious grace give[s] me great joy." As one documentarian of early twentieth-century work, Sloan's paintings celebrated white domestics and their work, amplifying the connection between

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[273] See "Massachusetts: Tenement Houses. Construction, Maintenance, and Alteration Of. (Chap. 786, Act June 13, 1913)." *Public Health Reports (1896-1970)* 28, no. 48 (1913): 2567-579. http://www.jstor.org.ezproxy.library.wisc.edu/stable/4570201; "Columbus, Ohio: Housing Code. Title 2 (Sanitation)." *Public Health Reports (1896-1970)* 26, no. 38 (1911): 1426-427. http://www.jstor.org.ezproxy.library.wisc.edu/stable/4566758; "Duluth, Minn.: Housing. Construction and Alterations of Tenement and Dwelling Houses. (Ord. Nov. 29, 1912)." *Public Health Reports (1896-1970)* 28, no. 24 (1913): 1247-263. http://www.jstor.org.ezproxy.library.wisc.edu/stable/4569612.

[274] James Borchert, "Alley Life in Washington: An Analysis of 600 Photographs," *Records of the Columbia Historical Society, Washington, D.C.* 49 (1973/1974): 244-259; James Borchert, "The Rise and Fall of Washington's Inhabited Alleys, 1852-1972" *Records of the Columbia Historical Society, Washington, D.C.* 49 (1971/1972), pp. 267-288.

[275] Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996).

the outdoors and cleanliness with his use of warm color palettes, images of breeze-filled fabrics, and paintings bearing titles like "Sun and Wind on Roof" and "Red Kimono on the Roof."[276] Such depictions drew their power from their perceived alternative: shuttered indoor squalor. "I stepped inside the living-rooms," reported sociologist Francis Cope in 1901 about his experience of visits to New York City tenements. "All windows and doors were tightly closed; it was family washing day; and, as a result, the air was filled with steam, and close and foul beyond comprehension."[277] To social critics like Cope and Sloan, those unhampered by ever doing the wash themselves, outdoor spaces symbolized and guaranteed cleanliness. This was *because* of urban densities.

For other social critics, outdoor laundry lines were emblems of lower-class filth and the health dangers of unregulated urban density. Chief among these critics was the photographer Jacob Riis, whose sensational 1890 work *How the Other Half Lives* depicted what Riis took to be the deplorable living conditions endured by urban and immigrant residents in the nation's fastest-growing city: New York. Alongside early twentieth-century photographers Charles Holt and Progressive reformer Charlotte Rumbold, artistic agitators sought to render outdoor laundry lines as symbols of the tedium and desperation of urban life. The critique was, inevitably, gendered. "Could not such a woman help her family more ... by spending the strength and passion of work which cleanliness here entails, in earning money by work outside the house?" Rumbold asked readers. A "suicidal mania for cleanliness," impressed on domestics by larger

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[276] John Sloan, as quoted in Helene Barbara Weinberg, Doreen Bolger, and David Park Curry, *American Impressionism and Realism: The Painting of Modern Life, 1885-1915* (New York: Metropolitan Museum of Art, 1994), 288. Weinberg appropriately notes the voyeurism endemic to all of Sloan's paintings: his depictions of women hanging intimate garments like corsets, and his etchings of women backlit by indoor lighting and visible through nighttime windows, reveal his interest in the worker more than the work. See also Nick Yablon, "John Sloan and 'the Roof Life of the Metropolis'" *American Art* 25, no. 2 (2011): 14-017. doi:10.1086/661963.

[277] Francis R. Cope., Jr., "Tenement House Reform: Its Practical Results in the "Battle Row" District, New York," *American Journal of Sociology* 7, no. 3 (Nov. 1901): 331-358.

social expectation, relegated women to the squalid tenement. The outdoor laundry line, like the tenement itself, were signs of failure, not charm.[278]

In contrast to social critics, all of whom made large social symbol of the laundry line, early twentieth-century domestics saw urban rooftops as dangerous and tiresome work spaces that were, nonetheless, necessary. Ann Anderson Johnson, as a 17-year-old black woman arriving to New York City from rural Virginia, recalled her shock of an introduction to the city: "One of the chauffeurs saw me," she explained, after detailing that her employer had sent her to the roof of the wealthy woman's apartment building to hang laundry. Johnson had begun to use black cords she found up there as a laundry line. "He said: 'Hey honey! Don't touch that! Don't you do that, that's electricity!'"[279] Johnson's introduction to electricity was more dangerous than that of peers, but other domestics spoke with resignation that hanging laundry out was part of the job. "Ora … worked hard," recalled Velma Davis, of a fellow domestic worker in D.C. "She'd have four washes to do: white, coarse white, flannels, and the colored ones. She'd have her tubs of hot rinse water, too. Then she'd have them heavy irons for ironing them. She worked."[280] Though Davis does not mention it, one can imagine the amount of labor spent to hang those four washes' worth of garments. Besides, hanging out wash came with additional work in an urban context. Hanging clothes on the roof meant carrying them up and down stairs. Domestic worker Alfreda Baker emphasized the tiresome nature of vertical urban living. "You'd go down there to heat your water and I mean to pick up water," she recalled describing her work as a domestic laundress in D.C. She laughed as she added, "It would kill us today, and they lived to be old-age

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[278] Kimberly Little, "On Progressive-Era Photography" *Environmental History* 14 no. 1 (Jan., 2009): 146-150.

[279] Ann Jones, interview, Elizabeth L. O'Leary, *From Morning to Night: Domestic Service in Maymont House and the Gilded Age South* (Charlottesville: University of Virginia Press, 2003), 101.

[280] Velma Davis, interview, Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996), 170.

people."[281]

Social position shaped the possibility of an individual enjoying the non-human encountered in the backyard, alley, or rooftop—or the likelihood of them toiling through exposure to elements and non-cooperative nature. Examining how domestics spoke about their surroundings, both the human and non-human, reminds us of this fact. Social position also shaped norms within the wash process. Boiling serves as a useful example. For early twentieth-century domestics, the origins of the boiling norm were obscured as the nineteenth-century ideal of white homemaker-as-producer gave way to a twentieth-century ideal of white homemaker-as-manager. Was boiling one's garments a nineteenth-century symbol of class luxury transferred to twentieth-century households still able to hire domestic help for such toilsome work? Or did the act symbolize lower classes scraping by, shouldered by rural families with yards for boiling their garments alongside piecework from neighbors? By the first decade of the twentieth century, white domestics acknowledged their confusion about the origins of the ideal but nonetheless doubled-down on their commitment to it. "An excellent laundress once told me that washing was easy if one would only boil clothes before washing," gushed a reader writing into a monthly column in *Good Housekeeping* entitled "Discoveries by Our Observers and Experimenters."[282] Another marveled that "My colored laundress is the best I ever had" because the worker knew to boil garments, scrub them on a washboard, rinse them twice, and hang them in the sun. "The clothes come from her lines white and sweet, and from her irons glossy and dainty," the reader effused. Boiling, she maintained, was the key step of the process.[283]

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[281] Alfreda Baker, interview, Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996), 82-83.

[282] "Discoveries by Our Observers and Experimenters," *Good Housekeeping* 39 No. 4 (October 1904): 451-460.

[283] Mrs. E.F. Whitney, "Discoveries by Our Observers and Experimenters," *Good Housekeeping* 35 No. 5 (November 1902): 320-321.

Such entries in effect confirmed what African-American, Mexican, and Asian workers were coming to understand as they sought to find paying work in an early twentieth-century free labor economy: that the racialization of washing expertise had positioned non-white workers as "fit" for such domestic work, even experts at it—but qualified to do little else.[284] Such magazines entries also signaled the sea-change in femininity norms enacted over the previous forty years: a shift from the Victorian expectation that respectable white housewives were expert producers to an early twentieth norm that respectable housewives were efficient managers. Expertise about production processes could safely be unshouldered on non-white hired help. Household management was now what mattered.[285]

Domestic experiences of the non-human, then, were shaped by class and race, as well as whether one lived in an urban or rural location. But what remained true in the early twentieth-century U.S. was that multiple steps in the wash process made the work outdoor work: the collecting of wash water; the boiling garments at scale; and the hanging linens out to dry all pushed one between the confines of a kitchen or basement to the outdoor spaces of the backyard, alley, or rooftop. Through such labors, workers confronted the natural world in rain and snow, heavy with summer heat or soft with spring air. It was no accident they recorded their impressions of their local ecologies, be they backyard or back alley: washing work was another way of noticing the natural world. Workers spoke of throwing sticks into the fire under the

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[284] On the racialization of domestic work, see Glenn, *Issei, Nisei, War Bride* (1986); Choy, *Empire of Care: Nursing and Migration In Filipino American History* (2003); Hunter, *To 'Joy My Freedom* (1997); Clark-Lewis, *Living In, Living Out* (1996); Joan S. Wang, "Race, Gender, and Laundry Work: The Roles of Chinese Laundrymen and American Women in the United States, 1850-1950" *Journal of American Ethnic History,* Vol. 24, No. 1 (Fall 2004): 58-99.

[285] Glenna Matthews, *"Just a Housewife,"* 1987.

washboiler on "fall day[s] when it was kind of just nippy like that."[286] They tracked the change in garments, and the change in washing load size, based on changes to the natural world. "[W]e had to find a dandelion in bloom before we could take those cotton-picking old long underwear off," recalled one domestic worker from Michigan, speaking of her childhood. Dandelion blooms meant a change in garment, and lighter work. "Then we could take them off, and we could go barefooted. Then spring was here."[287] Washing work, with its reliance on the outdoors, forced in workers a functional awareness of one's surroundings.

For many workers, the outdoor parts of washing made washing more onerous rather than more dignified. The non-human was disruptive, a burden to shoulder. More importantly, commercial alternatives like steam laundries and paid help proved viable options for white women of means. For keepers of less wealthy homes, the typical tools of washday still made weekly appearances in the side yard or back alley, augmented by new store-bought soap or spring-loaded clothes pins. Tub, washboard, laundry line, and washboiler: these were still the tools of washing work.[288]

Early twentieth-century changes to household technology seemed to promise the alleviation of such burdens, instead making it possible to enjoy the outdoors. "Save your energy for pleasanter things than washing clothes," urged one 1916 advertisement for Procter & Gamble-brand white naphtha soap. The woman depicted sits on a rear porch reading, tree

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[286] Ruth Parsons, interview by Fran Leeper Buss, March 31, 1980, transcript, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Box 4, Wisconsin Historical Society, Madison, Wisconsin.

[287] Estella Myers, interview, *Voices of American Homemakers: An oral history project of the National Extension Homemakers Council,* Eleanor Arnold, ed., (National Extension Homemakers Council, 1985), 21.

[288] Miriam Bitting-Kennedy, "Modern Methods in the Laundry," *Good Housekeeping* 42 No. 2 (Feb. 1906): 235-236; Maria Parloa, *Home Economics: A Guide to Household Management Including the Proper Treatment of the Materials Entering into the Construction and the Furnishing of the House* (New York: Century, 1898); Ellen H. Richards and Maria S. Elliot, *The Chemistry of Cooking and Cleaning: A Manual for House Keepers (*Boston: Home Science Publishing Co., 1897).

boughs bending over her and linens hanging bright and white in the yard behind her.[289] "I don't see how I ever got along without it," reads the copy on another advertisement, from 1919, of a woman smiling from behind her Eden-brand washing machine."[290] Be it in chemical or mechanical form—as soap or washing machine or some other apparatus—early twentieth-century women's magazines suggested that new household technology would alleviate the burdens of doing the wash. But what industrialization would look like, and who it would benefit most directly, remained unsettled. Manufacturers were not the only one seeking to remake domestic work. They would need to overcome a few barriers before buyers would be convinced.

I. Bringing Washing Indoors: Making Servants into Problems

A 1913 article from *Good Housekeeping* magazine typified the arguments furthered by advocates for mechanizing the household. "[E]very house should be a factory," declared authors Allan L. Benson, newspaper editor and soon-to-be Socialist candidate for president, and Lydia Ray Balderston, instructor of Domestic Science at Columbia University. "Electric motors should wash, wring, and iron clothes, wash and dry dishes, clean floors, run sewing machines, and turn ice-cream freezers." The result of mechanizing the household, the authors argued, would be the quiet transformation in women's quality of life. "The mother will live longer for it. She will be happier. She will have better health." For Benson and Balderston, as for many of their contemporaries, the bodily toll of house chores could be alleviated by the addition of electric- or

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[289] "White Naphtha Soap," advertisement, *All-American Ads, 1900-1919*, Jim Heimann, ed., (Cologne: TASCHEN, 2005), 160.

[290] "Eden Washing Machine" advertisement, *All-American Ads, 1900-1919*, Jim Heimann, ed., (Cologne: TASCHEN, 2005), 160.

gas-powered appliances doing some of the heavy lifting around the house.[291]

This commitment to mechanization distinguished *Good Housekeeping* from some of its peer publications.[292] At the *Ladies' Home Journal*, for example, editors featured regular advertisements for commercial steam laundry services, as well as articles authored by industry spokespersons praising "laundry-free" homes as the paragons of modernity.[293] *Woman's Home Companion*, meanwhile, published essays extoling inchoate collective housekeeping arrangements and excoriating mechanized devices for being as disruptive in a female worker's day as unmechanized chores had been themselves.[294]

But editors at *Good Housekeeping* emphasized household-scale mechanization as the preferable means of modernizing the household. They would go on establish the magazine as *the* preeminent publication advocating for individual household appliance adoption. Under the leadership Harvey G. Wiley, first commissioner of the U.S. Food & Drug Administration (1907-1912), the magazine doubled-down on its investments in a Model Kitchen, Testing Station for

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[291] Allan L. Benson and L. Ray. Balderston, "Machinery for Women!" *Good Housekeeping* 57 No. 4 (Oct. 1913): 558-568. See also Jane Addams, "The Servant Problem," *Good Housekeeping* 37 (Sept. 1903): 233-40. Addams offers a different diagnosis, which is that the adoption of household appliances can serve as a boon for paid help and encourage the shift towards more collective housekeeping arrangements when families organize around the shared cost of appliances.

[292] For a subset of domestics, guidance in the buying new mechanical devices was exactly what they sought. By the mid-1920s, readership of *Good Housekeeping* had surpassed one million subscribers and continued to grow even through 1930s economic depression. By the late 1930s, the magazine's operating profit topped out at nearly $2.5 million, more than three times the profit generated by the combined profits earned by the eight other magazines owned by Heart Corporation, *Good Housekeeping's* holding company. In an era birthing a consumer's republic, the magazine seemed to have settled on a winning formula. *Printer's Ink* Vol. 186 (March 16, 1939): 16.

[293] See, for example, "Let the Laundry Do It" advertisements, *Ladies Home Journal* Vol. XLVII, Nos. 1, 2, 3, 5, 6, 7, 9, 10, 11, 12 (Jan., Feb., March, May, June, July, Sept., Nov., 1930): 134, 121, 140, 129, 108, 98, 135, 149, 94.

[294] Ethel Puffer Howes and Myra Reed Richardson, "We Women," *Woman's Home Companion* V.50, No. 2 (Feb. 1923): 15-16; Howes notably moderates her collectivist language on the pages of the *Woman's Home Companion* but more extensively defends the importance of uninterrupted time, what she termed "continuity," for women's intellectual growth and mental health, on the pages of the *Atlantic Monthly.* See Ethel Puffer Howes, "Accepting the Universe" *Atlantic Monthly* 129, No. 6 (June 1922): 444; Ethel Puffer Howes, "Continuity for Women," *Atlantic Monthly* 131, No. 12 (Dec. 1922): 736. An exception to this was the September 1903 publication of an argument for collective housekeeping arrangements. See Jane Addams, "The Servant Problem," *Good Housekeeping* 37 (Sept. 1903): 233-40.

Household Devices, and Domestic Science Laboratory. These units, subsumed under the Good Housekeeping Research Institute overseen by Dr. Wiley, evaluated new household products for qualities like purity, safety, and performance under strenuous use. The "Good Housekeeping Seal of Approval," awarded to test-passing manufacturers and published on the pages of the magazine, established *Good Housekeeping* as an industry expert, though ambiguously watchdog and cheerleader, both—reliant on advertising dollars in addition to subscriptions but ultimately committed to seeing appliances into consumer hands.[295]

Mechanized washing was not new in 1913, the year that *Good Housekeeping* published the "Machinery for Women!" article. As we have seen in the previous chapter, washing machines had existed as thresher-sized behemoths at an industrial scale—in hospitals, hotels, steamships, and prisons—for the better part of the previous half-century.[296] But at a household scale, by the early twentieth century, their presence was still a rarity. In fact, few devices that we today would recognize as washing machines even existed. Instead, the preponderance of patents filed with the U.S. Patent & Trademarks Office in the late nineteenth century under the D06F category ("Laundering, Drying, Ironing, Pressing or Folding Textile Articles") were *wash boilers*, not washing machines. Wash boilers were, in effect, giant vegetable steamers. They consisted of one perforated metal drum inside another, and were meant to hold soiled clothing above scant amounts of water ("two inches," specified one inventor) that was heated to steam the garments—a perceived improvement on submerging the garments in boiling water itself. Wash boilers

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[295] Mary Ellen Zuckerman, *A History of Women's Popular Magazines in the United States, 1792-1995* (Westport, Conn.: Greenwood Press, 1998); Emily Westkaemper, *Selling Women's History: Packaging Feminism in Twentieth-Century American Popular Culture* (New Brunswick, N.J.: Rutgers University Press, 2017); Frank Luther Mott, *A History of American Magazines,* (Cambridge, Mass.: Harvard University Press, 1968), 140-143.

[296] For an example of the scale of mid-nineteenth century washing machine, see "Improved Shaker Washing Machine" (Concord, N.H.: Charles C. Pearson & Company, 1877), 15; Pamphlet collection, Wisconsin Historical Society, Madison, Wisconsin.

required a fuel source: a backyard fire, a cook stove, or a newly available laundry stove, which retailer sold as broad-footed coal-powered devices.[297] More complicated wash boiler designs placed the perforated internal drum on an axel and attached this axel to an exterior crank handle, so a domestic worker could rotate the steamed clothing inside the device without opening the top and releasing the steam. "Labor-saving" in these machines, in other words, meant the following: less water; less fuel; and less direct contact with boiling garments. But they were far from labor-free. No machine could clean clothes without a human operator, be it household washboiler or industrial-scale washing machine. Such a thing was unthinkable.[298]

A scant number of household-sized washing machines did exist in the late nineteenth century. Like wash boilers, they required manual operation for virtually every step: loading and draining of wash water, shaving of soap bar into wash water, and wringing out of garments. Scrubbing was the single washing step that washing machines mechanized, and not without skepticism from some domestic workers and homemakers. Could a mechanized device clean garments as well as a worker could? Washing machine tubs had metal screws that could snag or rip a garment, metal joinery that could corrode and stain a garment, and were made of wooden planks that could splinter, snag, and tear. They seemed threatening, or at least flawed.[299]

Early twentieth-century advertising copy demonstrates the consumer skepticism of efficacy that manufacturers sought to rebut. "[O]ur celebrated Electric Washer … is constructed

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[297] For examples of laundry stoves, see "Laundry Stoves," Nos. 15871, 15872, 15873, in *Sears, Roebuck, and Company Catalog* 1897, 124.

[298] For examples of late-nineteenth century wash boiler designs, see S. Cox, Patent No. 265,027, "Wash Boiler," Sept. 26, 1882; M. Bardill, Patent No. 357,895, "Wash Boiler," Feb. 15, 1887; J. W. Ballard, Patent No., 382,289, "Steam Washer," May 8, 1888; W.E. Smith, Patent No. 405,509, "Wash Boiler," June 18, 1889; A.D. Weiss, Patent No. 511,979, "Wash Boiler," Jan. 2, 1894; W.R. Thomas, Patent No. 549,944, "Clothes Lifter and Supporter for Wash Boilers," Nov. 19, 1895; G.A. Crooker, Patent No. 611,060, "Washboiler," Sept. 20, 1898.

[299] "The Anthony Wayne Washer," "The Western Star Washer," and "Electric Washer," in *Sears, Roebuck and Co., 1897* (Chicago), 139; bolded text original.

of the best Virginia white cedar**,** and is stronger, more nicely finished, and is larger than any round machine on the market," crowed Sears, Roebuck sales staff in their 1897 print description of the most expensive washing machine the catalog offered. The electric washer described and pictured in the catalog was comprised of a wooden barrel lifted off the ground on spindly legs. It features a geared crank on the top of the wash barrel, presumably to be connected to an electric motor for agitating the clothing inside. The interior of the machine is not pictured, but Sears, Roebuck editors explained what buyers could expect when lifting the lid of the barrel. "[W]e use a square galvanized iron rod, making it impossible to tear the most delicate fabric," they assured readers. The machine "offers nothing in which the clothing can catch."[300] These assurances, repeated time and again, revealed manufacturer struggles to refute an expectation that mechanization was not as gentle on clothing as a human hand.

Human hands abounded in the early twentieth-century household. Often, and increasing in absolute numbers across the first four decades of the twentieth century, these were paid domestic worker's hands. Between 1870 and 1930, the number of female domestic workers more than doubled, from 960,000 to nearly 2 million. As a percentage of population, this represented a drop from 2.5 percent to 1.5 percent of population—or, as historian David Katzman has calculated, a drop in half when measured as a ratio of servants per thousand families.[301] Measured in absolute workforce numbers changing over time, this made domestic workers

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[300] "Electric Washer," in *Sears, Roebuck and Co., 1897* (Chicago), 139. Advertising copy does not say "on which clothing can catch," which suggests that copy writers were positioning this machine in conscious opposition to washing appliance competitor, washboiler. Wash boilers featured a double-barrel design that could, theoretically, damage clothing caught between the two barrels, a place "in which clothing could catch."

[301] Table Ba1033-1046 - Major occupational groups–all persons: 1860–1990, *Historical Statistics of the United States, Millennial Edition Online*; Table Ba814-830 - The labor force, by industry: 1800–1960 1 [Lebergott and Weiss], *Historical Statistics of the United States, Millennial Edition Online*; Table 2-1: Female Household Workers, 1870-1930 (10 Yrs. and Over), David M. Katzman, *Seven Days a Week: Women and Domestic Service in Industrializing America* (New York: Oxford University Press, 1978).

analogous, roughly, to the number of construction workers, miners, or teachers working in the 1870 to 1930 period.[302] Though the challenges of classification and invisibility discussed earlier in this dissertation should make us cautious about drawing too many conclusions from Census statistics alone, the numbers nonetheless capture a trend. Contrary to utopian imaginings of industrialization mitigating domestic work, that work flourished for the first half of the twentieth century.[303]

Instead, industrialization meant a change in perception. Between 1870 and 1910, white homemakers became increasingly alarmed by what they lamented was a dearth of good house help: a "servant problem." "The servant girl is disappearing," lamented I.M. Rubinow, economist and influential proponent of social insurance. "From year to year it becomes increasingly difficult to get efficient help; or, if efficient, at the right price; or, if at the right price, for any reasonable time; and, frequently, *any* help, at *any* price, for *any* length of time."[304] Driven by a desire to secure a strong middle class, Rubinow would go on to argue that the capacity to hire servants was, along with the creation of a social security program, a means of building a broad middle class. Though his motivations differed from that of other advocates, his anxiety about a perceived lack of eligible help was widely shared by white social critics. Public fears over a servant problem spurred federally commissioned studies of the domestic labor market; seminars at

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[302] Table Ba814-830 - The labor force, by industry: 1800–1960 1 [Lebergott and Weiss], *Historical Statistics of the United States, Millennial Edition Online*.

[303] The absolute number of domestic workers nationally first declined with the 1950 census, and for the second half of the century diverged from the teaching profession by decreasing in number, rather than increasing. However, it mirrored the construction and mining industries in a slow decline across the second half of the twentieth century. Two trends suggest that data collection methods of the last thirty years underreport the number of domestic workers. One, the limited capacity of Census agents to count undocumented workers suggested undercounting, as those workers disproportionately enter domestic service. Second, domestic work is often seasonal labor, leaving it difficult to categorize and count. Mary Romero, *Maid in the U.S.A.* (New York: Routledge, 1992).

[304] I. M. Rubinow and Daniel Durant, "The Depth and Breadth of the Servant Problem," *McClure's Magazine* Vol. 34, (Mar. 1910): 576, 585.

institutions like MIT and Columbia University; new city-backed domestic science schools; and investments in Home Economics curriculum for elementary and high schools around the U.S.[305]

The generic term "servant problem" hid the specific racial fears motivating early twentieth-century writers to lament a dearth of "eligible" help. White social critics were alarmed at the influx of non-white domestic workers, primarily black women entering Northern households as domestic workers.[306] In those spaces, homemakers were unaccustomed—as their Southern colleagues had become—of asserting and maintaining one's white identity. "The Swedes make the best servants of all our imported working people," commented the New England writer Mary Elizabeth Sherwood, explaining that Swedish women specifically "deplored the idleness and the disobedience … creeping in even amongst them in our American life."[307] She was not alone in lamenting an earlier day when house help was visibly white. Trying to explain why, by 1897, so few white women were entering into domestic service, the Bureau of Labor Statistics researcher Lucy Salmon lamented, tellingly, "[D]ifficulty is presented to the American born [sic] girl when she realizes that she must come into competition with the foreign

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[305] Sarah Stage and Virginia B. Vincenti, *Rethinking Home Economics Women and the History of a Profession* (Ithaca: Cornell University Press, 1997); Magda Fahrni, "'Ruffled' Mistresses and 'Discontented' Maids: Respectability and the Case of Domestic Service, 1880-1914," *Labour / Le Travail* 39 (1997): 69-97. doi:10.2307/25144107.

[306] In aggregate numbers, the racial demographics of domestic workers *did* shift between 1870 and 1920—though never to that extent touted by early twentieth century discussants of a servant problem. Between 1870 and 1900, the number of white domestic workers more than doubled, from 618,00 to 1.3 million workers. Non-white workers in this same period increased by a nearly identical percentage: from 243,000 workers to 567,000 workers—and still constituted just over one third of those domestic workers employed nationally. By the early 1920s, when white homemakers finally gave up on the hope that servitude would ever "return" to being a profession attracting large numbers of white women, white domestic servants still outnumbered non-white domestic servants 7 to 6. True, parity was closer to being realized. But a "servant problem" was a name for a problem of racist perception: that households, even northern households, might not be whites only. Table Ba1117-1130 - Major occupational groups–nonwhite females: 1860–1990, *Historical Statistics of the United States, Millennial Edition Online;* Table Ba1103-1116 - Major occupational groups–white females: 1860–1990, *Historical Statistics of the United States, Millennial Edition Online.*

[307] M. E. W. Sherwood, "The Lack of Good Servants," *The North American Review* Vol. 153, No. 420 (Nov. 1891): 546-558.

born or colored element."[308] The arrival of non-white workers into domestic spaces was alarming homemakers, primarily those in the north, Mid-Atlantic, and Midwest. Non-white workers were unreliable and threatened the apparent status of domestic work as a profession.[309]

Reconstructing whiteness was not only a project for early twentieth-century homemakers. It had also become a concern for trade union officers, public health officials, and even service clerks witnessing what they saw as a dangerous transformation of existing social hierarchies. Though the expansion of the free labor system in the late nineteenth century had made the economic status of waged white workers more precarious, unionists and public health officials scapegoated African-American workers and incoming Chinese, Latin American, and Korean immigrants as the cause of economic insecurity. In each of these industries, members wrote protectionist rules and racist policies delineating the borders between member and ineligible. As we have already seen in the previous chapter on commercial steam laundering, explicit rules as well as professional culture functioned to keep organizations closed to all but white members.[310]

Homemakers, in contrast to trade unionists, learned to treat mechanical technologies rather than rule-making as a means for reconstituting, in their case, the white household. By the 1910s, the growing network of electrical lines for urban households, and the marketing of stand-

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[308] Lucy Maynard Salmon, *Domestic Service* (New York: The MacMillan Company, 1897); viewed as Lucy Maynard Salmon, *Domestic Service* in "American Women: Images and Realities" series (New York: Arno Press, 1972), 147.

[309] Though historians have written on the economic and political forces shaping "the" domestic labor market between 1870 and 1930, an analysis treating racial categories as themselves being reconstructed during this period is yet to be written. See, for example, David M. Katzman, *Seven Days a Week: Women and Domestic Service in Industrializing America* (New York: Oxford University Press, 1978; Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996); Elizabeth Ross Haynes, "Negroes in Domestic Service in the United States: Introduction" *The Journal of Negro History,* Vol. 8, No. 4 (Oct., 1923): 384-442; Heidi Irmgard Hartmann, "Capitalism and Women's Work in the Home, 1900-1930," ProQuest Dissertations and Theses; 1974; ProQuest Dissertations & Theses Global, Accessed January 2, 2019.

[310] David R. Roediger, *The Wages of Whiteness: Race and the Making of the American Working Class* (New York: Routledge, Chapman & Hall, 1991); Nayan Shah, *Contagious Divides: Epidemics and Race in San Francisco's Chinatown* (Berkeley: University of California Press, 2001); Kevin P. Murphy, *Political Manhood: Red Bloods, Mollycoddles, and the Politics of Progressive Era Reform* (New York: Columbia University Press, 2008); Carl Zimring, *Clean and White: A History of Environmental Racism in the United States* (New York: New York University Press, 2015).

alone gasoline-powered home appliances for rural households, made mechanization a plausible alternative for homemakers giving up on finding white help. A 1914 advertisement for Western Electric household appliances said it best: "Electricity is the cleanest, quickest, most willing and most easily controlled household servant," read advertising copy. The advertisement featured images of a washing machine, an electric iron, a vacuum cleaning, and a telephone. The implications were clear: electricity could solve a servant problem. Electricity was, proclaimed the advertisement, "The 20th-Century Servant." By 1915, electrical wiring had reached exactly those urban areas where non-white workers were beginning to stream. But for the white domestic, electricity promised that one might not need to staff one's house any other way.[311]

For non-white domestics, mechanization in the 1900 through 1920s period ushered in key changes to their work. Virtually none described mechanization as labor-saving, nor did they lament a dearth of employment opportunities. Instead, the largest shifts realized by non-white domestics came in the form of where one lived, and for how long. One major shift was a shift to northern, midwestern, and west coast cities. Driven by the reconstruction of Jim Crow in the U.S. south and kinship networks stitching together urban areas in the north, black women began arriving in cities like New York, Philadelphia, Chicago, and Los Angeles by the thousand in the early twentieth century. For many of these women, domestic work was the only type of work available to them. "Who didn't do domestic work? Even the teachers did it for one while in their

[311] There were multiple drivers of national electrification, as demonstrated in the robust existing histories of technology. Historian David Nye persuasively argues that the building of electrical infrastructure necessarily enrolled local industry, local government, and the federal government, rather than constituting just an effort funded by private dollars. This was particularly true in the 1930s extension of electrical lines to rural areas of the United States. Nye concludes that price, technologic adoption, and a desire for convenience were the drivers of electricity adoption. Adding cultural drivers like racial anxiety, class emulation, or the reconstruction of gender norms would help build out his argument to include domestic workers and homemakers as themselves actors shaping the energy landscape. See David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880-1940* (Cambridge, Mass.: The MIT Press, 1990).

lives," recalled domestic worker Marie Stone.[312] Domestic work was the work of necessity. Another change was a shift in living arrangement: from "living in" the home of one's employer to living outside the house. The length of worker tenure in individual households also decreased: from an average time in one job situation at several years to, on average, changing workplace every three to six months. Though domestic workers realized an increase in their wages during the World War I years, domestic wages fell back to pre-war rates by the mid-1920s.[313]

For appliance manufacturers, public wrangling over a "servant problem" posed a sales opportunity. "[T]here is no servant problem in a house that is well equipped with machinery," advised Allan L. Benson in his 1913 *Good Housekeeping* article, echoing a sentiment shared by executives at companies like Maytag, Voss, and Bluebird Appliances.[314] Maytag's first washing machine with attached wringer came on the market in 1909 with the name Hired Girl, a further nod to the replacement they imagined buyers would be making.[315]

But the first washing machines were also ungainly devices: wood barrels, sharp metal screws, and leaking tubs limited the functionality of the appliances. Before manufacturers could increase sales of washing machine, they needed to create appliances that could launder delicate clothing gently; and they needed to overcome a homeowner expectation that white clothing must be boiled in order to be clean.

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[312] Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996), 88.

[313] David M. Katzman, *Seven Days a Week: Women and Domestic Service in Industrializing America* (New York: Oxford University Press, 1978; Elizabeth Clark-Lewis, *Living In, Living Out: African American Domestics and the Great Migration, 1910-1940* (New York: Smithsonian Institution Press, 1996); Elizabeth Ross Haynes, "Negroes in Domestic Service in the United States: Introduction" *The Journal of Negro History,* Vol. 8, No. 4 (Oct., 1923): 384-442.

[314] Allan L. Benson and L. Ray. Balderston, "Machinery for Women!" *Good Housekeeping* 57 No. 4 (Oct. 1913): 558-568.

[315] The Maytag Company, "Wringer Washers 1907-1983" viewbook (Newton, Iowa), n.d. Warshaw Collection of Business Ephemera, National Museum of American History.

II. Bringing Washing Indoors: Urbanizing the Washing Machine

Across the 1910s and 1920s, American appliance manufacturers jostled to gain a great share of a market whose size was uncertain. How far, manufacturers wondered, could washing machines sales be pushed beyond farm families? Could sellers break into urban markets seemingly saturated by commercial options and plagued by indoor space constraints?[316] Business executives disagreed over the answer, but one quality *did* unite the companies asking: virtually all were based in the Midwest. Voss Brothers Manufacturing Co., based in Davenport, Iowa; the Maytag Co., based in Newton, Iowa; the Upton Machine Company, based in St. Joseph, Michigan; Bluebird Appliance Company, based in St. Louis; and the Hurley Machine Company, based in Chicago: these were the players in the inchoate field. The one exception to this Midwest norm, the Nineteenth Hundred Washing Company, was based in Binghamton, New York. Nineteen Hundred Company served a primarily East Coast and Mid-Atlantic consumer base until a 1929 merger with the Michigan-based Upton Machine Company gave the resultant company—which would rename itself Whirlpool Corporation in 1949—cheaper and broader distribution.[317]

The Midwest roots of these manufacturers was not coincidental: it reflected manufacturing capacity and seats of consumer demand. The Maytag Company serves as a useful example. The company had gotten its start as a manufacturer of agricultural implements: huskers, shredders, grain graders, and hog waterers. Based in Newton, Iowa, the company first began building clothes washers in 1907 to overcome a problem of seasonal slumps in the

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316 Ronald R. Kline, *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore, MD: Johns Hopkins University Press, 2000).

317 G.D. Crain, Jr., *Crain's Market Data Book and Directory Class, Trade, and Technical Publications* (Chicago: G.D. Crain, Jr.), 1920.

manufacture of farm implements as farmers weathered cash-short winters.[318] To address this problem of seasonal manufacturing lulls, Maytag turned to building an appliance that would be demanded all year round, and stored more easily than a horse-sized thresher: the washing machine.

The effects of company origin place showed in their products. For the urban-based manufacturers like the Bluebird Appliance Company (St. Louis) and the Hurley Machine Company (Chicago), electric machines were their sole focus.[319] For the three companies distributing truly nationally and into Canada, the line of offerings was much broader: electric machines and those that could be connected to a gasoline engine, as well as the more widely-sold hand-operated devices. The offerings spanned the range from electrified and non-electrified households that they aimed to sell to.[320]

Two manufacturers led the field: the Maytag Company, based in Newton, Iowa; and the Upton Machine Company, based in St. Joseph, Michigan. Via a 1919 distribution deal with Sears, Roebuck; a 1929 merger with a New York-based manufacturer to expand their sales territory and cut transit costs; and a 1949 renaming, Upton Machine Company would establish itself by midcentury as industry giant Whirlpool Corporation.[321] Maytag, by contrast, was an early dominator in the market for washing machines: after 1922, with farm implement sales down but washing machine orders flooding its corporate offices, executives halted production of

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[318] "Maytag Wringer Washers, 1907-1983" viewbook, Maytag Company, "Laundry Machinery and Accessories" Collection, Warshaw Business Ephemera, n.d.

[319] "Blue Bird Electric Clothes Washer" advertisement, TASCHEN 1900-1920, pg. 259; "Announcing the New Thor-32 Electric Washing Machine," *Saturday Evening Post* November 20, 1920, pg.144.

[320] *General Catalog No. 25,* The Maytag Co., (Newton, Iowa: Maytag Co.): n.d., Steenbock Library, University of Wisconsin-Madison.

[321] Whirlpool Corporation, "1951 Annual Report," (St. Joseph, MI: Whirlpool Corporation, 1951); John Cooke, "A Century of Achievement, A New Century of Opportunity," (Benton Harbor, MI: Whirlpool Corporation, 2011).

all but the home device. Within two years, Maytag was outselling all other American washing machine manufacturers.[322] These two companies—Maytag and Whirlpool—would dominate the field of washing machine engineering and manufacturing for the first sixty years of the twentieth century, until the ascendance of Asian manufacturers chipped away at American industrial dominance.

Beginning in the 1920s, Maytag and Upton Machine Company debuted a series of design changes that would change "washing machines" from glorified wooden tubs to automated mechanized devices. They sought to effect one key change in perspective: for sales staff, home economists, and customers, they sought to teach that hand-washing and boiling were not processes for creating modern cleanliness. Instead, clean garments could only be had through mechanized agitation: the jostling of clothes against each other. We can see the success of this campaign unfold across the first three decades of the twentieth century.

Within washing, handwashing was key precisely because fabrics, laces, buttons, and embroidery needed such different levels of roughness to clean. As such, for the first two decades of the twentieth century, manufacturers struggled with how to mimic the motion of handwashing in mechanized form. They experimented with plungers, dollies, pounders, squeezers, and grippers; they introduced flexible bags and diaphragms that squeezed articles being washed; they touted horizontal axes of motion, vertical axes, inclined axes, and wobbling motions in both their hand-powered, gas-powered, and electrified washing machines.[323] The material from which

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[322] The Maytag Company, "Wringer Washers 1907-1983" viewbook (Newton, Iowa), n.d. Warshaw Collection of Business Ephemera, National Museum of American History.

[323] Patent classification D06F 5/00, "Hand implements for washing purposes;" Patent classification D06F 15/00, "Washing machines having beating, rubbing or squeezing means in receptacles stationary for washing purposes;" Patent classification D06F 21/00, "Washing machines with receptacles, e.g. perforated, having a rotary movement." Accessed via Google Patent Search, accessed Aug. 22, 2016. See also multiple articles from *The Electrical World: A Weekly Review of Current Progress in Electricity and Its Practical Applications*, hereafter *EW:* "Large-Sized Washing Machine," *EW* 65 No. 1 (January 2, 1915): 50; "Washing Machine of Inverted Drive Type," *EW* 65 No. 10 (March

machines were manufactured made a gradual migration away from wood and towards enameled metal (though as late as 1920, at least one manufacturer heralded its white maple cylinders agitating clothing for being "gentle handling … superiorities").[324] Manufacturers also increasingly attached a wringer to their washtubs, a hand-crank device through which a domestic would feed wet garments, so water would be squeezed back into the washtub and the linen would be drier to hand on the line. But these innovations aside, the primary focus of manufacturing efforts for the first two decades of the twentieth century was on mimicking hand-washing agitation in mechanical form. For manufacturers, this degradation and potential ripping of garments was the chief barrier to consumer adoption of a washing machine.[325]

One effect of manufacturer experimentation with form and function was that early washing machines remained outdoor devices, particularly in the rural areas where sales were initially focused. Machines were large, loud, leaked water, and needed constant changing of water or adding of soap. Early purchasers spoke of side porches, lean-tos, and sheds where they stored washing machines; they kept gasoline cannisters nearby for feeding motorized machines and reserved their stamina for the weekly work of cranking machine and wringer. "I just step out there and do my washing," commented Ruby Powers, of the side porch her son had built for her via a Federal Housing Loan. "Since 1929 we've always had an electric wash machine, the wringer type. In summer it would be moved out to the porch and Mom would wash clothes on

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6, 1915): 618; "Motor-Driven Washer of Household Size," *EW* 65 No. 16 (April 17, 2015): 1008; "Electric Washing Machine," *EW* 65 No. 17 (April 24, 1915): 1077; "Electric Washer With Vacuum Plunger," *EW* 65 No. 17 (April 24, 1915): 1260; "Cylinder-Type Electric Washer," *EW* 65 No. 17 (May 15, 1915): 1260.

[324] Altorfer Bros. Company, "A-B-C Super Electric," advertisement, *Ladies' Home Journal* (February 1920): 180.

[325] "Maytag Washing Machines" in *General Catalog No. 25,* The Maytag Co., (Newton, Iowa: Maytag Co., n.d.): 52, Steenbock Library, University of Wisconsin-Madison; "What They Say About Maytag Washers," *Ibid.,* pp. 55; Helen M. Whitson, "Washing for Several Families at the Institute: When Washing Machines are Tested and New Methods of Washing Worked Out," *Good Housekeeping* 84 No. 5 (May 1927): 92-93.

the porch and in winter, of course, the washer would come in the kitchen," similarly recalled Mae Gliniecki of Marathon County, Wisconsin.[326] Even with mechanization, washing work remained outdoor work in many rural areas.[327]

In urban areas, washing work was less obviously outdoor work for machine owners. It chiefly remained outdoor work via the need to hang linens to dry. By the 1920s, companies like the Worcester-based Hill Dryer Company boasted sales of dryers to "nearly one million … and not one dissatisfied." By "dryers," the company chiefly meant collapsible laundry frames and laundry lines. Via such designs as the Steel-Frame Balcony Dryer (built for permanent attachment, with hand-crank expansion and collapse), Roof Dryers (lightweight frames built for carrying up and down apartment stairs), and Lawn Dryers (for suburban users), the company stretched sales across the United States and internationally. "No where are the Hill Dryers more appreciated than in the thickly-settled districts of our large cities, where not only room but convenience is most desired," crowed Hill Dryer advertising circulars. Virtually all were accompanied by illustrations of long-haired, corset-wearing homeowners hanging out the wash alongside maids in starched uniforms. The pitch was meant to be dual-focused within one image: sell the technology to both women doing their own wash, and those still hiring help.[328] Washing work for laundresses and washerwomen also, even in urban areas, was outdoor work. Moving between different family homes, trying to boil at scale, and the reality of shoddy indoor plumbing in underserviced sections New York, Washington, D.C., and San Antonio meant that washing still

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[326] Mae Gliniecki, interview, as quoted in *The Impact of Her Spirit: An Oral History,* Georgia Hoberg, Priscilla Hargraves, Betty Pipkorn, Ruth Dehne, and Lucille Storm, eds., of the Wisconsin Extension Homemakers Council, Inc. (River Falls, Wisconsin: River Falls Journal, 1989), 65.

[327] For oral testimonies about outdoor washing, see Ruby Powers, Ruth Parsons; Melissa Walker, *All We Knew Was to Farm: Rural Women in the Upcountry South, 1919-1941* (Baltimore: Johns Hopkins University Press, 2000).

[328] Hill Dryer Company, "Hill's Twentieth-Century Conveniences for the Home" viewbook (Worcester, MA: Hill Dryer Company), n.d.; Warshaw Collection of Business Emphemera.

pushed workers outdoors, and unpleasantly so. Domestic worker Audrey Smith recalled being out of doors frequently as a child helping her mother with a large client list. She used the D.C. streetcar system to pick up and deliver baskets of laundry throughout the city. One day, she recalled hiding a basket of clean laundry in the bushes so she could play in nearby Fountain Lake. The customer, unhappy at this treatment of their clothes, alerted Audrey's mother, who gave Audrey a severe spanking on her return home. "We had no time to play. It was always business, always work."[329] Outdoor spaces were hybrid work spaces, play spaces, and space to move through in pursuit of more work. But, increasingly, washing out of doors was becoming racialized, and not respectably middle class.

By the late 1920s, two technological shifts combined to move home washing work firmly indoors: one was the shrinking of washing machines to fit in urban homes, particularly via the installation of a center post to agitate the clothing. Devices that had previously measured three, four, even five-feet square now fit in corners of kitchens or newly styled "laundry rooms" in suburban homes.[330] The second shift was towards manufacturing electric washing machines, rather than gas-powered or hand-powered styles. Engineers designed and built this new generation of smaller electrified washing machines with urban and suburban customers in mind, particularly playing on their anxiety over a supposed "servant problem." The popularity of these devices presumed widespread access to an electrical grid, a reality for urban residents that cut along expected class and racial lines.[331]

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[329] Audrey Smith, interview, 7 December 2001, in Elizabeth L. O'Leary, *From Morning to Night: Domestic Service in Maymont House and the Gilded Age South* (Charlottesville: University of Virginia Press, 2003), 95.

[330] Carter, "Household Appliances," 1990; Malcolm B. Russell, "Captive Supplier or Partner? Sears, Whirlpool and Washer Design," *Business and Economic History* Vol. 25, No. 1 (Fall 1996): 143-153.

[331] David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880-1940* (Cambridge: MIT Press, 1990); Ronald C. Tobey, *Technology as Freedom: The New Deal and the Electrical Modernization of the American Home* (Berkeley, CA: University of California Press, 1997); Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge,

Engineering changes timed alongside cultural shifts propelled washing machine manufacturing forward. Between 1916 and 1925, manufacturing expanded ten-fold, from 70,000 to 882,000 machines produced annually. Growth rates leveled off for the latter half of the 1920s, however, with sales lingering at one million units shipped annually between 1925 and 1929. In 1930, manufactured devices dropped below 1925 rates, with the onset of economic depression. Surveys of homemakers from the early 1930s suggested that sales rates would continue to stagnate: at the start of 1930, somewhere between one third and 40% of households were doing their wash at home, while an analogous number was reportedly paying for commercial help—either sending out the wash or hiring help to come into the house—most of the time.[332] Though paying help didn't necessarily mean one would not also a washing machine, the willingness to pay for washing help did suggest a troubling trend: that homeowners of means were only so willing to do the wash themselves.[333] Further exacerbating this distaste for washing work, *even* with the help

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Mass.: Harvard University Press, 2014); Ronald R. Kline, *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore, MD: Johns Hopkins University Press, 2000).

[332] Appliance adoption figures from this period contradict each other, and reflect the perspective of the data source, i.e. a contest over the inevitability of washing machine adoption versus the work existing a field whose future was a genuine contest. For three *mostly* similar data sources, see "Table 23: The Growth of Washing Machine Production" Heidi Irmgard Hartmann, "Capitalism and Women's Work in the Home, 1900-1930," ProQuest Dissertations and Theses; 1974; ProQuest Dissertations & Theses Global, Accessed January 2, 2019, pg. 295; from U.S. Census of Manufacturers, 1909-1967; Helen Whitson Kendall, "The Way We Wash, Told by 400 Good Housekeeping Readers," *Good Housekeeping* 91 No. 5 (Nov. 1930): 86-87; George J. Stigler, *Domestic Servants in the United States 1900-1940*, National Bureau of Economic Research Occasional Paper 24 (New York, 1946), pp. 24, 28, based on estimates from William Shaw of the American Washer and Iron Manufacturers' Association (letter, Nov. 27, 1943).

[333] Federal officials shared this view that homemakers would be limitedly willing to do work laundry work if out-of-home alternatives existed. Within a 1930s context, the rough parity between washing machine users and commercial service users suggested an avenue for creating jobs. In 1930, policymakers examined laundering as part of an efforts, commissioned by President Herbert Hoover, to survey the future of homeownership and housing construction in the U.S. Even on the other side of an October 1929 New York Stock Exchange crash—in fact, *especially* in the wake of that economic downturn—the commercialization of washing work seemed like an important mechanism for employing jobless Americans. "As the spinning wheel left the kitchen fireside and the sewing machine took its place, and as ready-made clothing later displaced the sewing machine, so little by little other processes once carried on in the home are now relegated to commercial establishments," wrote authors like Secretary of Commerce Robert P. Lamont and sociologist Robert S. Lynd in the pages of the report. What industrialization of laundry-washing promised was nothing short of "the elimination of the laundry from the home." *Household Management and Kitchens*, Effie I. Raitt and Abby L. Marlatt, Chairmen, President's Conference on Home Building and Home Ownership series, Vol 9, (Washington, D.C.: National Capital Press, Inc., 1932), 209.

of a washing machine, was the reality that half of homemakers reported that they still boiled their white cottons and linens.[334] Washing with a machine still meant changing water, wringing garments, shaving soap, and transferring linens to a boiler. It was far from "laborless." It seemed that washing machines would not become a household necessity, nor even an improvement on commercial options like sending washing out.

III. Bringing Washing Indoors: Automating the Washing Machine

Three technological shifts would transform washing machines from their status as a 1920s accoutrement in wealthy urban households and 1920s farm implement in rural homes to their post-war status as necessary fixture of middle-class comfort by the 1950s. These three changes were interrelated in that they effected another shift: the move of washing fully indoors. First via the popularization of the automatic water heater beyond the Pacific Northwest to households nationally in the 1920s and 1930s; then the patenting of the fully automated washing machine in the 1930s, and its popularization in the post-war period; and finally, in the 1950s, the popularization of disposal diapers that finally made obsolete the perceived need to boil garments.[335]

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[334] "The Way We Wash, Told by 400 Good Housekeeping Readers," *Good Housekeeping* 91 No. 5 (Nov. 1930): 86-87.

[335] The 1930s were marked by two additional changes that paved the way for appliances manufacturers to send more washing machines into a greater number of households. The first of these was the gradual gutting of the commercial steam laundry industry, discussed previously. Arwen Mohun argues convincingly that steam laundries emerged and then failed due to a dialogue between what was technologically feasible and what was culturally desirable. By this she means that laundry owners, laundry workers, federal regulators, and consumers all had a role in shaping the industry, but that competing demands—for efficiency and scale, for safety, for cleanliness—oftentimes placed these constituents at odds. To this analysis I have added the rubric of race, suggesting that commercial steam laundries employed a racialized definition of sanitation in their self-fashioning and marketing campaigns, an appeal that ultimately failed in favor of washing machine adoption. See Arwen P. Mohun, *Steam Laundries: Gender, Technology, and Work in the United States and Great Britain, 1880-1940* (Baltimore: The Johns Hopkins University Press, 1999). Federal investments in rural electrification, as well as federal extension of low-interest or no-interest lines of credit to white consumers during the 1930s also explain the revived interest in washing machine purchase, demand that was interrupted by World War II but resumed robustly after the conclusion of the war. See Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge, Mass.: Harvard University Press, 2014); Ronald R. Kline, *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore, MD: Johns Hopkins University Press, 2000);

Each of these technological shifts occurred during overlapping time periods, the on-the-grounds piece of what the historian Lizabeth Cohen has termed the mid-century construction of a consumer's republic: "an economy, culture, and politics built around the promises of mass consumption," within which federal policymakers came to define "both … material life and the more idealistic goals of greater freedom, democracy, and equality" in the language of consumer choice and purchasing power.[336] It was within this early twentieth-century moment that appliance manufacturers, in tandem with federal policymakers, solidified another shift: the obsolescence of any lingering conflation between outdoor spaces—for boiling, for drying linens—and cleanliness. By the 1940s, outdoor washtubs had become symbols of rural backwardness or urban poverty, a negative perception bleeding over to police domestic space more broadly. Over the subsequent decades, appropriate domestic work spaces were indoors: the kitchen, the laundry room, the nursery, the basement. Inappropriate domestic work spaces extended to include balconies, porches, roofs, and yards. By the 1960s, this policing of space via learned expectation would expand to include line-drying, which became a symbol of poverty.[337] How did this change in perspective become a reality? Let us examine each technological shift in turn.

Hot water heaters were first popularized in the Pacific Northwest via an active utility association that, in the absence of many large industrial consumers, sought to expand the energy

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Lendol Glen Calder, *Financing the American Dream: A Cultural History of Consumer Credit* (Princeton, NJ: Princeton University Press, 1999); Louis Hyman, *Debtor Nation the History of America in Red Ink* (Princeton, NJ: Princeton University Press, 2011).

[336] Lizabeth Cohen, *A Consumers' Republic: The Politics of Mass Consumption in Postwar America* (New York: Vintage Books, 2003), 7.

[337] Shaping my thinking on the subject of space and peer surveillance shaping individual action is Anna Andrzejewski, *Building Power: Architecture and Surveillance in Victorian America* (Knoxville, TN: University of Tennessee Press, 2008), esp. Chapter 3., "Hierarchy." See also Thomas Hubka, *Big House, Little House, Back House, Barn: The Connected Farm Buildings of New England* (Hanover and London: Univ. Press of New England, 1984); Sallie Marston, "A Long Way From Home: Domesticating the Social Production of Scale," in *Scale and Geographic Inquiry: Nature, Society, and Method*, Eric Sheppard and Robert B. McMaster, eds. (Malden, MA: Blackwell Publishing, 2004), 170-191.

load demanded by what engineers termed the "small user:" single-family households utilizing limited electrical loads. In 1915, more than 150 delegates of the Northwest Electric Light and Power Association met to discuss how to encourage energy-intensive devices like electric rangers and water heaters into more consumer hands. Their conclusions would be the strategy that would cast the mold: newspaper advertising; booklets, circulars and postcard advertising; the use of demonstration agents.[338] By the 1930s, rural utilities advocates were marveling that even their farm families, more reliant on gasoline than urban and suburban customers, were clamoring for electric water heaters as a key improvement to daily life.[339]

Despite the context of proliferating indoor water heaters, washing machine design as it related to water use was changing very little. Whether or electric, gasoline, or hand-crank, washing machines in the 1920s still universally required a user to drain one batch of water—saving soap suds in the process, if was the preference of the user—and pour in another batch of wash or rinsing water. Additionally, such devices were still *wringer*-washers: this meant that users would still need to pull wet garments out of the washtub and wring them through a hand-crank set of rubber rollers to squeeze water out of clothes. (A handful of homemakers recalled using wringer-washers for an alternate purpose, shelling peas from the garden. "You could shell peas with those hard rollers, but that didn't work good with the later softer rollers, because they would smash them," recalled Sarah Ball of Oklahoma. Whether or not this was a widespread practice, such comments highlight the role of Extension program agents in popularizing devices that, in

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[338] "Northwest Association at Portland: Publication Relations, the Small-Customer Problem and Electric Cooking Among Topics Discussed," *EW* 66 No. 1 (Sept. 11, 1915): 569.

[339] M. S. Winder, "Utilities Should Finance Rural Service Lines" *EW* 95 (June 21, 1930): 1292. Historians of energy have offered scant treatments of water heaters, and more work remains to be done. See David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880-1940* (Cambridge: MIT Press, 1990); Ronald C. Tobey, *Technology as Freedom: The New Deal and the Electrical Modernization of the American Home* (Berkeley, CA: University of California Press, 1997); Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge, MA: Harvard University Press, 2014).

multiple manuals, agents learned to teach skeptical non-adopters that such devices had multiple plausible uses.[340]) Hot water might be appearing automatically in the household, but washing machines were still portable rather than connected to indoor plumbing. Instead, engineers at companies like Maytag, Upton Machine Company, and Bluebird were still focused on solving a servant problem via creating a gentler "hand-like" agitators, reduced size, and reduced noisiness for urban buyers.

This would change in the 1930s, where designers at an engineering firm unconnected with the domestic appliance industry began seeking means to expand sales. Bendix, a California-based company, had specialized for thirty years in devices useful to the automotive and airplane manufacturing industries. But in 1930, stumbling on dropping sales, its executives leased the company's automatic-change technology to a small company in Cincinnati, the similarly-named Bendix Company. Engineers at Cincinnati Bendix began playing around with using this automatic-change device in washing machines that, they gambled, would largely sell to suburban homes where move-ability was less of an issue. These new machines, they gambled, could be directly connected with a home's indoor plumbing, especially its automatic hot water heater. What was borne was a device that would add and drain batches of water automatically, after timed washed cycles; and a motor that would spin the barrel of the machine quickly enough after the last rinse to wring excess water out of garments. With this technological transfer, the first "fully automatic" washing machine was born—at least in an engineering office, with uncertain prospects for its salability.[341]

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[340] Sarah Ball, interview, as quoted in *Voices of American Homemakers: An oral history project of the National Extension Homemakers Council,* Eleanor Arnold, ed., (National Extension Homemakers Council, 1985), 165. Carolyn M. Goldstein, *Creating Consumers: Home Economists in Twentieth-Century America* (Chapel Hill: The University of North Carolina Press, 2012).

[341] Malcolm B. Russell, "Captive Supplier or Partner? Sears, Whirlpool and Washer Design," *Business and Economic History* Vol. 25, No. 1 (Fall 1996): 143-153.

The entry of the U.S. into the Second World War temporarily stayed washing machine production across the U.S. For firms whose engineers had heard about Bendix's automatic washing machines but who were unconvinced this innovation would sell widely, the wartime years proved opportunity to experiment with alternate designs. At the Nineteen Hundred Corporation, engineers treated the automatic washer as a luxury item—with its $85 manufacturing cost due to its steel-intensive design, and its $200 selling price, the Bendix automatic was at least 50% more than any competing device on the market.[342] Further, the design used an enormous amount of water and soap, because the machine drained fully after each wash cycle. Nineteen Hundred Company engineers created two alternatives: one, a "suds miser" feature to the automatic machine they were designing, where a tank on the side of the machine and a two-way pump drained and stored soapy water, then reversed the flow back into the machine for the next wash. They also debuted a mid-market device, one that was cheaper to produce because it used less steel. Though a drawback of this device was its propensity to "walk" itself across the floor in the course of a wash—agitation of clothes spread to vibrate the whole device—it had sold 20,000 by the end of 1947 and another 89,000 sold in 1948.[343] In 1949, Maytag had followed suit, introducing its first fully-automatic washing machine to the national market. With washing machines that tapped into hot water systems and anchored in place, appliance manufacturers had firmly pushed away from devices that would have moved between indoors and outside.

The final step towards indoor automated washing came in an unlikely form: the

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[342] Upton Machine Company becomes the Nineteen Hundred Corporation when the two merged in 1929; it is not until 1949 that the conglomerate is renamed Whirlpool. Readers are advised as to the continuities within the company I am describing but I caution against any implied inevitability of outcome by using Whirlpool anachronistically.

[343] Malcolm B. Russell, "Captive Supplier or Partner? Sears, Whirlpool and Washer Design," *Business and Economic History* Vol. 25, No. 1 (Fall 1996): 143-153.

disposable diaper. Through the 1940s, writers in U.S. women's magazines lamented the "stubbornness" of homemakers who clung to the practice of boiling her garments and advised that the only clothing type that needed boiling were baby diapers. "Boiling diapers is really a safety measure, and although it is sometimes inconvenient and time-consuming, it is not wise to omit it," cautioned *Good Housekeeping* contributor Helen Kendall. Bleach could serve as a plausible alternative, particularly "if you are living in small quarters," a nod to both the possibility that in such urban apartments one might be living without a washing machine or a space to boil garments. But, advice givers concluded, boiling was the only way to guarantee truly disinfected diapers.[344] The popularization of disposable diapers over the subsequent decade would, by 1960, make such advice obsolete.[345] Boiling had no place in the household and washing machines would see no competition from wash boilers, commercial workers, steam laundries, or multi-step wash processes. The automated washing machine seemed poised to stay.

IV. Conclusion: Bringing Drying Inside, and the Nature That Doesn't Go Away

In 1950, editors at *Good Housekeeping* magazine published a thought piece spotlighting what, for at least one editor, was the new frontier in laundering: rinse-free washing. "[B]efore the development of the detergents," wrote author Emily Taylor, "washing clothes without rinsing would have been unthinkable. But these new detergents have most unusual characteristics," she went on to explain. They had two properties that made them superior to soap: one, they lowered surface tension and thus penetrated soiled clothing fibers more fully, a property that chemists prized in agents called surfactants, or "surface-active agents." Second, they had the capacity to

[344] Helen W. Kendall, "Clean Clothes Make a Baby Sweet," *Good Housekeeping* 117, No. 2 (August 1943): 142-143; "Use a Bleach," *Good Housekeeping* 125, No. 4 (Oct. 1947): 321.

[345] Kendra Smith-Howard, *Green Clean*, forthcoming.

keep dirt suspended in wash water rather than letting water redeposit dirt onto to partially washed clothes. These new detergents were perfect for "slips, stockings, sweaters, and other things usually washed by hand," Taylor continued, thinking of the cascade of new fabrics populating the closet and the washing machine: Rayon, Nylon, Fibro, Sylph, Celanese, Teca, Quiana. But Taylor would tip her hand in the final lines of the article. "Soap is fine for washing clothes in soft water. … Detergents, on the other hand, do their best work in hard water." In saying so, Taylor revealed a simple but profound reality: even by mid-century, nature had not really left the household. It endured as hard and soft water, as clean drying days, and in the metal appliances—and electrical currents powered by distant coal fields—that populated new indoor domestic work sites. Nature had been subdued or erased. Its nineteenth-century experts had been transformed, via early twentieth century racial fears and the appliances that answered those fears, into Mammies, laundresses, and cleaning ladies.[346]

Despite all these changes, the non-human endured in the washtub as hard and soft water. The expertise needed to manage that non-human messiness accumulated more at laboratory benches than in laundry rooms. Chemical engineers far from the appliance manufacturing firm had, for the last half-century, redefined cleanliness by ordering the non-human. They labored in laboratories at companies with names like American Viscose Company, E.I. du Pont de Nemours, and Procter & Gamble. In the early twentieth-century decades during which the washing machine had shifted from wood to metal, hand-crank to electric, and luxury item to symbol of middle-class respectability, these chemists had synthesized, named and popularized domestic technologies that would transform the meaning of cleanliness even more than would the obvious device like the washing machine.

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[346] Emily Taylor, "Emily Taylor's Corner: She Cleans Things," *Good Housekeeping* 131 No. 5 (Nov. 1950): 32.

These innovations were two-fold. One, form-holding synthetic fabrics and the dyes that would turn these garments magenta, azure, or fluorescent yellow, is the subject of the next chapter. In that chapter, we'll trace the proliferation of chemical technologies that would transform domestic expectations of cleanliness from starched stiffness to laundered softness, and from bleached whiteness to bright vibrant color. The second, synthetic detergents, is the subject of the final chapter of this book. That innovation, perhaps more than any other, would transform cleanliness, giving clean garments—for the first time in history—named and branded scent that, without which, consumers could not detect cleanliness. That topic, the transformation of our sense of smell, needs some set up. It is to the topic of synthetic fabrics that we turn next.

Chapter Four: Polyester
Or, Making Cleanliness Soft, 1889 – 1970

"Rayon is the one textile fibre not subject to the vagaries of nature, and is, as far as is possible for such a thing to be, directly under human control."[347]

— S. A. Salvage, 1926

Introduction: In Search of New Threads

U.S. chemists first glimpsed artificial silk, what they would later name rayon, at the 1889 Paris World's Exposition. "The fibrous material … is very lustrous and beautiful, closely resembling the finest silk," marveled Spencer B. Newbury, Cornell University chemist and U.S. delegate to the fair. Reporting back to Congress on the unusual chemical products showcased at the event, Newbury had kept up an exhausting schedule in order to see the full offerings in the Hall of Chemical and Pharmaceutical Products. He had inspected novel pigments, paints, and varnishes. He had surveyed gelatin dry-plate technology promising to transform photography. With a gloved hand, he had prodded sulfur samples in an effort to understand Italian dominance in the global sulfur trade; with his other hand, he had scraped fruit waxes off of treated apples and lemons. But of all these chemical novelties, it was the sumptuous and shining fibers that most caught Newbury's eye.[348]

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[347] Samuel A. Salvage, "Rayon's Place in the Textile Field," Address delivered before the 22nd Annual Convention of the National Wholesale Dry Goods Association, Waldorf-Astoria Hotel, New York, January 19, 1926; as republished in *The Rayon Journal* 1 no. 1 (February 1926), 11.

[348] "Artificial Silk" in *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington: Government Printing Office, 1891), 607-608. See also "Photographic Apparatuses," "Chemical and Pharmaceutical Products," and "Products of petroleum distillation" in *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II,* Spencer B. Newbury, contributing author (Washington, D.C.: Government Printing Office, 1891): 526-527.

Artificial silk signaled more than just individual ingenuity. In the hands of a French chemist, in the city of Paris that served as a global seat of fashion, the silken strands also represented a potential threat to U.S. economic interests. There was a reason Newbury was reporting back to Congress rather than his wife: U.S. officials were keen to maintain dominance in the global textile trade, and new fibers could threaten that position. It was not lost on Congressional leaders in 1889 that cotton was not an inevitability, particularly those who had watched the economy of the American South torque towards reliance on cotton exports between 1840 and 1885. In 1860, the U.S. had accounted for two-thirds of global cotton production; by 1889, this position remained undamaged by the American Civil War but policymakers watched warily the expansion of Indian cotton plantations and other textile fiber industries.[349] British and East African producers enjoyed a near monopoly on the small but important flax industry, the fibrous plant woven into linen.[350] Britain, Brazil, Argentina, and Australia dominated the 1880s wool market, trumpeting their unique soils as much as their sheep breeds when explaining the softness and length of the wool staple produced.[351] U.S. sericulture, for its part, had failed

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[349] Sven Beckert, *Empire of Cotton: A Global History* (New York: Alfred A. Knopf, 2014); Stephen H. Yafa, *Cotton: The Biography of a Revolutionary Fiber* (New York: Penguin Books, 2006); Beth Anne English, *A Common Thread: Labor, Politics, and Capital Mobility in the Textile Industry* (Athens: University of Georgia Press, 2006). A global environmental history of nineteenth-century textile production, particularly the drivers of a shift from fur- and wool-based textile economies to cotton-based economies, has yet to be written. A few scholars have begun to trace this story in a non-U.S. context: Iñaki Iriarte-Goñi, "Forests, Fuelwood, Pulpwood, and Lumber in Spain, 1860–2000: A Non-Declensionist Story." *Environmental History* 18, no. 2 (2013): 333-59, http://www.jstor.org.ezproxy.library.wisc.edu/stable/24690425; Emily O'Gorman, "Local Knowledge and the State: The 1990 Floods in Cunnamulla, Queensland, Australia," *Environmental History* 17, no. 3 (2012): 512-46, http://www.jstor.org.ezproxy.library.wisc.edu/stable/23212358.

[350] The literature on the expansion of American flax production is sparse, particularly descriptions of its production growth in tandem with demand for flaxseed oil in the late nineteenth century. See *The European Linen Industry in Historical Perspective,* edited by Brenda Collins and Philip Ollerenshaw (Oxford: Oxford University Press, 2003); William F. Leggett, *The Story of Linen* (Brooklyn, N.Y.: Chemical Pub. Co., 1945).

[351] On comparative wool production, see Elizabeth Hitz, *A Technical and Business Revolution: American Woolens to 1832,* unpublished Ph.D. thesis, New York University (1978), 408 pp.; James Burnley, *The History of Wool & Woolcombing* (New York: A. M. Kelley, 1969); Arthur Harrison Cole, Cole, *The American Wool Manufacture, Vols. I and II* (Cambridge, MA: Harvard University Press, 1926)); Kosmas Tsokhas, *Markets, Money, and Empire: The Political Economy of the Australian Wool Industry* (Carlton, Vic.: Melbourne University Press, U.S.A. and Canada, 1990); *D. T. Jenkins, The British Wool Textile Industry, 1770-1914 (Aldershot, Eng.: Scolar Press, Pasold Research Fund, 1987);* Raymond V. McNally,

completely across the 1870s, leaving Italian and Chinese producers continued dominance.[352] Cotton was king, but its endurance was not a given. With maintained export dominance a key policy goal, threats to that position—threats like new textile fibers showcased at the 1889 World's Fair—were of significant political interest.

Newbury's report was meant to do more than alert U.S. Congressional leaders to the dawning possibility of artificial silk. In it, he also sought to position chemists as more wide-ranging experts than industrialists had previously seen them to be. Across the nineteenth-century, chemists had consulted for pharmaceutical, mining, and military industries; in the textile industry, they had worked alongside higher-stature mill financiers to fabricate new dyes and dye-fixatives. But it was rare that a chemist—and certainly not their lesser-status industrial cousin, the chemical engineer—designed a production line or led investment decisions. Instead, such decision-making power and status accrued to lenders and company heads. Chemists were mere handmaidens of the process.[353]

Newbury's use of chemically specific language and description of production process revealed a desire to bolster his expertise before peer readers who might dismiss the business savvy of a laboratory chemist. "A serious drawback to the practical application of the artificial fibre is its great inflammability," he cautioned readers, naming a fabrication challenge that only a

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"The American Wool Problem," *The American Journal of Economics and Sociology* 7, no. 2 (1948): 185-203. http://www.jstor.org.ezproxy.library.wisc.edu/stable/3483681.

[352] On the struggles of American silk production, particularly in tandem with contemporaneous Japanese expansion, see Giovanni Federico, *An Economic History of the Silk Industry, 1830-1930* (Cambridge: Cambridge University Press, 1997); Jacqueline Field, Marjorie Senechal, and Madelyn Shaw, *American Silk, 1830-1930: Entrepreneurs and Artifacts* (Lubbock, Tex.: Texas Tech University Press, 2007); Debin Ma, "The Modern Silk Road: The Global Raw-Silk Market, 1850-1930," *Journal of Economic History* 56: 2 (Jun., 1996), 330-355; *Silk City: Studies on the Paterson Silk Industry, 1860-1940,* Philip B. Scranton, ed. (Newark: New Jersey Historical Society, 1985).

[353] Nikolaos A. Peppas, *One Hundred Years of Chemical Engineering: From Lewis M. Norton (M.I.T. 1888) to Present* (Dordrecht: Springer Netherlands, 1989); Paul Starr, *The Social Transformation of American Medicine* (New York: Basic Books, 2017); Arnold Thackray, *Chemistry in America, 1876-1976: Historical Indicators* (Boston: D. Reidel Pub. Co., 1985); *German Professions, 1800-1950, Geoffrey Cocks and Konrad H. Jarausch. eds. (New York: Oxford University Press, 1990).*

chemist could solve. Newbury, in fact, already postulated one solution. A tendency of artificial silk to combust "may be overcome by immersing the skeins in dilute nitric acid," he advised. Surveying the raw materials needed and the equipment needed, Newbury concluded, "[I]t is quite possible that in the event of the discovery of suitable solvents for silk, wool, etc. the process may have an important future."[354] The message was clear. In a new industrial age, chemists could be the ones designing the building blocks of industry, not just tinkering with add-ons like lubricants and dyes. Wood, coal, cotton, and iron had been the building blocks of nineteenth-century industry. In the twentieth century, the material backbones of industry seemed undecided. Artificial silk raised the possibility that cellulose, the most common material in wood pulp and discard plant matter, could be molded into unexpected new shapes. Artificial silk, Newbury intoned, suggested just one of the new materials chemists would soon be able to fabricate from scratch. This would make them crucial builders of new industry, not just handmaidens to existing processes.

Cellulose was the chemical name for a chief component of wood pulp. This made cellulose one of the most common substances on earth—an assertion of abundance that chemical engineers made frequently in an 1890s search for new raw materials on which to found industry.[355] As the ingredient comprising plant cell walls, cellulose was also the ingredient in mulberry leaves that silkworms consumed, digested, and turned into silk. To see that fabrication process happening in the hands of a chemist was a marvel of scientific invention. But more than that: to see that fabrication process controlled so as to dictate the precise diameter, length, and

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[354] "Artificial Silk" in *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington: Government Printing Office, 1891), 607-608.

[355] See, for example, Arthur D. Little, "Report to Daniel C. Spruance, Esq. on the Technical Development of Viscose on the Continent of Europe and in Great Britain" (1899), 1, 4; Series II, Box 214, Arthur D. Little Papers, U.S. Library of Congress, Washington, D.C.

texture of the silk strands was to witness a triumph of scientific invention *over* natural process. "While the details of the process belong alone to the inventor," wrote one chemical engineer with a tinge of envy, "enough of the principle has been indicated to answer the question 'What is artificial silk?'"[356]

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Far from the halls of Paris World's Exposition, another type of inventor was also fabricating new fibers from unexpected materials. "[M]y mother made a lot of our clothes. She … just could make a garment you could wear," recalled Ruth Parsons, of a childhood growing up in rural Mississippi. "Got the material off the flour sacks mostly. My father would buy the flour [/] in these printed sacks. I believe the calf feed came in those sacks, too." Domestic Maggie Muhar similarly recalled flour sacks as a source of garment fabric, noting that they were "colorful sacks, they'd get prints and such." Such statements were not boasting; repurposing of flour sacks for garments was an act of economic necessity rather than choice. Flour sack dresses communicated one's class status to others; flour sack undergarments reminded one, itchily, of one's poorness. Recalled Julia Souza, "All the other kids in the truck [which took us to school] … they used to get so angry with me, because I had silk panties, and they had the rice bag kind."[357] But the fact remained: patching, mending, and repurposing of fabric constituted an alternative to

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[356] Charles Richard Dodge, "Artificial Silk" in *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington: Government Printing Office, 1891), 526.

[357] Ruth Parsons, interview with Fran Leeper Buss, March 20, 1980 in Box 4, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Wisconsin Historical Society: Mss 809 2M/44/F3-4; Maggie Muhar, interview with Fran Leeper Buss, April 2, 1980 in Box 4, Julia Souza, interview, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Wisconsin Historical Society: Mss 809 2M/44/F3-4; *Voices of American Homemakers: An oral history project of the National Extension Homemakers Council,* Eleanor Arnold, ed., (National Extension Homemakers Council, 1985), 21. I recognize that I use these interviews anachronistically, implying that the describe an 1880s period when their speakers are in fact discussing experiences from the early twentieth century. One research goal for after the dissertation has been submitted is to return to the Cairns Collection and scour nineteenth-century diaries for mentions of mending, creative fabric reuse, and reappropriation of textiles. For now, these interviews are meant to illustrate that nineteenth-century advice guides were not unrealistic in explaining how to salvage fabrics.

buying new threads. For homemakers and domestic workers of lesser means, skills built as laundresses and seamstresses could be put to use, laboriously, transforming used fibers into new dresses, aprons, quilts, and rugs.[358]

This is not to valorize poverty. As the historian Susan Strasser reminds us, what we might today perceive as frugality or noble reuse was, for nineteenth-century domestics, actually a form of consumption, i.e. an attempt to mimic the material wealth of higher classes. But in nineteenth-century households, the normalcy of mending, darning, refurbishing, and repurposing was a given, even for houses of means—although in those households, paid help did the darning alongside the washing. Worn bedsheets became pillowcases; worn dresses became skirts; flannels became rugs; calicoes became quilts; and linen undergarments became medical gauze.[359] No nineteenth-century industrialist tracked consumer rates of fabric use, and no Census agent counted how many yards of fabric a household refabricated or discarded on an annual basis. But the normalization of daily work with fabric—both to launder it, and to mend it—reveals both the economic necessity of such activity and the textiles expertise that domestic workers possessed, also by necessity.

Reuse existed at more than just the household scale. It was also a part of industrial life. Wool serves as a telling example. As late as 1915, five widely-sold textiles were manufactured at scale from non-virgin wool: noils, mungo, shoddy, extract, and flocks. Noils, extract, and flocks were all made from fibers sloughed off during combing or spinning processes, essentially the dog food of textile mills whose owners were happy to turn former waste into sellable product. But

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[358] See Susan Strasser, *Waste and Want: A Social History of Trash* (New York: Metropolitan Books, 1999).

[359] Economic writing on the topic of reuse abound from this period. As representative examples, see, "Over the Mending Basket" in S.D. Power, *Anna-Maria's Housekeeping* (Boston: D. Lothrop and Co., 1884), 175-189; Helen Campbell, *Women Wage-Earners: Their Past, Present, and Future* (Boston: Roberts Brothers, 1893); "Professional Menders" in Sallie Elizabeth Joy White, *Business Openings for Girls* (New York: The Werner Co., 1899), n.p.

mungo and shoddy were made from disassembled collected fibers—that of clothing, blankets, and outwear gathered via a modest rag-collecting trade. An estimated 125 million pounds of shoddy were manufactured in England alone in 1884. These discards were collected, cleaned, and spun back into useable yarn.[360]

Household reuse and industrial reuse offered an alternative vision for textile production in the late nineteenth-century, though artificial silk chemists would not have seen it as such. Reuse attracted none of the excitement or investment that laboratory fibers would generate in the wake of the 1889 World's Fair. Instead, it would take nearly a century before the 1960s slogan "Reduce, Reuse, and Recycle" to offer a critique of twentieth-century industrialization, and three more decades before self-styled "radical homemakers" would foist darning needles as symbols of political activism rather than gender-based political repression.[361] And it would take another decade beyond that for limnologists, wastewater treatment managers, and fisheries to begin identifying and tracking microscopic fibers in waterways and fish bodies as plastic textile threads washed from synthetic garments.[362]

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[360] "Wool Substitutes" in Roberts Beaumont, *Woollen and worsted: the theory and technology of the manufacture of woollen, worsted and union yarns and fabrics* (London: G. Bell and Sons, 1915), 34-39; "Shoddy, Mungo, and Flocks," in Walter S. Bright McLaren, Spinning woolen and Worsted: Being a Practical Treatise for the Use of All Persons Engaged in Those Trades (London: Casell, 1884), 187-189.

[361] Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (Cambridge: Cambridge University Press, 2001); Valerie Padilla Carroll, "The Radical Possibilities of New (Feminist, Environmentalist) Domesticity: Housewifery as an Alternodernity Project" *Interdisciplinary Studies in Literature and Environment* 21 vol. 1 (Winter 2016): 51-70; Shannon Hayes, *Radical Homemakers: Reclaiming Domesticity from a Consumer Culture* (Richmondville, NY: Left to Write Press, 2010); *Sharon Astyk*, Depletion And Abundance Life on the New Home Front (Gabriola Island, B.C.: New Society Publishers, 2008); Barbara Kingsolver, *Animal, Vegetable, Miracle: a Year of Food Life* (New York: HarperPerennial, 2008).

[362] Mark Anthony Browne, et. al., "Accumulation of Microplastic on Shorelines Worldwide: Sources and Sinks" *Environmental Science & Technology* 45 no. 21 (Sept 6, 2011): 9175-9179; DOI 10.1021/es201811s; Matthew Cole et. al., "Microplastics as contaminants in the marine environment: A review," *Marine Pollution Bulletin* 62, no. 12 (Dec. 2011): 2588-2597; DOI 10.1016/j.marpolbul.2011.09.025; Stephanie L. Wright, et. al,. "The physical impacts of microplastics on marine organisms: A review" *Environmental Pollution* 178 (July 2013): 483-492; DOI 10.1016/j.envpol.2013.02.031; David K.A. Barnes, "Accumulation and fragmentation of plastic debris in global environments," *Philosophical Transactions of the Royal Society B-Biological Sciences* 365, No. 1526 (July 27, 2009): 1985-1998; DOI 10.1098/rstb.2008.0205.

Before any of the downstream consequences of synthetic fabrics could be considered, the new threads needed to be made safe for mill production and desirable for household use. Controllability—for the garment manufacturer, for the homemaker—would prove key.

* * *

This chapter starts with a puzzle of how: how did synthetic fabrics like nylon and polyester become pervasive in U.S. houses and homes? We can extend this question one degree further, taking cues from labor historians and environmental historians of work. What implications did the dominance of chemical expertise over textiles have for domestic workers, particularly their knowledge of how to create, use, and reuse fibers? Finally, I return to the question that has animated this dissertation throughout: How did the proliferation of synthetic fabrics transform what consumers expected cleanliness to look and feel like?

Controllability, I argue, was the key attribute that chemists first emphasized to textile mill owners, and then to Fifth Avenue marketing agencies, when selling synthetic fibers. In the textile mills, controllability meant a guard against price volatility endemic to seasonal fibers like cotton, wool, linen, silk. It was not only ecological reality that drove price fluctuations of raw materials, growing conditions and seasonal shortages were key factors. In households, controllability had a shifting meaning across the first half of the twentieth century. With rayon, it first meant the fabric was positioned as a functional alternative to luxurious silk. With nylon, the appeal shifted to the fiber as a novel textile with high-fashion potential. Marketing agents did not conflate controllability and labor-saving capacities, particularly via wrinkle-proof polyester, until the post-war period, an appeal to mid-century ideals opening the workplace to women without substantively challenging the gendering of the "second shift" of housework. Throughout, the

controllability of synthetic fibers, as well as their cheap per unit cost, was primarily a selling point for textile mill owners eager to expand production.

The popularization of synthetics timed with a dramatic shift in expertise. In the late nineteenth-century cultivation of fiber, expertise accruing at two ends of the production chain: that of graders assessing wool staple or cotton fibers, for sale to textile mills; and, separately, that of domestic workers assessing the useable lifespan and alternate usages of a piece of fabric. By the 1950s, chemists controlled the length, weight, and tensile strength of laboratory-borne fibers; both fiber grading and domestic mending expertise limped along only as shadows of their former selves. The marketing of synthetics did not singularly cause the depreciation of sewing skills; the rise of ready-wear clothing, first-wave feminism, and the continued legal subjugation of racialized domestic work also hastened the atrophy of mending.[363] As such, this chapter also traces the centralization of industrial expertise, particularly that of commercial chemists, replacing a decentralized expertise about fabric shared between growers, textile mill owners, and domestic workers themselves. This is not to romanticize nineteenth-century expertise held by agricultural workers and domestic workers too often constrained to this work, and no other, by their race, class, and gender. But it is to name more explicitly a source of ingenuity and knowledge that environmental historians have too often overlooked: that of domestic workers.[364]

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[363] Glenna Matthews, *"Just a Housewife:" The Rise and Fall of Domesticity in America* (New York: Oxford University Press, 1987); Sarah Stage and Virginia B. Vincenti, *Rethinking Home Economics Women and the History of a Profession* (Ithaca: Cornell University Press, 1997); Dorothy Sue Cobble, *The Other Women's Movement: Workplace Justice and Social Rights in Modern America* (Princeton University Press: Princeton, NJ, 2004); Linda Przybyszewski, *The Lost Art of Dress: the Women Who Once Made America Stylish* (New York: Basic Books, a member of the Perseus Books Group, 2014).

[364] This analysis draws on Harry Braverman's agenda-setting 1974 analysis of the role of industrialization in shaping work. Pointing to automobile assembly plants, steel milling works, and the construction industry, Braverman notably argued that work has become increasingly subdivided to the point of requiring virtually no skill, a break with earlier craft and skilled assembly. The result, according to Braverman, was a "modern trend of work … 'alienating' ever larger sections of the working population." (3) This critique has been taken up by historians of technology within the household, thinkers oft-cited in this dissertation like Ruth Schwartz Cowan and Susan Strasser. See Harry Braverman, *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century* (1974). As this dissertation has tried to maintain throughout, we cannot analyze the drivers of a cessation of expertise, or a deskilling, separate from

Synthetics transformed the meaning of cleanliness. By the 1950s, pliable and elastic synthetic fabrics had unseated a nineteenth-century ideal equating cleanliness with starched and ironed stiffness. Instead, mid-century cleanliness standards for casualwear was out-of-the-washing-machine softness and elasticity. For formalwear, by contrast, synthetics reinforced rather than upended the expectation that worn garments be wrinkle-free. By mid-century, marketing agents were pushing shape-holding synthetics as the means for making ironing obsolete. But their effects were not so simple. Even in households where synthetics fabrics made obsolete the work of ironing, these same petrochemical threads pushed bodily burdens downstream rather than alleviating them: moving the burden from household workers toiling over hot steam irons to residents living near polyester and nylon factories. Assessing the contemporary merits of that mid-century trade-off accrues to domestic workers and downstream inhabitants alone.

I. Grading Fibers

Mill owners in the late nineteenth century coveted raw textiles fibers characterized by uniformity: uniform length; uniform diameter; and uniform tensile strength. Uniformity, owners implored producers, made for efficient work processes. Industrial combers, spinning devices, and looms that were fed uniform raw material would see minimal breakages and, thus, minimal mill shutdown. Industrial equipment fed heterogeneous stock, by contrast, require constant upkeep. Preference for the latter dominated.[365]

analyzing the racial, class, and gender hierarchies dictating those categories of worker deemed "fit" for "skilled" versus "unskilled" work. To ignore these social categories is to miss the construction of skill as itself a tool for furthering existing social hierarchy.

[365] Beckert, *Empire of Cotton: A Global History* (2014); Cole, *The American Wool Manufacture, Vols. I and II* (Cambridge, MA: Harvard University Press, 1926), esp. 67, 234.

By the 1880s, raw material producers had developed a profession devoted to doing just this: graders. Grading was the process of inspecting a bundle of raw cotton or unwashed fleece for a simple purpose: to separate heterogeneous fiber into constituent batches of homogenous texture, elasticity, and quality. Graders were sometimes employed by a mill or might work as free agents for hire by farmers themselves. More rarely, graders acted as middle men, assessing the fleece produced by a given farmer and buying it themselves if of certain quality, then re-selling graded bundles to textile mill owners demanding specific fiber qualities. Though mentions of wool graders can be found listed in the *London Gazette* as early as 1707, it took a surge in domestic fiber production in the 1850s and 1860s U.S. for grading as a practice to be elevated to the status of a named profession.[366] Their role only became more prominent through the subsequent decades. As domestic wool producers doubled their tonnage produced between 1869 and 1893, there was more need for standardization for industrial use.[367]

Grading was a profession requiring visual acumen and the performance of expertise. To assess a bundle of wool, for example, a grader would lay an unwashed fleece on a cage-wire table, thus letting dirt and sand fall away. The fleece, shorn in one piece from the sheep, would be

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[366] See "wool-stapler" *n.*, in *Oxford English Dictionary* 2nd ed., (Oxford: Oxford University Press, 1989).
Notice that within the woolen industry specifically, wool fibers were known as "wool staple," and sorters were referred to as "wool staplers" or "wool sorters" rather than "wool graders." For clarity, I compress this variance into the general term, "grading." On the formalization and expansion of the profession in the mid-nineteenth century, see for example *McElroy's Philadelphia City Directories*. Samples of volumes yields the following: six individuals self-identifying as "wool comber," "wool spinner" or "linen and woolen drafter" in 1810. By 1850, the number of "wool dealers" had expanded to 15 individuals, and six "wool sorters." By 1867, the number of "wool sorters" in the directory had expanded to fully 48 individuals. See *A. McElroy's Philadelphia City Directory* (Philadelphia: Isaac Ashmead & Co., 1840), Archive.org, accessed February 13, 2018, DOI https://archive.org/details/mcelroysphiladel1840amce; *A. McElroy's Philadelphia City Directory* (Philadelphia: A. McElroy & Co., 1850) Archive.org, accessed February 13, 2018, DOI https://archive.org/details/mcelroysphiladel1850amce; *McElroy's Philadelphia City Directory,* 30th ed., (Philadelphia: A. McElroy & Co., 1867) Archive.org, accessed February 13, 2018, https://archive.org/details/mcelroysphiladel1867amce.

[367] "Shorn Wool: Production" in Table Da755–765. "Cotton, cottonseed, shorn wool, and tobacco – acreage, production, price, and cotton stocks: 1790–1999 [Annual]," contributed by Alan L. Olmstead and Paul W. Rhode, in *Historical Statistics of the United States, Millennial Edition*, Susan B. Carter, Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch, and Gavin Wright, eds. (Cambridge: Cambridge University Press, 2006).

spread into a recognizable flat shape with the "spine" running down the center, and the grader would commence his work: removing a portion of twigs, burrs, and seeds from a section; trimming off dirtied hard tufts of fiber; and then analyzing the manually cleaned section. Fiber fineness, strength, elasticity, softness, and color were evaluated by sight, touch, and sometimes even smell.[368]

Though wool grading gained particularly economic importance in the latter half of the nineteenth century, it is worth remembering that other laborers would have overlapped in expertise with nineteenth-century wool graders. Farm hands, shearers, and seasonal laborers enjoyed none of the modest professional status or compensation accruing to the wool sorting profession, but their expertise was just as formative to shaping the quality of the fleece produced. This was true because farm hands, shepherds, and seasonal laborers came in the most direct contact with flocks. It was those workers who would have been on the lookout for grazing pasture free from burrs and thistles, since those would catch and break otherwise usable staple on the belly and hindquarters of the sheep.[369] Similarly, shearers made decisions about where on the body of a sheep to begin and end cutting a given fleece. Decisions about whether to shear soiled fleece or leave it on the body of the animal could make quicker the job of sorting. This meant that the emergence of grading as a profession further erased the value created by other laborers.

Grading helped mill owners standardize production because of the physical variability between flocks grazed differently. Sheep moved from colder to warmer climates to graze, for example, shed the short coarse hair bulking up their longer, more valuable staple. The same was true of flocks fed on richer pasture. This meant that a change towards a warmer climate or a

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[368] "Sorting" in Roberts Beaumont, *Woollen and Worsted Cloth Manufacture: Being a Practical Treatise for the Use of All Persons Employed in the Manipulation of Textile Fabrics* (London: G. Bell and Sons, 1899), 43-46.

[369] "Burring" in Charles Vickernman, *Wollen Spinning: A Text-book for Students in Technical Schools and Colleges, and for Skilful Practical Men in Woollen Mills* (New York: Macmillan and Co., 1894), 124-129.

richer diet meant an increased softness of the wool an animal was growing. The fiber on an individual sheep, in other words, was in part a document marking the ecological conditions that animal had weathered within a single nine-month season of growing its fleece.[370]

Variability was also a norm within a single flock, not just between flocks grazed differently. Finer wool came from lambs (less than six months old) or yearlings (the second clip of wool). Further, fiber coarseness varied on the body of a single animal. "Both coarse and fine fibres are often found on the same animal," advice writer Thomas Webster reminded readers in his massive 1844 encyclopedia of domestic production.[371] The shoulders and back yielded the strongest, softest wool; the loins and upper part of the legs, comparatively shorter but still usable fibers. On the belly and forequarters were those fibers of the lowest quality because these were the parts of the animal most liable to collecting burrs, dirt, and detritus.[372]

Grading was also made necessary by an increased need for standardization in the fibers being fed into increasingly fine-tuned industrial machinery. Particularly with the increasing capitalization of textile mills in the 1880s and 1890s, mill owners were expanding production to encompass everything from expensive tweed to everyday calico within one mill. Wool sorters divided fleeces into as few as three grades ("fine-quality," "medium-quality," and "low-quality" staple) or as many as eight ("picklock, "prime," "choice," "super," "head," "seconds," "abb," and "breech").[373] The end buyer often dictated the nomenclature adopted by a grader. Within the

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[370] Thomas Webster, *An Encyclopaedia of Domestic Economy* (London: Longman, Brown, Green, and Longmans, 1844), 956.

[371] Thomas Webster, *An Encyclopaedia of Domestic Economy* (London: Longman, Brown, Green, and Longmans, 1844), 956.

[372] Fig. 7. "Qualities of Wool" in Charles Vickernman, *Wollen Spinning: A Text-book for Students in Technical Schools and Colleges, and for Skilful Practical Men in Woollen Mills* (New York: Macmillan and Co., 1894), 68.

[373] "Part IV. Wool Sorting" in Charles Vickernman, *Wollen Spinning: A Text-book for Students in Technical Schools and Colleges, and for Skilful Practical Men in Woollen Mills* (New York: Macmillan and Co., 1894), 65-68; William I. Hannan, *The textile fibres of commerce: a handbook on the occurrence, distribution, preparation, and uses of the animal, vegetable, and mineral fibres used in cotton, woollen, paper, silk, brush and hat manufacture* (London: C. Griffin, 1902).

Cheviot industry, for examples, tweedmakers only sought three grades of fiber because milling technique mattered as much as raw material. Mills specialized in producing multiple fabric types, by contrast, prized more grades as a means of averting the spinning of "uneven, faulty, and unsatisfactory yarns."[374]

In addition to hiring graders, textile mill owners also bought raw cotton, wool, silk, or flax based on their places of production. This was a strategy as much produced by colonial hierarchies as physical quality difference. Finished textiles woven from British, French, and Belgian merinos were understood to be the undisputed highest quality wools; Australian merino and South American alpaca followed as a close second.[375] In a U.S. context, where textile production relied almost exclusively on domestically produced fibers, different regions of the country competed weakly for buyer attention. Boasted one auctioneer's notice for an 1862 wool sale on Boston Common, "[T]he entire parcel of about 600,000 pounds, is of the best growth of Pennsylvania, Ohio, and Virginia."[376] Others, less boosterist in their claims, nonetheless treated place as relevant indicator of quality: "Fenno & Childs, No. 14 City Wharf, offer for sale 200,000 lbs. Ohio, Illinois, and Wisconsin fleeces."[377] In a postbellum period marked by an increasing

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[374] "Chapter II. Woollen Yarn Manufacture: Wool Sorting, Scouring and Blending" in Roberts Beaumont, *Woollen and worsted: the theory and technology of the manufacture of woollen, worsted and union yarns and fabrics* (London: G. Bell and Sons, 1899), 43-93.

[375] Multiple nineteenth-century sources arrived at this conclusion. See, for example, Robert H. Baird, *The American cotton spinner and managers' and carders' guide: a practical treatise on cotton spinning* (Philadelphia: Henry Carey Baird, 1863); Horatio Paine and A. A. Fesquet, *A practical treatise on the manufacture of worsteds and carded yarns* (Philadelphia: Henry Carey Baird, 1869); S. Annie Frost, *The art of dressing well: a complete guide to economy, style and propriety of costume* (New York: Dick & Fitzgerald, [1870]).

[376] Auctioneer notice, April 10, 1862; Box 8, Folder "Business Records – Miscellaneous," Collection No. 60, Warshaw Collection of Business Americana, NMAH Archives, Smithsonian Institution, Washington, D.C.
[377] *Boston Daily Advertiser* [Boston, Massachusetts] 2 Jan. 1865; Issue I.

array of raw textile fibers, place of origin emerged as one means for buyers to distinguish between the quality of wool they were buying.

Saxon, Silesian, Spanish, French and Belgian merinos enjoyed longstanding status across the nineteenth century as the highest quality wools. Some American wools, particularly those from the mid-Atlantic, fared fine by comparison. "The finest wool in the world, says the United States Economist, is grown in Silesia. The next finest is grown in Washington County, Pa., and across the border in two or three counties in Ohio and in a small section in West Virginia," enthused editors of *The Industrial Review and Textile Reporter* in 1888.[378] But American wools grown in the western ranges of the Rocky Mountain Plateau were deemed of inferior quality, and graders found ecological reason to explain them as such. "The nature of the soil, sickness, due to insufficient nourishment at various times and exposure, weaken the wool in the fleeces of these sheep," warned one writer, when assessing the commercial status of American fleeces in contrast to its European or Australian counterparts.[379] In the end, graders had difficulty refuting a long-standing bias favoring European wools: "[T]he soft worsteds and merinos of French and Belgian manufacture are the most difficult to compete with here," U.S. mill owners opined, and it seemed even with greater volume coming off of U.S. farms, not much could be done to improve the comparative advantage of a nation cursed with inferior soils.[380]

One response to inferior soils was to search for alternate fibrous crops that *would* grow well on U.S. soil, thus distinguishing the nation from its competitors. Aspiring textile investors

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[378] "Wool and the Tariff," *The Industrial Review and Textile Reporter*, Vol. 2, No. 2. (Philadelphia, August 1888), 29.

[379] "Classes of Fleece Wool" in Stanley Hewlett Hart and Edward W. France, *Wool: the raw materials of the woolen and worsted industries* (Philadelphia, Pa.: Philadelphia Textile School of the Pennsylvania Museum and School of Industrial Art, 1917), 31.

[380] "The Textile Fabrics of the United States Generally," *American Journal of Fabrics and Dry Goods Bulletin*, Vol. 1, No. 2. (New York, January 24, 1885), 6.

scoured writings of antiquity and travel journals of past European explorers in search of fantastical, forgotten fibers from far-off places: the brown silk cording of the Italian *pinna marina* mussel, used by the crustacean to anchor itself to sea shelf 30 feet beneath the ocean's surface had reportedly been harvested by Roman workers for weaving into *byssus* fabric; ramie of southern California, the perennial plant that thrived in warm climates and produced strong, light fibers; short-legged spiders spinning egg-sac silk; stalks of stinging nettles; vegetable silk from the branches of young mulberry trees; pineapple leaves.[381] "[S]cattered through the literature of Antiquity … [are] among the many beneficent achievements of inventive genius," effused Clinton G. Gilroy in his 1845 history of the textile trades. "Among the first under this head may be classed the invention of Weaving," he continued. In his volume and others from the mid-nineteenth century, the appeal of antiquity pulled strongly.[382]

Seeking inspiration from antiquity was not just a gentleman's hobby, though it was that. Between roughly 1875 and 1890, the fibrous perennial plant ramie served as prime example of how U.S. producers, anxious about losing their foothold in global textile trade, attract investors interested in claiming and commercializing non-native plants. Exoticized as "the fiber … from Java," ramie was described by investors as the next possible type of textile, and ramie farms sprouted up across the 1880s in Southern California and Louisiana, as well as across the ocean in Portugal, Spain, and Italy.[383] In New York, the president of no less than the New York Cotton

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[381] For lengthy and colorful descriptions of alternatives to the classic four fibers of cotton, wool, flax, and silk, see Thomas Webster, *An Encyclopaedia of Domestic Economy* (London: Longman, Brown, Green, and Longmans, 1844); "A Valuable Textile," *American Journal of Fabrics and Dry Goods Bulletin* Vol. 1, No. 3, January 31, 1885; Dibner Library, Smithsonian National Museum of American History, Washington, D.C.

[382] Clinton G. Gilroy, *The history of silk, cotton, linen, wool, and other fibrous substances: including observations on spinning, dyeing, and weaving. Also an account of the pastoral life of the ancients, their social state and attainments in the domestic arts* (New York: Harper & Brothers, 1845), vi.

[383] See "A Valuable Textile" *American Journal of Fabrics and Dry Goods Bulletin* 10 (January 31, 1885), 1; "The Progress of Ramie—A Tribute to Our Paper" *American Journal of Fabrics and Dry Goods Bulletin* 10 (January 31, 1885), 9; Dibner Library, Smithsonian National Museum of American History, Washington, D.C. Emile LeFranc, *The Ramie: Its Origin, Its Value, Its Advantages, Its Culture, Its Extracting Process* (Imprimerie de la Renaissance Louisianaise, 1869).

Exchange purchased a decorticating machine in 1887, a mechanical device for stripping the fibrous outer layer from the ramie plant to reveal their silken underside.[384] By 1889, six manufacturers had entered decorticating devices to the Ramie Machine Trials at the Paris Exposition, and American viewers, skeptical that the machines functioned as well as touted, nonetheless expressed hopes that "should ramie culture be established," its cultivation would herald a new chapter for U.S. interests domestically and overseas.[385]

Ramie, like more fanciful ventures like *pinna* mussel silk built on an aspiration dating back at least to midcentury: to find new materials, plant other otherwise, from which to spin yarn. As early as 1844, London manufacturers Williams and Sowerby had obtained a patent for a fabric successfully spun from glass: shards of the crystalline substances reached a semi-fluid state when heated to sufficient temperatures, and these pliable fibers could be spun into yarn.[386] The result was what one viewer described as "a splendid kind of brocade"—though the wearability of that textile remained unreported.[387] Though glass fabric never became a commercialized textile, its invention in the 1840s highlighted the longstanding fascination with locating such alternatives.

The search for fibers can also pull us far from the textile mill, wool grading floor, or stock exchange, however. What did late nineteenth-century wearers laud or complain about in the

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[384] "Ramie Conquering the South," *American Journal of Fabrics and Dry Goods Bulletin* 11 (January 9, 1886), 5; Dibner Library, Smithsonian National Museum of American History, Washington, D.C.

[385] Charles Richard Dodge, "The Ramie Machine Trials of 1889," *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington, D.C.: Government Printing Office, 1891), 524.

[386] Patent for the Williams and Sowerby fabric? As mentioned in Thomas Webster, "On a few other Materials used occasionally in making Cloth" in *An encyclopaedia of domestic economy* (London: Longman, Brown, Green, and Longmans, 1844), 994.

[387] Thomas Webster, "On a few other Materials used occasionally in making Cloth" in *An encyclopaedia of domestic economy* (London: Longman, Brown, Green, and Longmans, 1844), 994.

garments they were wearing? We turn now to the household—and to domestic workers themselves.

II. Mending Fibers

Sewing and laundering were alternate tools in the nineteenth-century search for new fibers. It was in the sewing room that workers refashioned existing textiles to new purposes; and it was in laundering that workers could extend or shorten the lifespan of a garment. Fabric was too precious as to let one use spell obsolescence: thus, reuse constituted an important and economical form of ingenuity. "I am making a patchwork bed quilt of pieces of silk," wrote the diarist Anne Gorham Everett to an unknown correspondent in 1842, her cheerful tone and specific request for silk—the most expensive of the fabrics—suggesting pride rather than shame at such reuse. "If you could procure me any pieces in Paris, of silk, satin, or velvet, I should be very glad. Perhaps the dress-makers would give you little bits."[388] Everett's suggestion that her correspondent ask the dressmakers hints at a flow of material goods outside our usual understanding of market exchange — what the historian Susan Strasser has called "trashmaking as a social process" rather than predetermined a fact of life.[389] Indeed, material culture scholars have shown the importance of patchwork quilting specifically, a process marked by the cutting and patching together of worn garments into a useable blanket, as a locus of socializing and a means of mimicking material consumption of upper classes as well as a form of material reuse.[390]

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[388] Anne Gorham Everett, Letter from Anne Gorham Everett, January 16, 1842, in *Memoir of Anne Gorham Everett, with Extracts from Her Correspondence and Journal,* (Boston, MA: Privately published, 1857), 204.

[389] Susan Strasser, *Waste and Want: A Social History of Trash* (New York: Metropolitan Books, 1999).

[390] Marybeth C Stalp, *Quilting: The Fabric of Everyday Life* (Oxford: Berg, 2007); *The Quilts of Gee's Bend*, produced and directed by Vanessa Vadim and Matthew Arnett (Atlanta, GA: Tinwood Media, 2006); Bets Ramsey, *The Quilts of Tennessee: Images of Domestic Life Prior to 1930* (Nashville, TN: Rutledge Hill Press, 1986).

Patchwork quilts were far from the only form of nineteenth-century material reuse. In the hands of white domestics, reuse became lauded symbol of stalwart American practicality. The repeated laundering of flour sacks reportedly made the calico into a useable fabric for a crude work dress. Gathered and cut garment scraps could be braided into a rug. Wrote Susan Fenimore Cooper, noted apologist for what she called "country life," the rag carpet could be found "in every farmhouse, and common in the villages also[.] … One of the best and largest country inns in the interior of this State is almost wholly carpeted in this way."[391] But reuse advice was not only about visible practicality and patriotism; it also had economic merit. Items that no one would see—bedsheets, for example—should be patched or torn down the middle and reattached with their less threadbare edged sewn together to form a new whole. Worn calico and linen could be used as cheesecloth, for straining jam, or turned into medical gauze. As typified by the diarists Anne Gorham Everett and Susan Fenimore Cooper, cultural capital for frugality accrued only to white American domestics. But the economic merits of reuse made the practice widely shared, and demanding sewing expertise.

Mending was not without its burdens. Nineteenth-century diaries include laments as well as boasting about the constant demand of keeping up with one's mending. "[T]oday am 26 years old. do my washing. patch some. tend baby," wrote the diarist Emily Gillespie dispiritedly in 1864.[392] Mary Elizabeth Harris, another diarist writing in the 1860s, evidenced similar dejection, mixed with exhaustion. "Went to Eldon in the morning and commenced a cap for Mrs[.] Harris who showed me how to put in a patch. I sew and stitch so much day after day and no rest.

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[391] Susan Augusta Fenimore Cooper, *Journal of a Naturalist in the United States, vol. 2* (London: Richard Bentley & Son, 1855), 1-44.
[392] Emily Hawley Gillespie, *A Secret to be Buried: The Diary and Life of Emily Hawley Gillespie, 1858-1888* (Iowa City, IA: University of Iowa Press, 1989), 120.

…Hardly slept 2 hours all night," Harris wrote in her diary in May 1868.[393] Mending, darning, patching, fixing — these activities were labors.

In addition to sewing, washing was a nineteenth-century tool in the search for renewed fibers. Starching clothing, more than any other part of the wash process, serves as illustrative example. Starching's primary purpose was to introduce stiffness to a garment that would otherwise launder to pliability. Starch made from wheat, potatoes, or rice, created an additional step in the clothing production process: after washed and partially dried, a garment would be sprinkled with starch, which would stiffen when ironed. So why create cleanliness standards that created additional labor, and reintroduced organic matter to clothes recently wash free of it? Historians highlight two motivations for starching. One was social. "In America most families have their washing done once a week," wrote the Philadelphia advice author Leslie Eliza. "This is much better … than the European custom of monthly or quarterly washes."[394] As historians like Ruth Schwartz Cowan and Kathleen Brown have argued, "frivolities" like one's immaculately pressed collar, one's starched pleats, or one's bleached-white cravat functioned to showcase one's access to domestic labor capable of undertaking such labor-intensive practices, and also functioned in an increasingly global age to draw distinctions between desirable or civilized bodies, and undesirable ones. Starching was like ironing, bleaching, bluing, and the laundering in its labor intensiveness, which was itself a form of social status.[395]

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[393] Mary Elizabeth Lucy Ronalds Harris, et. al., *The Eldon House Diaries: Five Women's Views of the 19th Century* (Toronto, ON: Champlain Society, 1994), 427-428.

[394] Eliza, *The house book* (1840), 8.

[395] Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology From the Open Hearth to the Microwave* (New York: Basic Books, 1983); Kathleen M. Brown, *Foul Bodies: Cleanliness in Early America* (New Haven: Yale University Press, 2009).

But to see starching as only status-oriented is to ignore its alternate purpose: extending the usable lifetime of a given fabric. "[C]lothes derive great injury from lying in their dirt," chided the Philadelphia advice writer Leslie Eliza, in making observations about the utility of the weekly wash.[396] Starching, similarly, helped extend garment life. By giving additional heft to a fabric, starch helped increase the dirt-repelling capacity of fabric that might otherwise absorb sweat and oil; it also helped protect delicate fabrics from tearing. Nineteenth-century adherents to Victorian etiquette expected stiffness in clean versions of most garments.[397] This expectation began relaxing in the 1880s; increasingly, only collars, cuffs, and lace trimmings were starched.[398]

Skilled work like sewing and laundering made possible a nineteenth-century household ecosystem where fabric circulated through multiple uses. But homemakers, like graders of raw wool and cotton, knew that some margin of quality was dictated by the fibers themselves. Buyers had witnessed a "considered change in fabric and quality since the homespun linen of Colony days," wrote editors of *Good Housekeeping* in 1888. But such gains had their limits. Though U.S.-made muslins were as popular as ever for daily wear, a "woman of fashion" still had to turn to "France, England, and India for the diaphanous muslins" that were the stuff of gauzy tea gowns and eveningwear.[399] Just as graders had internalized a part-physical, part-Colonial view of certain soils yielding most desirable fibers, so too had buyers. Grading, washing, or mending,

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[396] Eliza, *The house book* (1840), 8.

[397] Leslie Eliza, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey and Hart, 1840); Emily Thornwell, *The lady's guide to perfect gentility, in manners, dress, and conversation* (Cincinnati: H.W. Derby & Co., 1856).

[398] Juliet Corson, *Every-day cookery, table talk, and hints for the laundry* (Chicago: Adams & Westlake Manufacturing Co., 1884); S. Annie Frost, *The art of dressing well: a complete guide to economy, style and propriety of costume* (New York: Dick & Fitzgerald, 1870).

[399] "Family Fashions and Fancies: Petticoats, Hosiery, and Other Underwear," *Good Housekeeping* 7, no. 4 (June 23, 1888): 50.

would all fail to overcome a reality that textile mill owners saw as built into threads themselves: the differential physical quality of a fiber stemmed from the fiber's place of origin.

Beginning in the 1880s, however, an alternative to both the problem of place-based comparative advantage and fiber heterogeneity began to emerge within both European and U.S. fiber industries: the chemical treatment of fibers.

III. Improving Fibers

Chemical washing and treatment methods that emerged in the late nineteenth century offered producers new means of transforming the physical characteristics of the fibers they were selling. For cotton producers, it was alkali that mills were scrambling to buy as a key ingredient in a treatment method called mercerization. Soaking cotton threads in the caustic reagent chemically rearranged their outermost layer, leaving threads smoothed, strengthened, and newly lustrous.[400] In the silk industry, tannins and salts of lead and tin attracted the attention of silk producers with eyes on their profit margins. New steam treatments methods for cleaning raw silk cocoons, though effective at stripping gummy sericin from raw silk cocoons and thus aiding the initial reeling process, cut into producer income because silk was sold to textile mills by weight rather than volume. The discovery that raw silk readily absorbed tannins, metallic salts, and silicate empowered silk producers to adopt this chemical treatment method for re-add lost sericin weight to spooled silk.[401] In the wool industry, particular debates swirled around new methods for scouring raw wool. Steam heat and alkali baths proved effective at stripping oils and fats ("yolk") from fleeces prior to their carding, combing, and spinning into yarn. Some chemicals might

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[400] Harwood Huntington, *Some Notes on Mercerizing: A Summary Report on the Situation of Suits Concerning the Thomas and Prevost and Liebman Patents in Germany and England* (New York City: no publisher, 1900).
[401] T.L. Phipson, "Weighted Silk," *Chambers's Journal* 75 (December 11, 1897), 44-45; Thomas Wardle, *Silk* (Philadelphia: J.B. Lippincott Company, 1892).

confer beneficial properties to wool prior to spinning and weaving. Raw wool treated with chlorine gas had "a decided lustre" and "an increased affinity for dyestuffs."[402] Wool fibers treated with metallic salts, similarly, held color more uniformly and permanently.[403] Regardless of raw material, one trend emerged: the use of chemical treatments to clean, strengthen, and smooth raw fibers.

In addition to chemical treatments intended to improve existing fibers, textile mill owners watched with anticipation the emergence of an international dye industry that promised to transform woven fabrics for the better, no just their raw fiber constituents. Fabrics had never enjoyed such prospects of becoming so bright, so uniform, and so impervious to fading. "Dyphenyl Dark Blue K;" "Chrome Fast Yellow R;" "Acid Rhodamine R.R.R.:" commercial chemistry research centered especially in Germany promised a new generation of hues that would retain their brilliance and uniformity on any fiber they were used to treat. Textile trade journals began circulating sample dye books, thick as years' worth of mailings and stuffed with page after page of yarn and fabric samples showcasing the brilliant fuchsias and dusky blues possible with these new metal-based dyes.[404] German firms were at the center of dye innovation, manufacturing half the world's dye consumption by 1881 and nearly 90 percent by 1900.[405] But

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[402] Fenwick Umpleby, et. al., *Cyclopedia of Textile Work: A General Reference library on Cotton, Woolen and Worsted Yarn Manufacture, Weaving, Designing, Chemistry and Dyeing, Finishing, Knitting, and Allied Subjects,* Vol. VI, (Chicago: American School of Correspondence, 1907), 29.

[403] "Action of Different Reagents on Wool," in Fenwick Umpleby, et. al., *Cyclopedia of Textile Work: A General Reference library on Cotton, Woolen and Worsted Yarn Manufacture, Weaving, Designing, Chemistry and Dyeing, Finishing, Knitting, and Allied Subjects,* Vol. VI, (Chicago: American School of Correspondence, 1907), 35-39. [Note that this book has two conflicting sets of pagination. This is from the bottom of the book. My other numbers might be from the upper corners of each page in the book. Check.]

[404] See relevant examples in *The Dyers' Supplement the Textile World* (Guild and Lord: Boston, 1901); Dibner Library of Science and Technology, Smithsonian National Museum of American History, Washington, D.C.

[405] Kathryn Steen, The American Synthetic Organic Chemicals Industry: War and Politics, 1910-1930 (Chapel Hill: University of North Carolina Press, 2014).

regardless of origin, commercial chemistry promised novel colors and thus new sales opportunities for users.

Novel in content as well as expertise required, chemical reagents for washing or treating raw fibers were not without their skeptics. "The scouring of wool … *must be accomplished by the mildest means possible*," advised the Brit Charles Vickernman to readers of his 1894 volume, writing against a recent turn toward the use of alkali or mineral acids for scouring fleece. Wool enjoyed "natural softness, strength, free openness, and brilliancy of the fibre" without the addition of chemical elements; treating it otherwise risked destroying these properties. Vickernman pointed to the forced water scouring machine displayed at the Crystal Palace Exhibition of 1881, which typified a haste toward mechanical and chemical treatments that he feared would destroy the integrity of wool fibers.[406] For him, the simplest treatments remained the most desirable. Lukewarm water and animal urine made "the greasiest wool … extremely clean and brilliant."[407] Alkali and acid washes that were increasingly popular in industrial production were cause for alarm.

The author's British position was wholly relevant to his assessments of chemical treatment. At the heart of objections to chemical treatment was a defense of place-based fiber quality that mapped easily onto a growing nativism in the face of global trade. "[M]ost of the colonial scoured wools are scoured with soda, which is very objectionable," pointing to those fleeces grown in British-controlled colonies Australia and South Africa. Though the inferiority of such textiles might merit such a treatment, real textile expertise endured only in those regions—

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[406] "Part V. Wool Scouring and Drying" in Charles Vickernman, *Wollen Spinning: A Text-book for Students in Technical Schools and Colleges, and for Skilful Practical Men in Woollen Mills* (New York: Macmillan and Co., 1894), 69-82.

[407] "Washing and Treatment of Raw Wool" in *The Industrial Review and Textile Reporter*, Vol. XII, No. 2. Philadelphia, August 1888, pg. 33. Dibner Library of Science and Technology, Smithsonian National Museum of American History, Washington, D.C.

like the U.K.—where the highest quality wool had been produced historically. "It is very desirable that each manufacturer should receive his wool in the grease," Vickernman advises his presumably British audience, "so that it may be subjected to one scouring only, and that, too, under much milder treatment than it receives in the colonies." He added: "[W]ool is much nicer, softer, more genial, and in every way better to manage through every stage in the manufacturing processes" by British agents. Wool arriving in British ports from parts of the Americas, Africa, and Australia were inferior unless subject to British handling from knowledgeable British manufacturers.[408] Competition for market share loomed. "The rapid strides that are being made by our competitors on the continent and in the United States of America, and the readiness with which they are calling into requisition all that the resources of modern scientific discovery and mechanical invention have placed within their reach, out to stimulate us to renewed exertion," Vickernman chided readers.[409]

Vickernman's writings, and that of others, revealed a deeper logic at play in period writings against chemical treatment: a type of nativism that saw one's home soils as uniquely capable of producing the highest quality fibers. The logic skewed with particular favor towards those places that, historically, had enjoyed status as regions capable of producing the best fibers and fabrics. Chemical treatments stripped the "natural" lustre from British-grown wools; ditto salting methods on French-produced silks or scouring methods used on South American alpaca. Attending the 1889 Paris World's Fair, French commissioners Stiassny and Rasetti lauded the enduring importance of Lyon silk even in the face of artificial alternatives. "The exhibition organised by the Lyons Chamber of Commerce is something wonderful, and most clearly proves

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[408] Charles Vickernman, *Woollen Spinning: A Text-book for Students in Technical Schools and Colleges, and for Skilful [sic]Practical Men in Woollen Mills* (New York: Macmillan and Co., 1894), 79.

[409] Charles Vickernman, *Woollen Spinning: A Text-book for Students in Technical Schools and Colleges, and for Skilful [sic]Practical Men in Woollen Mills* (New York: Macmillan and Co., 1894), 18.

that so far from being in danger, as some alarmists have been pleased to declare, the industry of Lyons is, on the contrary, in the full swing of prosperity," they declared, with some obvious defensiveness.[410] Their defensiveness would pervade even a decade later, as visitors to the 1900 World's Fair evinced similar skepticism of chemical methods. "[A]rtificial silk, too, had shoved its way among the *purer* goods," wrote the American doctor James P. Brody with evident distaste for artifice.[411] Added a despairing Franklin Allen, Fair visitor and secretary of the Silk Association of America, "It may be frankly stated at the outset that the silk exhibits of manufacturers from the United States, was incomplete and unsatisfactory in many respects."[412] Where one grew one's fibers, i.e. place-based competitive advantage, was a challenge difficult to overcome even in an era of increased circulation of textile goods.

Not all parties were convinced that chemical treatment of a fiber like wool destroyed its inherent strength, luster, and flexibility. At the industry-focused American School of Correspondence, authors of a seven-volume encyclopedia on textile manufacturing drew an opposite conclusion to skeptics of chemical treatment. Not alkalis were equally harsh in their effects on wool, and sometimes chemical treatment improved the dyeability, flexibility, or waterproofing qualities of wool. Authors advised industry readers to draw distinctions between different types of raw wool washing reagents, for example. "Alkaline solutions in general have a noticeable action on wool, but the effects produced vary considerably according to their nature,

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[410] *The Paris Universal Exhibition Album, 1889*, Published under the Patronage of the American Commission by W. Stiassny and E. Rasetti (London: 76 Finsbury Pavement, E.C, 1889), Dibner Library of Science and Technology, Smithsonian National Museum of American History, Washington, D.C.

[411] James P. Boyd, *The Paris Exposition of 1900: A Vivid Descriptive View and Elaborate Scenic Presentation of the Site, Plan and Exhibits* (James P. Boyd, 1900), 391; emphasis added; Dibner Library of Science and Technology, Smithsonian National Museum of American History, Washington, D.C.

[412] Franklin Allen, *American Silks at the Paris Exposition of 1900* (August 1990), 12; Dibner Library of Science and Technology, Smithsonian National Museum of American History, Washington, D.C.

concentration, temperature, and period of the action," technical writers advised. Soap and carbonate of ammonia were the least harsh and conferred beneficial cleansing properties. It was the carbonates of potassium and sodium that "tend to give the wool a yellowish color and render it slightly harsh and less elastic." By drawing this distinction between different alkalis, authors indicted generalizations about the effects of entire classes of chemicals. Such generalizations risked overlooking potential chemical aids in the wool cleaning and textile manufacturing processes.[413]

Even within the silk industry, never a nineteenth-century export good for American producers, Americans like Franklin Allen saw some room for hope created by chemical treatment and new artificial strands. "The merit of the American manufacturer is his power of manufacturing promptly and well, whatever the people want, without in any way over-stocking his shelves with out-of-date goods," Allen reminded industry readers. "The goods which we expose [at worldwide exhibits] are sold at moderate prices, made for the great mass of our general public[.]"[414] If chemical treatments of textiles fibers threatened the producers enjoying competitive advantage from the natural integrity built into fibers based on place of growing, chemical treatments might offer American fiber producers an foothold into competing in a global market that they had long dominated for cotton but never competed in for wool, silk, or flax. Not much could be done to change the place in which a wool fleece or silk strand had been grown. But late nineteenth-century chemical treatments showed that fibers were nonetheless, yes, improvable.

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[413] Fenwick Umpleby, et. al., *Cyclopedia of Textile Work: A General Reference library on Cotton, Woolen and Worsted Yarn Manufacture, Weaving, Designing, Chemistry and Dyeing, Finishing, Knitting, and Allied Subjects,* Vol. VI, (Chicago: American School of Correspondence, 1907), 28-29.

[414] Franklin Allen, *American Silks at the Paris Exposition of 1900* (August 1990), 13; Dibner Library of Science and Technology, Smithsonian National Museum of American History, Washington, D.C.

IV. Creating Fibers

Franklin Allen was not alone in his enthusiasm. Artificial silk impressed other American industrialists specifically because it closely mimicked silk, the most luxurious and expensive of the fibers, but also because its production relied on raw material in abundance in the U.S. Wood pulp could be had from the same production lines feeding lumber yards and paper mills. American soils might not yield sheep whose wool could compare with that of Silesian or Australian merinos; its cotton might scratch in comparison to Egyptian and Indian varieties; and its silk industry might be non-existent. But its soils had plenty of raw wood.

Of course, wood fibers were not particularly pleasant against the skin, even when distilled to viscous cellulose and extruded as threads. Instead, competing with the queen of fabrics would require feats of rhetoric as well as chemistry It was no accident that U.S. chemists visiting the 1889 artificial silk exhibit lauded the "wonderful brilliancey [sic] and finish" of artificial silk fibers.[415] It was also no accident that visitors to the 1889 booth commented on the benefits that distinguished artificial strands from its silk counterparts. De Chardonette's threads "may easily be dyed to any desirable shade" one commented enthusiastically, a near direct response to acknowledged difficulty in finding reds and magentas that would cling uniformly to organic silk fibers.[416] Beyond luster and dyeability, the prospect—not yet realized—of lower production cost became the final argument chemists offered when explaining artificial silk's commercial viability. Writing back to U.S. Congress, American commissions attending the 1889 Paris Exposition reportedly optimistically: "It is claimed that this silk can be produced for 15 to 20 francs per

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[415] *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington: Government Printing Office, 1891), 607.

[416] On the challenges of creating certain shades of dye, see Regina Lee Blaszczyk, *The Color Revolution* (Cambridge, Mass.: MIT Press, 2012).

kilogramme, or about $1.40 to $1.80 per pound, natural silk costing from three to four times as much."[417] Chemists pointed to the controllability of artificial silk: its luster, its dyeability, and its potential cheapness of production. In these terms, they sought to position it as a viable commercial undertaking.

Chemists' enthusiasm for artificial silk timed with a trend in textile manufacturing: an increasing demand for ready-wear garments. De Chardonnet's display of artificial silk at the 1889 Paris Exposition was far from the only display of fabrics at the fair. In the Hall of Textile Fabrics, Wearing Apparel, and Accessories, bolts of cambric and lace lay draped alongside "wearing apparel for both sexes" for viewers to admire. Of particular note was the ready-made menswear. Flashy blue waistcoats, square-cut jackets, close-fitting trousers, and embroidered flowers on lapels were "[a]ll … risky things for men's garments," commented one viewer, but nonetheless evidence that "tailors show no less talent in adorning the stronger sex."[418] These objects were also evidence that buying habits were changing: towards pre-cut clothing, and especially towards demand for moderately priced garments ready for everyday wear. According to fairgoers, tailors were "literally giving … away" trousers priced at 6 francs and suits at 20. "[T]he garments also were better made and more lasting" than their antecedents, on visitor reported, both as praise for the English and German textiles used in the ready-wear industry and a response to concerns about mass production cheapening attire.[419] For proponents of artificial silk, an interest in ready-wear also presented an opportunity. If thread of fake silk could be

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[417] *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington: Government Printing Office, 1891), 527; Dibner Library of the History of Science and Technology, National Museum of American History, Washington, D.C.

[418] "Textile Fabrics, Wearing Apparel, and Accessories" in *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington: Government Printing Office, 1891), 367.

[419] "Textile Fabrics, Wearing Apparel, and Accessories" in *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington: Government Printing Office, 1891), 368.

extruded to whatever shape and length one might need, what types of pre-assembled garments were possible?

Count de Hilliard De Chardonnet's booth was one answer to an increased demand for fibers. Though the chemist would not disclose how he made viscose, the syrup from which artificial silk was extruded, he was happy to showcase the possibilities opened up by his research. His raw material was wood pulp, fibrous and stiff. His thread-spinning apparatus was a vertical, cistern-like contraption capable of extrusion. To use it, he would fill its innermost chamber, a glass tube, with viscose, then use air pressure to force the syrup through a tiny aperture in the glass tube. This extruded strand was caught into a surrounding bath of weak acid: a tiny, fragile thread that solidified when exposed to acid and could be caught by mechanically turning pincers that would wind a bobbin. The final step was the pulling of threads up out of the acid to dry with warm air. And then the process was complete: a shimmering, neatly spooled skein of artificial silk.[420]

The most mysterious part of De Chardonnet's process was also the feature that made it most commercially valuable: his ability to transform fibrous wood pulp into viscous syrup, or viscose. For the lay visitor, the answer was a matter of chemical ingenuity. But for visiting chemists, it was this piece of the process that was most worrisome. "A serious drawback to the practical application of the artificial fibre is its great inflammability," observed Newbury, pointing to the propensity of nitric acid, the key ingredient used to transform fibrous wood pulp into viscous liquid, to combust.[421] Nitric acid was most known to chemists as a key ingredient of the commercial explosive nitroglycerine. To integrate it into an industrial-scale production

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[420] See "Fig. 7" Count Hilliard De Chardonnet, as included in *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington: Government Printing Office, 1891), 526-527.
[421] See "Fig. 7" Count Hilliard De Chardonnet, as included in *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II* (Washington: Government Printing Office, 1891), 526-527.

process seemed a serious risk. Complicating matters, combustion could happen both during thread production and during weaving. Nitric acid, then, did not seem practical for use in the commercial production of artificial silk.[422] Herein lay the limits of De Chardonnet's innovation.

The chemist's basic insight, however, captivated chemists. Cellulose, the building block of virtually all plant life, could be liberated from its fixed form and transferred into a viscous syrup if treated with a harsh acid. "Cellulose is a light, flexible, colorless, translucent, lustrous solid about one and a half times as heavy as water and remarkably strong and tough," wrote the MIT-trained chemist Arthur D. Little to potential investor D.C. Spruance in 1899, a decade after De Chardonnet had first hung his display.[423] Little, on tour of laboratories in Europe at the behest of Philadelphia businessman W. D. Spruance, reported to the moneyed investor—in what was as much a sales pitch as a survey of commercial viability—that cellulosic chemistry would transform American industry. "It is … my well-considered opinion and that of other chemists best qualified to judge that the chemistry of cellulose is on the eve of a great development, and the economical effect of which cannot fail to be profound," Little extolled. He implored his non-chemist investors to see the material as he had learned to see it: abundant, cheap, and endlessly malleable.

Little was not alone in his enthusiasm, nor his commercial aspirations. Inspired by De Chardonnet and with an eye to industrial production, chemists across 1890s Europe and the U.S. sought alternatives to De Chardonnet's prescribed nitric acid for dissolving wood fiber into viscose. Patents multiplied: for an ammonium-laden solution of cupric oxide, patented in 1890 by the French chemist Louis Henry Despeissis; for a combination of alkali hydroxide and carbon

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[422] *Reports of the United States Commissioners to the Universal Exposition of 1889 at Paris, Vol. II,* Spencer B. Newbury, contributing author (Washington: Government Printing Office, 1891), 607.

[423] Arthur D. Little, "Report to Daniel C. Spruance, Esq. on the Technical Development of Viscose on the Continent of Europe and in Great Britain" (1899), 1, 4; Series II, Box 214, Arthur D. Little Papers, U.S. Library of Congress, Washington, D.C.

disulfide, patented by the British chemists Charles F. Cross and Edward J. Bevan in 1892; for cupric acid, patented by German chemists Emile Bronnert, Max Fremery, and Johann Urban in 1897; and for zinc oxide, patented in 1898 by British chemists William Porter Dreaper and Harry Kneebone Tompkins.[424] It was not the case that De Chardonnet's display had single-handedly spurred a "race to patent"—the rapidity of patents following his 1889 display suggests that research had been ongoing contemporaneous to his efforts—it *was* the case that commercial applicability and competition motivated the frenzy toward legally protected understandings of cellulosic chemistry.[425] The challenge for all chemists was the one that vexed the French chemist: how to extract cellulose.

Each proposed solvent had specific drawbacks. Cupric oxide, that proposed by the French chemist Despeissis, was relatively unreactive compared with the nitric acid integral to De Chardonnet's process. Non-reactivity avoided the problem of combustion but hampered artificial silk production in an inverse fashion: wood fibers treated with cupric acid were often left undissolved even after many days of soaking, producing a syrup too riddled with detritus to extrude into uniform silken threads.[426] Alkali hydroxide and carbon disulfide, by contrast, posed

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[424] See Emile Bronnert, "Production of Cellulose Solution for Manufacturing Threads," Letters Patent No. 646,381, U.S. Patent and Trademarks Office (March 27, 1900). In this patent, Bronnert mentions the Despeissis patent, filed as French Patent No. 203,741 and received May 9, 1890; and the Pauly patent, filed as French Patent No. 272,718 and received on December 1, 1897. On the Cross and Bevan process, see Charles Frederick Cross and Edward John Bevan, "Manufacture of Cellulose Acetate," Great Britain Patent No. GB189409676A, granted March 23, 1895, accessed January 23, 2018 via Espacenet Patent search, no DOI available. In this patent, authors reference "Patent No. 8700 of 1892" which includes "the solution obtained by treatment of crude cellulose with caustic alkali and carbon disulphide, as described in the Specification of the Patent." On the Dreaper and Tompkins patent, see William Porter Dreaper and Harry Kneebone Tompkins, "Improvements in the Manufacture of Artificial Silk from Suitable Forms of Cellulose," Great Britain Patent No. GB189717901A, granted July 30, 1898, accessed January 23, 2018 via Espacenet Patent search, no DOI available.

[425] De Chardonnet did not secure an American patent until 1919, waiting nearly thirty years from the filing of his origin French patent. See Patent No. 1,209,133, Issued December 19, 1919, U.S. Patent and Trademark Office.

[426] For discussion of cupric oxide's drawbacks, see Emile Bronnert, "Production of Cellulose Solution for Manufacturing Threads," Letters Patent No. 646,381, U.S. Patent and Trademarks Office (March 27, 1900), accessed January 22, 2017 via Google Patents; https://patentimages.storage.googleapis.com/09/36/e7/ea897a5c2e0ad2/US646381.pdf.

a worker hazard rather than a production hindrance. As early as the 1880s, physicians like the French neurologist Jean-Martin Charcot were lecturing on the potential poisoning effects on workers in the rubber industry, where carbon disulfide was used for vulcanization. Workers exposed to high doses of carbon disulfide suffered neurological and nervous system damage: everything from blindness to personality change.[427] Worker exposure was not the primary concern for patent filers, admittedly. But the fact of its toxicity did at least throw into question the commercial viability of artificial silk.

In Europe and the U.S., interest in cellulosic chemistry evolved from a fixation on textiles to a quest to identify all possible uses for viscose syrup. British papermakers James Williamson & Son and W. Burt capitalized on their statuses as high-end bookbinders to extend production into a gamble on fake leather cloth—made from paper treated with cellulose syrup—as one binding option. A smattering of firms churned out modest quantities of photographic film, paint, and adhesives.[428] Showcasing a particularly broad conception of how to use the material, the British chemists Dreaper and Tompkins patented a process via which human wigs might be made from cellulose.[429] In the U.S., the chemist Arthur D. Little sought to commercialize multiple production efforts: the extrusion of lamp and lightbulb filaments; the mixing of house paints; the casting of photographic film; the pouring of viscose into molds to make handles for tool; the lathe-turning of viscose to make it into spindles for chairs. Papers dipped in cellulose syrup

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[427] Paul David Blanc, *Fake Silk: The Lethal History of Viscose Rayon* (New Haven: Yale University Press, 2016).

[428] Arthur D. Little, "Report to Daniel C. Spruance, esq. on the Technical Development of Viscose on the Continent of Europe and in Great Britain" (1899), 27-34; Series II, Box 214, Arthur D. Little Papers, U.S. Library of Congress, Washington, D.C.

[429] William Porter Dreaper and Harry Kneebone Tompkins, "The Manufacture of Crimped Fabrics, such as Crape, and Articles ordinarily made of Crimped Human or Horse Hair, such as Wigs and the like, from Cellulose," Great Britain Patent No. GB189710487A, granted April 27, 1898, accessed January 23, 2018 via Espacenet Patent search, no DOI available.

became stronger and more waterproof; paint applied to fabric clung more firmly with cellulose syrup as an adhesive. The possibilities seemed endless, but nothing seemed to attract a market of buyers.[430]

British chemistry and British capital flowing into American laboratories helped overcome stagnation in the commercialization of viscose. In 1892, the U.S chemist Arthur Little had watched with great enthusiasm as the British chemists Charles F. Cross and Edward J. Bevan patented a viscose-producing process that used alkali hydroxide and carbon disulfide as the reagents. Free from both the vexing problems of flammability and non-reactivity, alkali hydroxide worked well. The regent dissolved wood pulp into syrup fully; it was cheap to obtain; and it stored without degrading for years at a time. Reporting to potential investors following an 1899 tour of the Europe, Little enthused that "the cheapness of all the materials concerned" meant that the cost of all raw materials was only 3½ to 5 cents per pound of cellulose treated, capital costs and wages not included.[431] The chemist convinced American industrialists D.C. Spruance and Willard Saulsbury to invest in a company that would produce a wider variety of goods: photographic film, viscose-printed textiles, tool handles, and a small amount of yarn.[432]

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[430] Patents filed for cellulosic products abound in this decade. See, as representative examples, Elmer A. Sperry, "Cellulose envelop for elements of storage batteries," U.S. Letters Patent No. 646,923, obtained April 3, 1900; Max Fremery and Johann Urban, "Manufacture of Threads &c. from Cellulose," U.S. Letters Patent No. 691,257, obtained January 14, 1902; John B. Bernadou, "Smokeless Powder," U.S. Letters Patent No. 652,505, Obtained June 26, 1900; George Kelly, "Non-Conducting Lining or Covering," U.S. Letters Patent No. 665,229, Obtained January 1, 1901; Edward B. Cunningham and Edward Thiele, "Synthetic adhesive gum," U.S. Letters Patent No. 637,090, Obtained November 19, 1899; John Christmas Chorley, "Machien for producing cellulose films for photographic or other purposes," U.S. Letters Patent No. 641,623, Obtained January 16, 1900. All patents accessed January 26, 2018 via Google Patents Search; no DOI.

[431] Arthur D. Little, "Report to Daniel C. Spruance, esq. on the Technical Development of Viscose on the Continent of Europe and in Great Britain" (1899), 19; Series II, Box 214, Arthur D. Little Papers, U.S. Library of Congress, Washington, D.C.

[432] American Viscose Corporation, "Short Story of Rayon," (c. 1940), Trade Literature Collection, National Museum of American History, Washington, D.C.

Of the many ends to which he hoped viscose could be put, Little was skeptical of proposed textile applications. Artificial silk, regardless of the reagent used, was weaker than that from silkworms. Worse, its tendency to tear increased when it was wet—exactly the laundering state in which it would be most stressed. "The sole field for the product is in the production of effects," Little concluded to his investors, suggesting that only braid, cord, tassels, and other dress goods attachments could be made from the material. Decorative uses of artificial silk were fine. "For any other purpose," he concluded, "it is merely beautiful rubbish."[433]

British investors concluded otherwise. Sales of artificial silk had proven near impossible in the U.K., where proximity to Lyon's storied silk industry did not help, nor did the six seasonal months of dampness encouraging the wearing of woolen stockings. But enthusiasm for ready-wear in the U.S., and particularly the proliferation of an urban and female middle class, suggested one fruitful commercial use of artificial silk: hosiery. At Courtauld's, the century-old British textile house and design team, money was found to invest in production overseas. By 1910, Courtaulds representatives had bought out Little's production rights and what had become a failed enterprise. The British holding company forming an American subsidiary in its place, the American Viscose Company. Company-hired workers began construction of a plant at Marcus Hook, Pennsylvania that same year.[434]

For the first ten years of its operation, the American Viscose Company's Marcus Hook facility remained the only production facility of its size in the United States. Modest competition emerged in the form of American companies DuPont, Tubize Co., Belamore (later known as

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[433] Arthur D. Little, "Report to Daniel C. Spruance, esq. on the Technical Development of Viscose on the Continent of Europe and in Great Britain" (1899), 62; Series II, Box 214, Arthur D. Little Papers, U.S. Library of Congress, Washington, D.C.

[434] American Viscose Corporation, "Short Story of Rayon," (c. 1940), Trade Literature Collection, National Museum of American History, Washington, D.C.

Hartford Rayon), Industrial Rayon, and American Cellulose and Chemical Manufacturing (later Celanese), who also began producing rayon between 1910 and 1920. But none of these facilities every rivaled the scale or scope of the Marcus Hook facility, nor its emergent parallel plants in West Virginia and western Pennsylvania.[435]

American textiles mills in the hosiery industry emerged as the single largest buyer of artificial silk thread. These, unlike their nineteenth-century New England predecessors, were scattered across the entire country. The George Frost Company of Boston; Erlanger Brothers of New York; Cooper's of Bennington, Vermont; and the McCallum Hosiery Company of Northampton, Massachusetts: one corridor of hosiery production spanned the New England states from urban to rural. But a larger collection of hosiery production originated from the Midwest, particularly the Lake Michigan-bordering city of Milwaukee. At the Luxite Textile mills; at Everwear Hosiery; and the Holeproof Hosiery Company workers fed skeins of artificial silk into machines that knit and folded the many types of hosiery Americans were learning to wear.[436] Another hub of production centered on the U.S. South, particularly North Carolina.[437] In each of these places dense with mills, production lines were reflecting a larger change in attitude. Fully-fashioned socks, delicate and sheer stockings, negligees, and underwear functioned as modern responses to what were becoming stodgy and confining Victorian corsets and

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[435] Ch. 10 "Rayon Fibers" in *Handbook of Fiber Chemistry, 2nd ed.,* Menachem Lewin and Eli M. Pearce, eds., (New York: Marcel Dekker, Inc., 1998).

[436] *Producing Fashion: Commerce, Culture, and Consumers,* Regina Lee Blaszczyk, ed. Philadelphia: University of Pennsylvania Press, 2008); See also Joy Parr, "Rethinking Work and Kinship in a Canadian Hosiery Town, 1910-1950," *Feminist Studies* 13, no. 1 (1987): 137-62, doi:10.2307/3177840; Brigid O'Farrell and Joyce L. Kornbluh, "We Did Change Some Attitudes: Maida Springer-Kemp and the International Ladies' Garment Workers Union." *Women's Studies Quarterly* 23, no. 1/2 (1995): 41-70. http://www.jstor.org.ezproxy.library.wisc.edu/stable/40003999.

[437] Andrew J. Seltzer, "The Effects of the Fair Labor Standards Act of 1938 on the Southern Seamless Hosiery and Lumber Industries," *The Journal of Economic History* 57, no. 2 (1997): 396-415. http://www.jstor.org.ezproxy.library.wisc.edu/stable/2951043; Gavin Wright, *Old South, New South: Revolutions in the Southern Economy Since the Civil War* (New York: Basic Books, 1986).

bustles.[438] For a growing set of middle-class female buyers, artificial silk served as one more affordable vision of a new femininity.

Producing viscose was a resource-intensive process. We can begin to understand the ecological costs built into the process by reading the landscape of American Viscose Corporation's Marcus Hook facilities. The 150-acre campus was most distinguished by compactness: a factory yard clustered with low brick buildings that each shared at least one wall.[439] This was no accident. "[C]oncentration in this industry is the fundamental factor in obtaining maximum efficiency," recommended one industry expert. What the expert alluded to but did not state outright was that liquid viscose and its dissolving reagent, carbon disulphide, needed such careful containment.[440] Carbon disulphide was a known neurological disruptor, having been used by rubber workers for vulcanizing rubber, and agricultural workers as an antifungal treatment for plants.[441] The acid bath needed to "set" viscose threads also posed ecological and human health hazards.

Redoubling these ecological costs were the inputs and effluents of the manufacturing process. A factory producing two tons of artificial silk per day required 750,000 gallons of water at a bare minimum. Soft water in particular was a priority: water was crucial to the washing of spooled threads before they could be sent out to textile mills, and the remnant alkali hydroxide

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[438] Gayle V. Fischer, *Pantaloons & Power: A Nineteenth-Century Dress Reform in the United States* (Kent, Ohio: Kent State University Press, 2001); Patricia A. Cunningham, *Reforming Women's Fashion, 1850-1920: Politics, Health, and Art* (The Kent State University Press, 2015).

[439] Size estimate based on size of streetcar (27.5 feet in length) pictured in proportion to one side of the factory yard. Rough dimensions of factory yard estimated at 600 feet in length, 900 feet in width, or 630,000 square feet total. For the photo allowing such estimates, see "A plant of The Viscose Company where rayon is manufactured" in *The Story of Rayon, the Newest Textile Yarn* (New York: The Viscose Company, c. 1925), 48-49; Othmer Library of Chemical History, Science History Institute (formerly Chemical Heritage Foundation), Philadelphia, Pennsylvania.

[440] E. R. Mend, "The Layout of the Spinning Mill: Some Factory Pre-Requisites," *The Rayon Journal* 1 no. 6 (July 1926): 32-38.

[441] Paul David Blanc, *Fake Silk: The Lethal History of Viscose Rayon* (New Haven: Yale University Press, 2016).

on the threads would form a substrate when exposed to mineral content in hard water.[442] Washing also meant that effluent was a chief concern. "This treatment of waste water, however, is likely to cause high expenditure, and where ancient rights exist the manufacture can count on the saving of a fair sum of money on his manufacturing costs," advised one industry expert as one means of avoiding disposal costs.[443] But regardless of disposal terms, we can see evidence of a need for water in renderings of the plant. With marshlands just beyond the northern reaches of the factory yards and the Delaware River to its east, pipes and docks reached out into the water. The risks of leaching chemical reagents into the surrounding environment would have been analogously high.

Peering into the buildings themselves, the most surprising sight would have been their contents. Insides cavernous storerooms, wooden trusses high overhead, sheets of purified wood pulp lay baled in rectangular bundles stacked twenty feet high. Wood fiber for making viscose was most frequently stored as sheets of paper, clean and perfectly dry as protection against the risk of water absorption which caused problems in the viscose-making process. Written onto some of these bales are the type of wood included in the fibrous sheets. By the early 1920s, pine had become the wood fiber of choice for use in the silk-making process, and pulp mills across the U.S. South and as far north as Quebec had begun marketing their raw materials as particularly suited for artificial silk production.[444] The size, prevalence, and expense of the wood fiber stored in warehouses reminds us that for artificial silk manufacturers, the question of source origin was

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[442] "The Scientific Fundamentals of the Viscose Process," *The Rayon Journal* 1 no. 6 (July 1926): 25-32.

[443] E. R. Mend, "The Layout of the Spinning Mill: Some Factory Pre-Requisites," *The Rayon Journal* 1 no. 6 (July 1926): 32.

[444] Canadian International Paper Company, "Kipawa Wood Cellulose for Rayon Manufacture" advertisement, *The Rayon Journal* 1 no. 6 (July 1926): 3; Chas H. Herty and R.H. Rasch, "Southern Pine for Rayon," *Rayon and Melliand Textile Monthly* 15 no. 2 (February 1935): 67-69.

ever-present. "Scientific silk" was not an abstraction, nor a test tube product: it came from somewhere.

The presence of wood fiber origin place in production decisions throws in stark relief its absence from marketing materials for artificial silk. Beginning in the 1910s, producers of artificial silk began printing publicity materials aimed at salespeople and potential buyers of the fabric. Just as we have examined these depictions of the Marcus Hook facility for clues about cost-considerations in the production process, an exercise in reading the landscape, we can also examine these same depictions for insights into what stories about artificial silk executives wished to project to a consuming public. That story is, above all, a story about a fiber explicitly from nowhere.

Clean, controlled, modern laboratory facilities are the sites most frequently depicted in publicity materials. In viewbook after viewbook, company photographs present a particular view of modern chemistry. Omitted are the large tanks holding alkali hydroxide and carbon disulphide, or the caustics room where wood fibers would have been treated with these reagents to form viscous syrup. Instead, the vision of chemistry that the company presented is one of bright, airy, control. Tidy individualism and test tube-sized flasks of reagents populate these laboratories, as do only handfuls of workers. The spaces are conspicuously gendered male, though in the background we can see at least three dark-haired workers—presumable female laboratory assistants—bent over workbooks. The spaces are well-ventilated, clean, and modern.[445]

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[445] Photo spread in "A plant of The Viscose Company where rayon is manufactured" in *The Story of Rayon, the Newest Textile Yarn* (New York: The Viscose Company, c. 1925), 48-58; Othmer Library of Chemical History, Chemical Heritage Foundation; Philadelphia, Pennsylvania. Note that "The Viscose Company" was the original name of the Courtauld operation in Marcus Hook, Pennsylvania. After purchasing the rights to Arthur D. Little's original organization, the American Viscose Company, Courtauld's executives changed the name to the Viscose Company. The company would be rebranded as "American Viscose Corporation" in 1933. For the sake of clarity, I use the

In public company viewbooks showcasing the facilities producing rayon, one value comes through above all else: control. Publicity photographs foreground the Erlenmeyer flasks and workbenches where artificial silk threads had presumably first been spun. They story they tell is not about the growers nurturing cotton bolls or yearlings; nor is the story they tell about the fields and hillocks imbuing fibers with loft, softness, or warmth. No mention is made of southern pine or Canadian hemlock used to make rayon. Instead, publicity photographs tell a story about ingenuity had through rationality, control, and laboratory methods.

Such depictions of control were not necessarily to explicitly pit laboratory synthesis in opposition to harvest of natural goods: as scholars like Michael Kideckel and Kendra Smith-Howard have argued, early twentieth-century producers of goods like breakfast cereal and milk actively invoked naturalistic appeals when explaining the desirability of their factory outputs. Factories built on lush campuses, using automation instead of exposing product to "dirty" human hands, and powered by hydroelectric technologies represented the harmonious union of industrial rationality in nature.[446]

Artificial silk producers enjoyed modest sales increases between 1910, the year construction began on the Marcus Hook facility, and the early 1920s. The material found secure demand from the hosiery industry, enough to warrant additional capital investments spearheaded by executives at the American Viscose Company. After seven years of operations at the Marcus Hook plant, the company opened another factory in 1917 in Roanoke, Virginia; five

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American Viscose Corporation throughout to refer to an entity that retained identical legal status and largely identical production priorities throughout its lifetime.

[446] Kendra Smith-Howard, *Pure and Modern Milk: An Environmental History Since 1900* (New York: Oxford University Press, 2014); Michael Kideckel, *Fresh from the Factory: Breakfast Cereal, Natural Food, and the Marketing of Reform, 1890-1920*, unpublished Ph.D. thesis (New York: Columbia University, in process); see also Stephen Mihm, "How Your Breakfast Cereal Became '100% Natural,' *Bloomberg* (April 6, 2016), accessed Feb 22, 2018, https://www.bloomberg.com/view/articles/2016-05-06/how-your-breakfast-cereal-became-100-natural.

years later, it had begun operating plants in Lewiston, Pennsylvania and Nitro, West Virginia.[447] In sanitized viewbooks and in storeroom floors, the future looked bright for the silken, luminous threads.

VI. Naming Fibers

Jubilant assessments of artificial silk's future were kept in check by two existing realities. One was an enduring problem of weakness caused if the fabric got wet. This created problems for wear, but especially for laundering. When washing artificial silk, wrote chemists at the soap manufacturer Lux to homemakers, "remember that some of these fabrics become weaker while wet … [and] rebel at a hot iron." Instead, these garments needed to be hand-washed with great delicacy—and delicates-only soap, implied soap manufacturers—to ensure the integrity of the fabric.[448]

The other problem for artificial silk producers was the reality that it was not the only cheaper-than-silk option available textile mills and consumers. Fake silk debuted in an expanding hosiery market alongside two other fibers that also promised—as one 1917 advertisement proclaimed—a "shapely, shimmering, closely-woven" fit. One of these fibers, mercerized cotton, benefitted from many of the same chemical insights that had yielded artificial silk. Since both artificial silk and mercerized cotton were built of plant fibers, the process of mercerization was, in a simple sense, a lesser degree of chemical treatment: just as caustic alkalis would transform fibrous cellulose into viscous syrup, washing cotton thread with a caustic alkali—in effect

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[447] American Viscose Corporation, "Short Story of Rayon," (c. 1940), 11, Trade Literature Collection, National Museum of American History, Washington, D.C.

[448] "Exciting New Materials—and How to Wash Them," Lux Soap Company pamphlet 3064X (August 20, 1934); Pamphlet Collection, Wisconsin Historical Society, Madison, Wisconsin.

exposing the cellulosic threads to alkali, but for a much shorter amount of time than in the syrup-making process—"melted" the outermost layer of a cotton thread, leaving that thread smooth, silken, and shining. Another new fiber being used in hosiery, lisle, was also cotton thread.[449]

Some commercial chemists worried that the preponderance of fiber options available when buying hosiery would sow consumer confusion rather than bolster sales. Aside from price, what did consumers perceive as the salient differences between silk, mercerized cotton, lisle, and artificial silk? Making matters additionally confusing from a consumer perspective was the fact that hosiery mills marketing to consumers used many different names when listing artificial silk in advertising copy. Some spoke of "fibersilk;" others, "wood silk;" still others plastered print ads with terms like "artificial silk," "viscose silk," "Gold Ray," or "scientific silk."[450] An abundance of terminology threatened sales.

Also threatening sales was the reality that producers of the thread had, dating back to the chemist Arthur Little, imagined that viscose would be *the* plastic underlying twentieth-century industrial production. But chemists struggled to demonstrate to clothing manufacturers that the thread could be put to more diverse end-uses than as a substitute for silk in hosiery, let alone uses beyond the textile industry. Artificial silk's proportion of global fiber production was still scant: even with 1923 marking a record-high year with nearly 10 million pounds of the cellulosic thread produced that year, it represented only three percent of global fiber production. King Cotton enjoyed greater than 75% share of the production market, followed in distant second by a

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[449] "Fashion and Beauty" in *All-American Ads, 1900-1919*, Jim Heimann, ed., (Cologne: TASCHEN, 2005), esp. p. 442-462.

[450] "Fashion and Beauty" in *All-American Ads, 1900-1919*, Jim Heimann, ed., (Cologne: TASCHEN, 2005), esp. p. 442-462.

struggling wool industry, and then by silk.[451] For producers of the novel-though-no-longer-new extruded viscose threads, some marketing strategy would need to change if expanded production was to find expanded demand.

The need to rename artificial silk reached a tipping point in 1924. Nowhere is this definition of value more obvious than in the 1924 re-naming of artificial silk as rayon. It was an effort that originated in the National Retail Dry Goods Association but required the cooperation of countless trade groups: the Silk Association of America, Artificial Silk Manufacturers, National Knitted Outerwear Association, and Association of Knit Goods Manufacturers all had seats at the committee table. Their efforts yielded a new name to replace the hodgepodge of terms: artificial silk, fibersilk, wood silk, viscose silk, scientific silk, or even "Gold Ray." The committee declared the preponderance of different names for the same material confusion, and on paper stated their worry about producer dishonesty in selling to consumers. "Artificial silk, as a descriptive term, is now passé," the committee declared.[452] Elsewhere proponents explained, "'Rayon' was selected because it is easy to say, pleasant to hear, and expressive. It suggests the sun's rays, and is appropriate for a material on which the sun can smile with the full strength of its warmth and brilliance without disastrous results."[453]

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[451] "The World's Rayon Production" in *The Story of Rayon, the Newest Textile Yarn* (New York: The Viscose Company, c. 1925), 23; Othmer Library of Chemical History, Chemical Heritage Foundation; Philadelphia, Pennsylvania.

[452] National Retail Dry Goods Association, "New Name for Artificial Silk a Boon to Retailers," *Confidential Bulletin* 6, no. 2 (February 1924): 6, 15. Artificial silk was in fact renamed twice that year, revealing the importance retailers and manufacturers placed on finding an evocative name. After a three-month stint petitioning for "glos" as the new industry term despite the resistance of retailers, an active constituency of sellers succeeded in petitioning for "rayon" as the new name.

[453] The Viscose Company, *The Story of Rayon: The Newest Textile Yarn[,] Being the Initial Complete Presentation of the Origin and Development and Merits of this Versatile Product* (New York: 1925), 8; Othmer Library of Chemical History, Chemical Heritage Foundation; Philadelphia, Pennsylvania.

The choice to emphasize color fastness and brightness, rather than performance in wet conditions, was wise; chemists had still not solved the problem of fabric weakness caused by dampness. But convinced of the attributes of the name, proponents created a concerted year-long advertising effort that was amplified by the National Retail Dry Goods Association on the pages of its monthly *Confidential Bulletin*. By the end of the year, retailers like Macy's and Saks were using the term rayon in their advertising copy.[454] Hosiery mills, soap manufacturing companies, advertising houses, and above all artificial silk producers had largely adopted it as well.[455]

Though the stated goal of the rayon rename was clarity for the consumer and honesty among producers selling artificial rather than real silk, internal industry publications from the period reveal the real motivation: expanding sales. "Rayon, for years after its inception, labored under the handicap of the misnomer of 'artificial silk,' which would and did imply that it was a substitute for silk," opined American Viscose Company president Samuel Salvage on the pages of the *Rayon Journal*. The real problem with such a name was that it implied that rayon could only be used in that tiny fraction of goods made of silk. Silk, a shrinking proportion in the textile economy, was increasingly an unattractive fabric to mimic if one's aspirations were larger. Salvage reveals his hand in objecting to the categorization of rayon in terms directly contradicting the origins of the product. "It [rayon] was saddled with this name of 'artificial silk' for years, even though it had none of the characteristics of silk," he declared, in additional rhetoric move to distinguish between rayon and silk.[456]

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[454] See, for example, R.H. Macy & Co., "54th Semi-Annual Sale of Hosiery" advert, *New York Tribune* (June 1, 1924), 9.

[455] National Retail Dry Goods Association, "Aggressive Advertising Used to Establish Rayon," *Confidential Bulletin* 6, no. 2 (February 1924): 26, 28; "'Rayon' Approved for Artificial Silk," *New York Tribune* (May 23, 1924): 24.

[456] Samuel A. Salvage, "Rayon's Place in the Textile Field," Address delivered before the 22nd Annual Convention of the National Wholesale Dry Goods Association, Waldorf-Astoria Hotel, New York, January 19, 1926; as republished in *The Rayon Journal* 1 no. 1 (February 1926), 11.

The results of divorcing rayon firmly from its status as an artificial silk would be an expansion of the uses to which manufacturers might imagine rayon could be put. A featured advertisement on the pages of the *Confidential Bulletin* showcase this drive towards expanding rayon's perceived utility beyond hosiery. "Rayon is Rayon, just as cotton is cotton, wool is wool and silk is silk," the print copy declares. "Chemical fiber was and is dependable fabric worthy of a name of its own."[457] By making rayon a material of its own type, separate from silk and malleable beyond current understanding, its sales possibilities could be infinitely expanded.

We know from the writings of Samuel A. Salvage, President of the American Viscose Company beginning in 1911, that laboratory synthesis was distinct from harvest of organic materials because of one key characteristic: control. "Rayon is the one textile fibre not subject to the vagaries of nature, and is, as far as is possible for such a thing to be, directly under human control," he declared to readers of *The Rayon Journal* in 1926. For this chemist-turned-businessman, control meant a guard against sudden variations in supply or attendant fluctuations in price. Control also meant the possibility of meeting any level of demand. Control also meant infinite substitutability: Artificial silk's "ready adaptation with silk, wool, or cotton, make it in case of a shortage of any of the other three … the ideal stabilizer or balance wheel of the 'Big Four' textile fibres," Salvage reminded readers.[458] According to Salvage, place was not an attribute to celebrate in a fabric; control of process was.

With "rayon" on its way towards public acceptance as a term, chemists turned their efforts toward other means for expanding the uses of the fiber. By 1935, textile designers were

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[457] Henderson-Hoyt Company, "Rayon is Rayon" advert, as included in National Retail Dry Goods Association, "Aggressive Advertising Used to Establish Rayon," *Confidential Bulletin* 6, no. 2 (February 1924): 28.
[458] Samuel A. Salvage, "Rayon's Place in the Textile Field," Address delivered before the 22nd Annual Convention of the National Wholesale Dry Goods Association, Waldorf-Astoria Hotel, New York, January 19, 1926; as republished in *The Rayon Journal* 1 no. 1 (February 1926), 11.

weaving rayon into dresses, skirts, and blouses for women, in ready-wear clothing that retailed nationwide; by 1940, rayon had been taken up by rug and carpet manufacturers interested in new fibers that could hold their loft better than traditional wool. Retailers boasted that higher filament counts and finer denier yarn was leaving rayon as the fiber of high-fashion choice, "responsible for the development of utterly new high quality fabrics which are an inspiration to fashion designers."[459] Sales of the thread bumped upwards across the 1930s, despite economic depression: growing from 130 million pounds of production to 360 million pounds between 1929 and 1939. In these regards, the renaming of the fiber was a success, as was its slow spread into other industries than the hosiery industry.[460]

But its proponents found themselves facing a new threat by the close of the 1930s: the prospect of an alternative to rayon, even stronger and more malleable than the cellulosic thread. Nylon was coming to market.

V. Controlling Fibers

By the 1930s, viscose was not a product used only by manufacturers in the U.S. Several large manufacturers of viscose had emerged globally: Courtaulds in the UK and Canada; Glanzstoff in Germany; SNIA in Italy; Comptoir des Textiles Artificiels (CTA) in France; and Teikoku Rayon Company in Japan. For many of these companies, the viscose product cellophane—not patented, trademarked, or branded—was the source of income from viscose technology. Rayon remained a side project.[461]

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[459] Francis A. Adams, "Rayon Gains Retail Prestige," *Rayon and Melliand Textile Monthly* 16 no. 12 (December 1935): 21; Francis A. Adams, "Rayon Gains Retail Prestige," *Rayon Textile Monthly* 21 no. 1 (January 1940): 33; C. Mcd. Carr, "Rayon Goes High Fashion," 21 no. 1 (January 1940): 35.

[460] "U.S. Rayon Production—1929-39," *Rayon Textile Monthly* 21, no. 1 (January 1940): 37.
[461] Paul David Blanc, *Fake Silk: The Lethal History of Viscose Rayon* (New Haven: Yale University Press, 2016).

In a U.S. context, the reverse was true. At the American Viscose Company, chemists scaled up output of rayon thread across the 1920s. Proximity mattered. Arcadia Knitting Mills, located just a hundred miles away, Allentown, Pennsylvania, emerged as the largest yarn buyer from the American Viscose Company by the 1930s. Meanwhile, executives at a company just across the Delaware River from American Viscose Company, E.I. DuPont de Nemours chemical company, also sought ways to expand their sales of viscose products. Seeing the success of the American Viscose Company, DuPont leadership had begun investing in cellulosic research in 1916 and 1917. In 1921, the company began selling skeins of viscose thread to textile mills under the product "fibersilk." In June 1923, they purchased from CTA-France the exclusive U.S. rights to make and market cellophane.[462] By the early 1930s, the company was operating a Rayon Department whose production poundage and research budget rivaled that of the American Viscose Company.[463] Though the latter still led in sales volume and profit on rayon threads, the two regarded each other as rivals alongside a handful of other producers who had also emerged as competition: Celanese Corporation of America; Allied Chemical, American Cynamide, and American Enka.[464]

Beginning in the early 1930s, DuPont researchers expanded their efforts beyond viscose syrup, seeking other malleable materials that could extrude into threads, fibers, and films. One goal was to find a substance that could offer the same price stability that made rayon vital to textile mill owners. However, rayon suffered from a key material deficiency: it became weak when wet. A decade of laboratory work yielded just such a substance: "nylon 6, 6," a polyamide

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[462] Paul David Blanc, *Fake Silk: The Lethal History of Viscose Rayon* (New Haven: Yale University Press, 2016).
[463] David A. Hounshell, *Science and Corporate Strategy: Du Pont R&D, 1902-1980* (Cambridge: Cambridge University Press, 1988).

[464] Masthead, *Rayon Textile Monthly.*

so named for bonded six-carbon chains making up the material. Nylon boasted several physical properties that distinguished the material from rayon. Nylon, unlike rayon, could absorb water and nonetheless retain its strength. It also released water easily, meaning that garments made from nylon threads would dry quickly. On the manufacturing line, nylon could be extruded into even finer threads than rayon, leading to possibly softer, more delicate, or more sheer fabrics; and it possessed a higher degree of elasticity than chemists had been able to introduce to rayon threads.[465]

In rayon industry forums, DuPont spokespersons assumed an ameliorative position. In a *Rayon Textile Monthly* article announcing the 1940 completion of DuPont's newest commercial nylon plant, DuPont publicists strove to allay fears of rivalry with other producers. "When the manufacture of rayon was begun this country in 1911, there were doubtless some who predicted ruin for the silk industry, but it is of interest that the United States actually consumed nearly twice as much silk in 1938 as in 1911, despite that the fact that last year the country produced some 280,000,000 pounds of rayon yarn," cooed publicists seeking to calm chemists and textile mill owners worried about rayon's obsolescence.[466] But such an casual attitude was also possible because, behind closed doors, DuPont executives had expressed a hope that nylon would have much broader industrial use than just in thread: for surgical sutures, toothbrushes, industrial brushes, electrical insulation, rugs, and upholstery. "At this time, however," they cautioned, "a discussion of the possibility of nylon in fields other than those mentioned would be mere speculation."[467]

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[465] "'Q and A' on Rayon,'" *Rayon Textile Monthly* 21, no. 1 (January 1940): 40-41.

[466] "'Q and A' on Rayon,'" *Rayon Textile Monthly* 21, no. 1 (January 1940): 40-41.

[467] "'Q and A' on Rayon,'" *Rayon Textile Monthly* 21, no. 1 (January 1940): 40-41.

Using their experience of selling "artificial silk" as a test case, DuPont spokespersons were eager to distance themselves from such marketing missteps. Nylon emerged in industry lines and women's magazines already named—as nylon. No advertising copy labeled the material as an imitation or artificial substance. Further, company executives steered clear of any mention of the petrochemicals and polymers on which the material was based. "[W]holly fabricated from such common raw materials as coal, water, and air," declared DuPont Vice President Charles Stine to an audience of women's club members at the 1938 New York World's Fair, "nylon can be fashioned into filaments as strong as steel, as fine as a spider's web, yet more elastic than any of the common natural fibers."[468] Coal-based nylon, in contrast to its wood-based analog rayon, was surely the fiber of the future.

If rayon producers sustained worries about dawning obsolescence, they hid it from even themselves. The same issue introducing DuPont's new nylon plant also featured a report touting the technological developments that, in the words of journal editors, had "transformed rayon into [the] textile industry's 'common denominator.'"[469] Seven years after the introduction of nylon, rayon producers continued to celebrate rather than worry over their future prospects. "As the new year 1945 dawns, the textile industry in the United States and elsewhere can be satisfied with the progress that a manmade product has achieved in bringing wider uses to textiles, and in making it possible for a staple to be available to industry at a steady price over long periods of time," effused *Rayon Textile Monthly* editor Francis A. Adams. Such price stability stood in sharp contrast to "the fluctuating process that are inherent to cotton, wool and silk." The "record of the

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[468] Charles Stine, "We Enter the World of Tomorrow," October 27, 1938, New York *Herald Tribune's* Eighth Annual Forum on Current Problems, as cited in Hounshell, *Science and Corporate Strategy: Du Pont R&D, 1902-1980* (Cambridge: Cambridge University Press, 1988).

[469] "How Technological Achievements Transformed Rayon into Textile Industry's 'Common Denominator,'" *Rayon Textile Monthly* 21, no. 1 (January 1940).

past twenty years in textiles" demonstrated the incontrovertible fact: that rayon had gained worldwide acceptance, transforming the textile industry and consumer tastes, both.[470]

Given rayon's success, particularly the ready adoption of the term "rayon" as a replacement for "artificial silk," producers found themselves with a new worry in the age of nylon: that rayon as a term would get mapped onto *all* fibers made in the laboratory. This expansion of the name had already happened in the U.K., where the British Cotton Industry Research Association had adopted the term rayon as a generic term "for all man-made fibers."[471] U.S. chemists worried about the imprecision of this expansion of the term rayon. The problems were two-fold. First, they objected to calling all man-made fibers "rayon" on the grounds that it was illegal in the United States. In 1937, Federal Trade Commission had adopted a definition of rayon: "A generic term for filaments made from various solutions of modified cellulose."[472] The 1937 definition, based on 1924 industry definition and recommendation to the FTC, treated raw material as the chief means with which to distinguish between fibers. Nylon was a petrochemical product rather than a cellulosic—that is, made from coal rather than wood. On these grounds, many U.S. chemists objected to using the term "rayon" to denote all human-made fibers.

Second, chemists objected to calling all man-made fibers "rayon" on the grounds that such a term would cause confusion. For peer researchers reading scientific or trade literature, the general term would obscure rather than clarify discussion in an era in which new fibers were proliferating. For the general reading public, expanding rayon's definition would require a

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[470] "Twenty-Year Acceptance of Term Rayon," *Rayon Textile Monthly* 26, no. 1 (January 1945): 1.

[471] "British Adapt 'Rayon' as Generic Term for All Man-Made Fibers," *Rayon Textile Monthly* 26, no. 1 (January 1945): 55.

[472] As cited in A. G. Scroggie, "Why the Word 'Rayon' Should Not be Adopted as a Generic Term for All Man-Made Fibers," *Rayon Textile Monthly*, Vol. 26, No. 1 (January 1945), 15.

concerted public education campaign that would, similarly, sow confusion in the face of a strident attempt to overcome that confusion fifteen years earlier with the initial coining of the term "rayon" to replace "woodsilk," "scientific silk," "artificial silk," and the like.

As an alternative, the chemist A. G. Scroggie suggested the adoption of the term 'synthetic' to encompass both rayon and nylon. "[I]t would be much easier to teach the trade and public that 'synthetic fibers' means all man-made fibers, than to teach them that rayon now includes nylon, Lanital, glass, etc.," he advised readers.[473] Acknowledging that rayon manufacturers might stonewall attempts to expand the definition of the term they had worked so hard to popularize, Scroggie nonetheless enjoined chemists to think in terms of industry-wide collaboration. 'Synthetic' was the term that could achieve expanded sales in the same way that 'rayon' had 15 years previously. "The use of the word 'synthetic,' … has been criticized on the basis that it has an undesirable connotation. We believe that while this may have been true to some extent in the past, it is rapidly disappearing."[474] The ready adoption of "synthetic" in industries like plastics, fuels, pharmaceuticals, and dyestuffs demonstrated the growing public appreciation that synthetic, rather than referring to a sub-par imitation, instead meant "something better than the natural product." Added Scroggie optimistically, "This is appreciated by both the public and the trade."[475]

At the heart of the debate was an anxiety over whether "synthetic" accurately communicated to a buying public the attributes with which chemists saw themselves infusing

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[473] A. G. Scroggie, "Why the Word 'Rayon' Should Not be Adopted as a Generic Term for All Man-Made Fibers," *Rayon Textile Monthly*, Vol. 26, No. 1 (January 1945), 15.

[474] A. G. Scroggie, "Why the Word 'Rayon' Should Not be Adopted as a Generic Term for All Man-Made Fibers," *Rayon Textile Monthly*, Vol. 26, No. 1 (January 1945), 15.

[475] A. G. Scroggie, "Why the Word 'Rayon' Should Not be Adopted as a Generic Term for All Man-Made Fibers," *Rayon Textile Monthly*, Vol. 26, No. 1 (January 1945), 15.

laboratory textiles. Commercial chemists wrestled with genuine confusion: for the imagined consumer, what *was* the benefit of rayon, nylon, or other laboratory fibers to the consumer? The appeal of an inexpensive and price-stable raw material for textile mills was obvious: it could replace more expensive fibers in rayon fabric or a growing number of blended textiles.[476]

But for chemists, the appeal to consumers was less clear. In advertising copy, the attributes that producers touted to potential rayon buyers changed multiple times across the 1920s and 1930s. The earliest selling point had been a simple price appeal: leading up to the 1920s, manufacturers like Luxite Textiles promised consumers women's hose in "scientific silk"—later rayon—a quarter of the cost of Japanese silk stockings.[477] But particularly with the 1924 renaming of "scientific silk" as rayon, inexpensiveness undermined attempts to shift consumer and textile mill perceptions of the fiber as more than an imitation of silk.

In 1925, marketing staff at the American Viscose Company tried an appeal other than inexpensiveness: rayon's color fixity and its sheen. Terming rayon a "modern necessity," marketers spun a fanciful image for a largely suburban audience: "Today the 'parlor' has been replaced by a living room—a livable room that gets its atmosphere of peace and restfulness from … light. Clear, bright daylight, even a ray of sunshine"—an explicit reference to the fabric's new name, 'rayon'—pours in through the silk-like curtains." According to marketers, rayon helped materials like curtains, upholstery, fringe, and tassels "retain its color when exposed to the glare of light." Rayon interwoven with silk, wool, or cotton enabled "an unlimited array of beautiful, cross-dyed effects in addition to self-tone stripes and patterns, brocades, etc." All of this was

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[476] *The Story of Rayon, the Newest Textile Yarn* (New York: The Viscose Company, c. 1925), esp. "Rayon and Silk Prices, New York Market," pp. 27; Othmer Library of Chemical History, Science History Institute (formerly Chemical Heritage Foundation), Philadelphia, Pennsylvania.

[477] "Hose of Luxite" advertisement, in *All-American Ads, 1900-1919*, Jim Heimann, ed., (Cologne: TASCHEN, 2005), esp. p. 459.

possible without greatly increasing the expense of a piece of fabric, upholstery, or a ready-made garment—these qualities made rayon a modern fabric.[478]

By the 1930s, marketers had shifted their appeal again. Rayon was, above all else, a supremely soft fabric. Women's negligees, teddies, and nightgowns were now made of the same fabric that had once only appeared in stockings and hose.[479] Producers were even finding ways to crimp rayon so it had a thickness appropriate for non-delicate garments like trousers and suit jackets.[480] Capitalizing on consumer recognition of the fiber, the Northern Tissue company even began marketing a new toilet paper for delicate behinds: "Such softness, as gained from making bathroom paper, like silky rayon, from pure cellulose."[481] But no appeals were made in terms of labor-saving abilities. In fact, the reverse was the case: rayon required additional work to wash because it became weaker when it was wet. For homes with electric washers, handwashing was the only suitable means for cleaning rayon.[482]

Rayon's competitor, nylon, first entered production lines in 1940; but production was interrupted by the U.S. entry into World War II and the repurposing of peacetime industries for wartime purposes. Instead, large-scale attempts to sell nylon waited until the post-war years. Ditto nylon's analogous class of petroleum-based fibers grouped under the name "polyesters," so named by chemists for the ester functional group on the chain of esters. These chemical units

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[478] *The Story of Rayon, the Newest Textile Yarn* (New York: The Viscose Company, c. 1925), 29-31; Othmer Library of Chemical History, Science History Institute (formerly Chemical Heritage Foundation), Philadelphia, Pennsylvania.

[479] "Give Practical Gifts with a National Trade-Mark," *Good Housekeeping* 95 no. 6 (Dec. 1932): 69; "Hanes for Men and Boys" advertisement, *Good Housekeeping* 97 no. 6 (Dec. 1933): 188;

[480] "Tecalaine" advertisement, Eastman Acetate Company, *Rayon and Melliand Textile Monthly* 16 no. 12 (Dec. 1935).

[481] "Northern Tissue" advertisement, *Good Housekeeping* 91 no. 1 (July 1930): 219.

[482] "Exciting New Materials—and How to Wash Them," Lux Soap Company pamphlet 3064X (August 20, 1934); Pamphlet Collection, Wisconsin Historical Society, Madison, Wisconsin.

were strung together at a molecular level to form viscous syrup that, like rayon and nylon at an industrial level, could be extruded to form threads of specific length, diameter, and tensile strength.[483]

The post-war period saw, for the first time, alternative polyesters to nylon marketed widely. Production companies touted these fibers for possessing physical qualities that even nylon did not offer. Chemists at the Tennessee Eastman Corporation spotlighted the capacity of their branded fiber to "achieve lasting wrinkle resistance;" built into the fabric, in other words, was a quality that would obviate the work of ironing.[484] But such modest "labor-saving" qualities were far from the only emphasis. At DuPont, chemists lauded the "microbiological resistance" of new patented thread. Others emphasized the "fatigue resistance" of fibers meant for industrial use; others lauded the anti-fungal qualities of fibers that promised to render outdoorwear, awnings, and patio furniture free from mildew.[485] Some chemists field-tested their canvas-alternative fiber Miami, New Orleans, Phoenix, Wilmington, and Minneapolis to confirm that extended sun exposure and cold exposure did not significantly damage the threads.[486] Chemists extruding each of these threads strove for control: of microbes, mildew, UV degradation, as well control of more mundane problems like garments pilling, tearing, stretching, or wrinkling. Synthetics obviated some amount of washing work, ironing chief among them. By the 1960s, sales of polyesters

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[483] "Du Pont Begins Nylon Yarn Manufacture," *Rayon Textile Monthly* 21 no. 1 (Jan. 1940): 38-40; "Rapid Progress Reported in Development of New Types of Fibers" *Rayon and Synthetic Textiles* 31 no. 1 (Jan. 1950): 26-27.

[484] "There is only one TECA fiber" advertisement, Tennessee Eastman Corporation, *Rayon and Synthetic Textiles* 31 no. 1 (Jan. 1950).

[485] W. Wycliffe Owen, "Synthetic Fibers in Industrial Uses,"

[486] J.B. Quig, "'Orlon' in the Canvas Goods Industry," *Rayon and Synthetic Textiles* 31 no. 1 (Jan. 1950): 64-65.

eclipsed those of rayon for the first time.[487] But the effects of this surging synthetic production, as we will see, created many more problematic bodily burdens than they prevented.

Conclusion: The Fibers That Never Go Away

In the summer of 1970, a postdoctoral fellow named Edward Carpenter noticed something strange about the fish he was collecting to evaluate the effects, if any, of nearly nuclear power generation on local ecology off the coast of Long Island. Although the fish showed no signs of radioactive exposure, their guts were laced with another pervasive industrial ingredient: plastic pellets. Subsequent water sampling showed that plastic particles of multiple sizes, types, and colors laced the oceanic ecosystem the researcher and his team was studying. The area sat in the catchment basin of a heavy industrial park where plastics were fabricated, as well as in the drainage area of the nearby two-gigawatt Dominion Millstone Nuclear Power Plant. Given the variety of plastic pollution in the water, the researcher noted an even more unusual finding: the color of the plastic pellets found in the intestinal tract of all of the fish was uniform in color: clear. The fish, it seemed, were mistaking the plastic pellets for food, and ingesting them selectively.[488]

Far from Niantic Bay, a researcher of another kind was also asking about the impact of power—household electricity—on the life experiences of poor and working-class women growing in the mid-century U.S. The researcher, an oral historian named Fran Leeper Buss, found herself drawn into a conversation about childhood with Ruth Parsons, a woman who had grown up in rural Mississippi. Asking about Parson's mother, the oral historian Buss inquired, "Did she have

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[487] *Handbook of Fiber Chemistry, 2nd ed.,* Menachem Lewin and Eli M. Pearce, eds., (New York: Marcel Dekker, Inc., 1998), 726.

[488] Edward J. Carpenter, Susan J. Anderson, George R. Harvey, Helen P. Miklas, and Bradford B. Peck, "Polystyrene Spherules in Coastal Waters," *Science* 178, no. 4062 (1972): 749-50. http://www.jstor.org.ezproxy.library.wisc.edu/stable/1735843.

a washing machine when you were little?" Parsons had replied at length, eventually turning to describe the multiple types of domestic work her mother had done, washing not least among them. "[M]y mother made a lot of our clothes," Ruth Parsons explained. "Got the material off the flour sacks mostly. My father would buy the flour [/] in these printed sacks."[489] Polyester fabric, made using the same processes yielding the plastic pellets lining fish stomachs in Niantic Bay, were only in their initial stages of popularization during the childhood about which Parsons was speaking. Besides, they were largely outside of her reach economically. The necessity of knowing how to fabricate one's own clothes shows in her testimony.

Economic necessity yielded a self-consciousness about fabric and garment design that Parsons made evident in her oral testimony. When describing a high school friend whom she admired, Parsons remarked that the friend owned "a really pretty taffeta skirt, little pleats in it and all." She recalled her own appearance as a young person as suffering from "kind of drab-looking clothes" and "severe-looking" dresses. The adult Parsons laughed at the yearning her younger self had for particular garments. "I remember particularly at one point … thinking if I just had like six pairs of socks at once I'd really be sitting pretty." Six pairs of socks: an indicator of class that, by midcentury, polyester producers heralded themselves as having made possible for more buyers.[490]

Specific clothing was not the only source of dignity Parsons named, however. Though she lamented that her garments were "not designer fabrics," she had turned to cleanliness as a strategy for self-fashioning worth. "At some point, I began to take pride in them," she recalled, of the dresses made from reclaimed cotton flour sacks. "I began to take pride in them and try to

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[489] Ruth Parsons, interview with Fran Leeper Buss, March 20, 1980 in Box 4, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Wisconsin Historical Society: Mss 809 2M/44/F3-4;
[490] Ruth Parsons, interview with Fran Leeper Buss, March 20, 1980 in Box 4, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Wisconsin Historical Society: Mss 809 2M/44/F3-4.

iron them especially and start and try to get them looking nice."[491] Self-confidence, in other words, had derived as much from exercising her domestic expertise—borne from necessity, yes—as from ownership of a specific garment.

One characteristic united the microplastics lining the fish intestines in Edward Carpenter's pelagic studies and the "designer fabric" Parsons sought to emulate using her sewing and laundering skills: 80 years of chemists dreaming of total chemical control. The 1926 words of Samuel A. Salvage, chemist for the American Viscose Company, would echo in debates begun in the 1970s over whether and how a new Environmental Protection Agency should regulate those textile manufacturers producing those very disruptive polyesters. "Rayon is the one textile fibre not subject to the vagaries of nature," Salvage had enthused to commercial chemists in 1926, extolling the benefits of the cellulosic silk. "[It] is, as far as is possible for such a thing to be, directly under human control." Fifty years later, the limits of that human control had been given voice by environmentalist activists like Rachel Carson and Lois Gibbs. A reborn environmental movement was revealing just how little American industry had ever controlled the downstream effects of their creations.

Where does this leave us today? The twentieth-century sales success of first rayon, then nylon, and finally polyester degraded place-based means of marketing fabrics that relied on a colonial logic of soils conferring quality. But the disposability of these fabrics also hastened the atrophy of skills—mending, darning, patching, and creative reuse—that constituted a viable alternative to the perceived necessity of extruding an ever-growing number of new synthetic fibers. "The search for new fibers to meet the ever[-]expanding needs of the American consumer has kindled a fire," declared Francis A. Adams, editor of the trade journal *Rayon and Synthetic*

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[491] Ruth Parsons, interview with Fran Leeper Buss, March 20, 1980 in Box 4, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Wisconsin Historical Society: Mss 809 2M/44/F3-4.

Textiles, in 1950. Only research could meet demand that was "moving in an ever-widening spiral."[492]

One wonders about alternatives. For Ruth Parsons in mid-century, six pairs of socks constituted a viable metric of respectability. Textiles today have only increased the number of garments needed to communicate individual respectability, while the textile mills producing these garments undervalue human and non-human health harmed in both the extrusion and disposal processes. The lifespan of garments, meanwhile, has decreased with the cheapening of textiles.

The history of synthetic fabrics reminds us that only a century ago, domestic workers possessed expertise needed to extend the lifespan of a fiber. It is the obsolescence of this expertise, via both the racialization of domestic work and the disregard for the knowledge's ecological importance, that this dissertation worries about. What ecological change could be driven by de-feminizing, de-racializing, and re-valuing domestic work using mechanisms like legal protections for domestic workers or publicly-financed wage for housework? What social change could happen in the same measure? Protecting the ingenuity and skill of domestic workers today, I argue, *is* environmental policy. It is only a very narrow view of human flourishing that justifies the limited regulation of textile producers wrought in the name of consumer access and affordability. Truly economically and ecologically just policies are not in conflict. Upholding the economic *and* ecological importance of domestic work can point us towards policies that both protect domestic workers and the downstream effects their labors help avoid. The history of synthetic fibers reveals some of the costs of undervaluing domestic work.

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[492] Francis A. Adams, "Expanding Needs for All Fibers," *Rayon and Synthetic Textiles* 31, no. 5 (May 1950), 37.

Chapter Five: Detergents, 1898-1996
Or, Inventing the Smell of Cleanliness

Introduction

What should cleanliness smell like? For homemaker Viola Smith, recalling a 1920s childhood in the foothills of the Smoky Mountains, cleanliness smelled of the local biota: "[W]e'd get sassafras bark, scrape it and put it in [the wash water] … we'd get birch to make it smell good. … And, geez, your clothes would just smell, they were clean, they really were," she would recall decades later, at age 76.[493] Wisconsin domestic worker Doris Hanson would similarly offer an ecological referent, pulled from a 1930s childhood and remembered across a lifetime: "I just love the smell of fresh clothes from the line," Hanson affirmed. "It is kind of a silly thing, but …"[494] And according to Ann Mathias, growing up in a working-class suburb of Chicago, the smell of cleanliness was hot and electric. "I must have been about seven or eight. ... I remember … ironing and how fresh it smelled."[495] Smell, as sensory memory, marked for all of these women both cleanliness and the place in which they were working.

In fits and starts across the twentieth century, and certainly by the late 1940s period marked by a 60% rate of washing machine ownership in U.S. households, cleanliness began requiring a new vocabulary, one untethered from local geography. Here is Consuela Tafolla, speaking of growing up in a big family house in 1950s Milwaukee. "You had Tide of Fab or

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[493] Viola Smith, interview with Fran Leeper Buss, June 4, 1979 in Box 5, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Wisconsin Historical Society: Mss 809 2M/44/F3-4.

[494] Doris Hanson, Interview with Fran Leeper Buss, December 4, 1983 in *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Fran Leeper Buss, ed., Wisconsin Historical Society: Mss 809 2M/44/F3-4.

[495] Ann Matthias [pseudonym], Interview with Fran Leeper Buss, February 15, 1980 in *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Fran Leeper Buss, ed., Wisconsin Historical Society: Mss 809 2M/44/F3-4.

Lifebuoy," Tafolla recalled, naming three of the top-selling laundry soap brands of her day.[496] Added Mary Robinson, a textile worker from Wetumpka, Alabama, "Everybody used that Oxygel soap."[497] Branded commercial detergents were, by the post-war period, both the tools of cleanliness and the shorthand description of what clean smelled like. In contrast to the fat-specific and wood ash-specific language possessed by soap-making domestic workers in the 1860s—that knowledge that we saw in Chapter One of this dissertation—and in contrast to the biota-specific language for working-class families in the 1910s, domestic workers by the 1950s expected cleanliness to smell of a commercial brand. They spoke about brands the way their predecessors had spoken about birch, sassafras, lard, and lye.

By four decades later, domestic workers found themselves recipients of another effort to redefine cleanliness. At laboratories in New Jersey and across the Atlantic in Ludwigschafen, commercial chemists worked to introduce "enzyme cocktails" into detergents they hoped to market as non-bleach cleaners capable of targeting "problem" stains like blood, cocoa, and grass. In Alabama, Pennsylvania, and Geneva, chemists sought polymers that would cling to the surface of synthetic garments in the washing machine, thus forming a "sacrificial layer" to which future stains would stick and that then could be washed off in subsequent cycles. In Kentucky, Connecticut, Ohio, and Texas, chemists sought chemical reagents called surfactants that could lower the surface tension of water, thus enabling wash water more fully "wet" a garment. In use since the 1960s, surfactants were costly ingredients that had been banned by a growing list of U.S. state legislators and several European nations due to their harmful effects on wildlife and riparian ecosystems. Chemists sought alternate surfactants that were less expensive to produce

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[496] Consuela Tafolla, interview with Fran Leeper Buss, April 30, 1980 in Box 5, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Wisconsin Historical Society: Mss 809 2M/44/F3-4.

[497] Mary Robinson & Mildred McEwen, interview with Fran Leeper Buss, May 23,1980 in Box 5, *Work and Family: Low-Income and Minority Women Talk about Their Lives,* Wisconsin Historical Society: Mss 809 2M/44/F3-4.

and avoided regulations that complicating attempts to market identical detergents in different U.S. states and nations. The sum of these efforts was a research agenda focused on redefining the tools of cleanliness. These new cleaning tools would not disrupt consumer expectations of the visual meaning of cleanliness; but they would further move expertise over the wash process from domestic workers to chemists.[498]

Outside of the cohort engaging in enzymatic, polymer, and surfactant research, a set of chemists rejected the notion that cleanliness was best defined in visual terms. At the fragrance and flavor-focused firm Givaudan, chemists emphasized cleanliness as the longevity of scentedness—specifically the lasting power of a fragrance on a garment after the wash. "[G]etting fragrance from a liquid laundry detergent onto fabric is indeed a Holy Grail of the detergent industry," explained Thomas McGee, head of global technology and innovation for the firm's fragrance division, referencing the tendency of surfactants to prevent any material—soil but also fragrances—from clinging to garments in the wash. For McGee and a growing number of chemists at commercial detergent firms, a trend towards "aesthetic-driven" purchasing of home care goods was driving an increased interest in re-scenting their soaps.[499]

Detergent chemists turned to encapsulation, a process that pharmaceutical companies had used for at least three decades to control the slow-release of drugs into the bloodstream. That technology was now repurposed for cleaning purposes. Trapping liquified scent particles in spray-dried emulsions, chemists transformed volatile fragrances into granules that could be directed toward the surface of a garment in the wash. This helped to ensure both that the fragrance would not wash off with a change in water, but also that it would linger on the surface

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[498] Susan J. Ainsworth, "Soaps and Detergents," *Chemical and Engineering News* 72, no. 4 (Jan. 22, 1996): 32-49, 54. DOI 10.1021/cen-v074n004.p032.

[499] Michael McCoy, "Soaps and Detergents," *Chemical and Engineering News* 82 no. 4 (Jan. 26, 2004): 23-28.

of the garment after laundering. If garments could retain a signature detergent scent at what chemists termed a desirable "perception threshold"—not too strong, but still fragrant—customers would perceive a detergent as keeping a garment cleaner for longer. This, as much as visual performance, would breed customer loyalty. Scent, in other words, was becoming the new frontier of commercial chemistry, and the new metric of cleanliness.[500]

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The century-long shift from birch bark to Oxygel to encapsulation technology reminds us that cleanliness has itself been a moving target, an ideal to aspire towards rather than a fixed condition. This history also reminds us of the integral role commercial chemists have placed in constructing and inflating standards of cleanliness, a process that has come with the stark movement of expertise from the washroom to the laboratory bench. Cleanliness has attracted the attention of cultural scholars like Susan Strasser, Sue Ellen Hoy, Nayan Shah, and Carl Zimring, who historicize the norm—in a largely U.S. context—to emphasize the role of cleanliness standards in perpetuating less overt but thus all-the-more potent forms of gendered, racial, and class-based disparity across the twentieth century.[501]

In contrast to a culturally-focused historiography, this chapter emphasizes the materiality of cleanliness: the moldering raw ingredients, the regional hard wash waters, the test tube-sniffing commercial chemists, and the sassafras-shredding domestic workers whose efforts drove the

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[500] Michael McCoy, "Soaps and Detergents," *Chemical and Engineering News* 82 no. 4 (Jan. 26, 2004): 23-28.

[501] Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology From the Open Hearth to the Microwave* (New York: Basic Books, 1983); Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon Books, 1982); Suellen Hoy, *Chasing Dirt: The American Pursuit of Cleanliness* (New York: Oxford University Press, 1995); Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge, Mass.: Harvard University Press, 1998); Nayan Shah, *Contagious Divides: Epidemics and Race in San Francisco's Chinatown* (Berkeley: University of California Press, 2001); Carl Zimring, *Clean and White: A History of Environmental Racism in the United States* (New York: New York University Press, 2015); Joan S. Wang, "Race, Gender, and Laundry Work: The Roles of Chinese Laundrymen and American Women in the United States, 1850-1950" *Journal of American Ethnic History,* Vol. 24, No. 1 (Fall 2004): 58-99.

twentieth-century shift from birch bark to Oxygel to encapsulation. Drawing on the insights of environmental historians like Christopher Sellers, Michelle Murphy, and Gregg Mitman, my purpose in this chapter is to historicize the body *itself,* particularly as natural-cultural hybrid whose perceptions have never been solely biologically wired nor culturally determined.[502] By centering smell as the topic of this chapter, and by following the chemists so central to redefining smell over the past century, the chapter further emphasizes the intimacy of industrialization wrought over the past 150 years. In *both* public and private, at *both* the scale of the house and the factory, industrialization meant more than automation, electrification and standardization. It also meant the rewiring of individual sensory perception, enabled through the racialization of domestic expertise once dictating what clean "should" and could smell like, and then the commercialization of bodily sensation.[503]

At stake in this transformation is determinative power over sensory experience. A century of commercialization rendered obsolete manifold physical sensations that were once integral to the cleaning process. Some of these were explicitly painful (hands rubbed raw from lye); some were explicitly pleasurable (the feel of clean silk against the skin). But most parts of the task occupied a middle territory of neither painful nor pleasurable outside of a cultural system giving these experiences meaning. The smell of birch bark communicated self-sufficiency to some,

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[502] Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven: Yale University Press, 2010); Gregg Mitman, *Breathing Space: How Allergies Shape Our Lives and Landscape* (New Haven: Yale University Press, 2007); Michelle Murphy, *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, and Women Workers* (Durham: Duke University Press, 2006); *Landscapes of Exposure: Knowledge and Illness in Modern Environments,* Gregg Mitman, Michelle Murphy, and Christopher Sellers, eds. *Osiris* Vol. 19 (2004); Nan Enstad, "Toxicity and the Consuming Subject" in *States of Emergency: The Object of American Studies,* Russ Castronovo and Susan Gillman, eds., (Chapel Hill: University of North Carolina Press, 2009), 55-68; Christopher Sellers, "Thoreau's Body: Towards an Embodied Environmental History," *Environmental History* 4, No. 4 (Oct 1999): 486-514.

[503] Connie Y. Chiang, "The Nose Knows: The Sense of Smell in American History." For other historians making such arguments, see Melanie Kiechle, *Smell Detectives: An Olfactory History of Nineteenth-Century Urban America* (Seattle: University of Washington Press, 2017); Melanie Kiechle, "Navigating by Nose: Fresh Air, Stench Nuisance, and the Urban Environment, 1840–1880," *Journal of Urban History* Vol. 42, No. 7 (2016); 753-771.

poverty to others; ditto the sound of linens snapping on the clothesline, the smell of Oxydol soap, the weight of the iron, and the dull sight of faded calico. The meaning of each of these experiences was not given; it was constructed.

Moving beyond debates over when household technologies saved labor or created more work for domestic workers, this chapter focuses on making explicit the sensory experiences constituting washing labor in the 1890s, 1920s, 1950s, and 1990s—and the role of commercial chemists in transforming those sensory experiences. To note labor saved by a century of commercial chemistry while ignoring the impacts of that research on worker's sensory experiences accounts for only *parts* of industrialization's impact on working bodies. Put more simply: domestic work was more than just laborious. It was also a process through which domestic workers experienced and managed the natural world. A full accounting of industrialization's impacts—shaping what cleanliness meant, thus what domestic work meant, and thus what sensory perception meant—requires centering domestic workers as the historical actors they have always been.[504]

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This chapter seeks to answer one seemingly simple question: Between roughly 1890 and 1990, how and why did commercial chemists transform laundry soap into laundry detergent? In resource terms, this transformation meant the reorientation of a soap-making industry built

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[504] Pleasure, of course, is a complicated term to assign both to work which has been exploitative for the full period my dissertation covers, and because pleasure itself, vis a vis female experience, suggests its own troubled history. There is more reading to do here. Informing my thinking on pleasure is the environmental philosopher Kate Soper. She writes, on the necessity of using pleasure as guide for distinguishing between ecologically beneficent and ecologically detrimental actions: "We have, in short, to be prepared to track the surfacing of desires for otherness [alternatives to capital modernity] on the ground *this* side of the precipitous face of such radical social change, even at the cost of finding them in the wrong places, desired by the wrong people, and contaminated by all the banality and political confusion and ordinariness of the everyday consumer culture out of which they will (since from where else?) be emerging." See Kate Soper, "Alternative Hedonism" *Cultural Studies* 22 (Sept 2008), 567-587. See also Kate Soper, *Troubled Pleasures: Writings on Politics, Gender, and Hedonism* (London: Verso, 1990). For an attempt to historicize authenticity, particularly how authenticity and performance relate to pleasure, see also Sarah Banet-Weiser, *Authentic: The Politics of Ambivalence in a Brand Culture* (New York: New York University Press, 2012).

around a resource-flexible reliance on many different types of fat—beef tallow, cottonseed oil, coconut butter, palm oil, and even horse grease—into one reliant on the petrochemical gas propylene. In capital terms, this transformation meant the consolidation and 1930s emergence of a "Big Three" multination corporations: Procter & Gamble, Lever Brothers, and Colgate-Palmolive, companies who today boast sales to four out of five households globally. In knowledge terms, this meant the transformation of domestic expertise held by household workers—knowledge of how to make soap, and how to scent wash water—into chemical expertise wielded at the laboratory bench. In cleanliness terms this meant the transformation of a nineteenth-century standard that left clean clothes odorless, to one in which clean clothes had a brand and a smell. "Here's TIDE—Procter & Gamble's new washday miracle!" cheered a print advertisement from a 1949 *McCall's* magazine for what was one of the first petrochemical detergents to appear on the national market. "NOTHING LIKE IT! … no soap—no other 'suds'—no other washing product known—will get your family wash as clean as Tide!"[505] Between 1890 and the 1950s, and then again between the 1950s and 1990s, the meaning and definers of cleanliness were transformed. Tracing the shift from birch bark to Oxygel to encapsulation offers us much insight into the material objects and chemical manipulation on which our contemporary cleanliness standards rely.

The central claim of my chapter is this: that synthetic detergents have been no washday miracle. Despite lofty language touting the cleaning ability of these petrochemical products, these postwar miracle cleaners functioned much as their antecedent soaps had, and by design. Both lathered. Both penetrated fabric fibers. Both move dirt off of fabric. Far from a washday miracle, emergent 1950s detergents instead indicated two transformations that had nothing to do with

[505] "Procter & Gamble's new washday miracle!" advert, *McCall's* __, No. __ (September 1949), 23.

cleanliness: they demonstrated the shoring up of commercial chemists as crucial actors in a corporate hierarchy, and petroleum rather than fat as a seemingly more secure raw commodity on which to build a production chain. The emergence of detergents also demonstrated the solidification of branded cleaning products as popular replacements for homespun varieties, rendering obsolete knowledge of how to make soap, as well as a knowledge of the natural world appearing in the washtub and on the laundry line.[506]

This chapter foregrounds smell as a defining metric of cleanliness. Focusing on smell is not intended to discount visual cues (whiteness, a lack of stains, or eventually colorful brightness) or tactile cues (starched stiffness, ironed smoothness, or eventually laundered softness) that in past chapters we have seen communicated one's cleanliness to peers in the nineteenth century and then twentieth centuries. But a focus on visual cleanliness risks missing a sensory world that commercial chemists, particularly those working in the early twentieth-century, ushered into being. Of all the sensory expectations associated with cleanliness, smell is *the* sense that chemists—in concert with advertisers, appliance manufacturers, and domestic workers—have most changed over the last century.

I. Saving Fat

At a household scale, nineteenth-century soap making required three key ingredients: fat, lye, and salt. Fat, which domestics referred to as "soap grease," was the most important ingredient by volume. Soap grease might come from floppy beef tallow, hard white pork fat, viscous olive oil, or straw-colored cottonseed oil. But the most likely source of soap grease was an

[506] On the rise of toxicity in the household, particularly the role of consumers as well as chemists in driving this change, see: Michelle Mart, *Pesticides, a Love Story: America's Enduring Embrace of Dangerous Chemicals* (Lawrence, Kansas: University Press of Kansas, 2018); Paul David Blanc, *Fake Silk: The Lethal History of Viscose Rayon* (New Haven: Yale University Press, 2016); Jeffrey L. Meikle, *American Plastic: A Cultural History* (New Brunswick, N.J.: Rutgers University Press, 1995); Regina Lee Blaszczyk, *The Color Revolution* (Cambridge, Mass.: MIT Press, 2012).

odorous combination of discard household fats, collected from the cooking stove and, perhaps, from the slaughter. The challenge for nineteenth-century homemakers was the management of this heterogeneous collection of fats. How should one clean, store, and transform discard drippings into uniform hunks of lathering soap?[507]

Household-scale soap making required one addition input beyond raw ingredients: labor. Homemakers and domestic workers put technical knowledge to work overcoming material constraints. With the work of an experienced domestic worker, waste cooking fat became soap grease or tallow for candles, and discard wood ash became caustic lye for soap making. The symbiosis of household processes was true for multiple parts of the garment-washing process. The same bran one used in muffins or breakfast cereal could be soaked to make a wash water good for cottons. At slaughtering time, the acidic liquid bile from inside a cow's digestive system—a nineteenth-century precursor to commercial enzyme cocktails—could be heated with soap to make a distillate useful for scouring woolens.[508] Early twentieth-century social critics either sought to professionalize this domestic knowledge via Home Economics, or to dismiss it endemic of rural "backwardness." Contrary to either of these indictments, soap making was embedded within a form of valuable system knowledge, prized by white domestics in the nineteenth century as emblems of Republican motherhood, and wielded by paid help and slaves as painful hedge against firing.[509]

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[507] See Catharine E Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845), esp. 290-291; Eliza Leslie, *The house book, or, A manual of domestic economy: for town and country* (Philadelphia: Carey & Hart, 1840). Mrs. Cornelius, *The young housekeeper's friend, or, A guide to domestic economy and comfort* (Boston: Tappan and Whittemore, 1855).

[508] Catharine E Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845); Sarah Josepha Buell Hale, *The Ladies' New Book of Cookery* (New York, H. Long & Brother, 1852).

[509] Glenna Matthews, *"Just a Housewife:" The Rise and Fall of Domesticity in America* (New York: Oxford University Press, 1987).

Expertise was important because homemakers made soap, at best, on a semi-annual basis. Know-how meant the difference between usable soap grease at soap-making time and grease that had turned rancid; finished soap that lathered in the wash basin or just sweated oil; and soap that left angry lye rashes on the skin versus that which did not. Measuring their work by the "kittle" (kettle) or barrelful, domestics shouldered a day-long labor when making soap. The process required as much as 40 pounds of grease to create sufficient stores of soap to last a household for six months. Proportions of each ingredient mattered a great deal, as did the strength or purity of each ingredient because soap making was a reaction between raw ingredients. Though the worth of a domestic worker was too often judged based on one's capacity to master "mundane" tasks as soap making, the fact remained that expertise yielded soap bars with a greater capacity to clean garments. As such, nineteenth-century domestic guides emphasized the need for a technical know-how when making soap.[510]

Odorlessness was the goal of nineteenth-century washing in large part because an abundance of pungent and unpleasant odors marked the laundry-washing process, not just soiled clothing, from start to finish: the acidity of ox-gall, the head-aching sharpness of lye, the sour scent of bluing, and the hot metallic smell of ironing would have marked the washing process for domestic laborers. To know that a piece of clothing was clean, one would seek the blandishment of putrid odors rather than the presence of a scent.

By the middle of the nineteenth-century, soap making had become at least a partially commercial enterprise. In dense northeastern cities like Boston, New York, and Philadelphia, door-to-door soap-fat merchants visited households and restaurants to collect waste grease. In

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[510] Catharine E Beecher, *A Treatise on Domestic Economy, for the Use of Young Ladies at Home and at School, revised edition, with numerous additions and illustrative engravings* (New York: Harper & Brothers, [1841] 1845); Sarah Josepha Buell Hale, *The Ladies' New Book of Cookery* (New York, H. Long & Brother, 1852).

some cases, they traded finished soap for stock ingredients. Julia Ward Howe recollected an 1845 visit from such a tradesman, who symbolized a well sight because of the work such a salesman represented: "Our house has been enlivened of late by two delightful visits. The first was from the soap-fat merchant, who gave me thirty-four pounds of good soap for my grease. I was quite beside myself with joy, capered about in the most enthusiastic manner, and was going to hug in turn the soap, the grease, and the man, had I not remembered my future ambassadress-ship, and reflected that it would not sound well in history."[511]

But for households outside an elite urban set, the work of collecting, cleaning, and rendering fat as soap fell on the shoulders of homemakers, domestic help, and slaves. Soap making was a technical process that demanded knowledge of fat type, storage, and cleaning; wood type, to recognize hardwood ash; and visual inspection to know when a boiling soap vat would yield usable soap when cooled.

II. Amassing Fat

Beginning in the 1870s, commercial soap making was a large enough enterprise in the U.S. to attract the attention of competitors in France, England, and Switzerland. From Britain, industrialist William Lant Carpenter offered the following hopeful assessment. "It may be said, without fear of contradiction, that while perhaps for fancy toilet soaps the palm must be given to France, England and the United States are pre-eminently the countries where the manufacture of the different varieties of household and factory soaps is most clearly understood, and carried

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[511] Howe, Julia Ward, 1819-1910, Letter from Julia Ward Howe to Louisa Culter Ward Crawford Terry, 1845, in *Julia Ward Howe*, 1819-1910, vol. 1. Richards, Laura E., Elliott, Maud Howe and Hall, Florence Howe. Boston, MA: Houghton, Mifflin & Co., 1915, pp. 110-111; Phoebe George Bradford, *Diary of Phoebe George Bradford*, January, 1836, in Phoebe George Bradford Diaries. Wilson, W. Emerson. Wilmington, DE: Historical Society of Delaware, 1975, pp. 250-258. See also "Chapter 2. Any Rags, Any Bones" in Susan Strasser, *Waste and Want: A Social History of Trash* (New York: Metropolitan Books, 1999).

out on the largest scale, and in the best manner."[512] The reasons for U.S. dominance were no secret to competitors in Europe: U.S. pig farmers, feeding their swine corn and other fattening grains, produced sufficient lard as to supply U.S. soap and candlemakers with ample left over for export. Lard producers in Europe—Russia, Hungary, and Serbia—could hardly keep pace. "Hungarian lard is supplied to the whole Continent; many of the pigs are so lean as to be useless for food, and some establishments in Budapest boil down ½ million yearly for the lard alone," Carpenter lamented. In the United States, by contrast, "the average yield of lard from each pig was 25 lb. in 1862, and 37 ½ lb. in 1874." These fatting figures meant that U.S. soap maker enjoyed ample raw stock before export. Further, annual lard exports from the U.S. in the 1870s were 35 million pounds, of which U.K. soap makers alone consumed ten percent. Fat, it seemed, was a key to industrial success.[513]

Scent, by contrast, factored into soap making processes for only the most expensive varieties. For soap makers on both sides of the Atlantic, fragrances made soap bars into luxury items that commanded a higher profit margin. The scenting of soaps had long been a norm for expensive toilet soaps – that which would sit by one's wash basin, alongside one's horsehair brush and crystal perfume bottle. Attempts to mimic French toilet soaps compelled Chicago- and New

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[512] William Lant Carpenter, *Treatise on the Manufacture of Soap and Candles, Lubricants and Glycerin* (London: E&F.H. Spon, 1885), 227.

[513] Carpenter, *Treatise* (1885), 25-26. On the process of raising and fatting out pigs, see Isaac Lippincott, *A History of Manufacturers in the Ohio Valley to the Year 1860* (New York: Knickerbocker Press, 1914), 112-114; 177-182. Lippincott explains that in Cincinnati, dubbed "Porkopolis" for the centrality of the city's pig slaughterhouses and meatpacking industries, lard had become a driving industry by the 1830s. This was in part due to the city's strategic position on the Ohio River, which linked the city to urban markets like Pittsburgh, Louisville, Memphis, and New Orleans. But it was also due to Cincinnati's strategic proximity to other ingredients crucial to producing sellable pork: salt and corn. Salt, which arrived by the barrelful from Kentucky, was crucial to preserving meat being shipped as bacon, sausages, and pork to distant cities. And corn was crucial for fattening pigs, a process that firmed up what was otherwise soft and oily meat, and produced firm and white lard. So crucial was the last stage of corn-feeding pigs that by the 1820s, two specializations had developed among growers of pork: "growers," who birthed and raised pigs from April through late August; and "fatters," who fed pigs corn for the six to eight weeks prior to their late-autumn slaughter. See also Daniel Aaron, *Cincinnati, Queen City of the West, 1819-1838* (Columbus: Ohio State University Press, 1992), esp. Chapter 1. "The Material Basis of the Society."

York-based soap producers to introduce scented, mottled, and high-fat soap bars sold to elite customers. Beginning in the 1870s and 1880s, U.S. soap makers began introducing fragrances like rose, almond, and even lettuce to paper-wrapped bars meant for washing one's hands and face. The odors communicated civility and class.[514]

Essential oils, however, were too expensive an ingredient to justify their integration into any production process except those yielding high-cost, high-profit toilet bars. Laundry soap, industrial soaps, and marine soap all arrived on store counters without any specific odor. Instead, 1870s soap makers producers sought to expand profit margins and demonstrate national dominance by solving a different problem: acquiring steady supplies of cheap fat at scale.

Within the U.S., soap makers contracted with slaughterhouses or oil-crushing plants to shore up fat supplies. This meant that raw materials varied regionally based on the type of fat companies amassed. Larkin & Co., a soap maker in Buffalo, took advantage of their strategic location at the terminus of the Erie Canal to buy floppy white beef tallow from Midwestern and New York cattle yards, both. At Cincinnati-based Procter & Gamble, by contrast, executives expanded on six decades of purchasing pork lard with a bet on viscous yellow cottonseed oil from regions to the south. The liquid oil had become viable as soap stock in the 1870s, when the introduction of separators made possible the cut the oil-rich kernels from their hulls and the filtering out fibers that otherwise turned the oil rancid.[515] In 1898, Procter & Gamble executives

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[514] William Lant Carpenter, *Treatise on the Manufacture of Soap and Candles, Lubricants and Glycerin* (London: E&F.H. Spon, 1885); "Chapter 5. Soft-Soap Empire: Commodity Racism and Imperial Advertising" in Anne McClintock, *Imperial Leather: Race, Gender and Sexuality in the Colonial Contest* (New York: Routledge, 1995). Carpenter (1885) mentions Kirk & Co., Babbitt & Co., and Colgate & Son as the largest soap producers of the 1880s; these will be named I'll want to look for when I go back to the NMAH archives.

[515] This was in addition to the 1890s establishment of a central purchasing department that bought coconut oil from the Philippines, the land spoil ceded to the U.S. at the conclusion of the Spanish-American War. The company also began purchasing palm oil from the Belgian Congo, and fats from slaughterhouses of Chicago. See Alfred Lief, *"It Floats:" The Story of Procter & Gamble* (New York: Rinehart & Company, Inc., 1958).

contracted for the entire output of a cottonseed-crushing mill in Mississippi. Soon after the soap-making company formed the Buckeye Cotton Oil Company as an in-house subsidiary. It leased and operated a mill at Greenwood, Mississippi in 1901, and installed several refining presses in Ivorydale, P&G's Ohio-based corporate headquarters. By 1905, P&G owned eight cottonseed mills across the U.S. south and by 1911, was one of the largest buyers of cottonseed oil in the world.[516]

Executives at European soap making firms watched U.S. industrial expansion with cool interest; they were amassing their own stores. If any moment marked the turning point from soap as a regional to a global commodity, it was this: the 1897 spring day on which a group of workmen clambered up to the roof of the three-story brick building at 194 Broadway Street in Cambridge, Massachusetts.[517] Down came the weathered "Curtis Davis & Co." sign; up went "Lever Brothers, Ltd." A sea change was sweeping in with William Lever, the 5-foot 8-inch Brit whose underwhelming stature belied the businessman's staggering access to capital. In 1897, the Bolton-born Brit was worth more than 4 million pounds, and head of a soap and butter company selling products in 11 Europe nations.[518]

Contrary to corporate origin myth celebrating courageous business gamble, Lever

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[516] Cottonseed would prove crucial for the venture that Procter & Gamble would become known for by the 1930s outside of the home cleaning market: the at-scale sale of manufactured food items like salad dressing, cooking oil, and margarine. Cottonseed oil would prove important stock for each of these uses. See Alfred Lief, *"It Floats:" The Story of Procter & Gamble* (New York: Rinehart & Company, Inc., 1958).

[517] "Davis, Curtis & Co.," in *The Cambridge Directory* (Boston: W.A. Greenough & Co., 1898), p. 190-191. By 1904, Lever Brothers Ltd had relocated to 107 Harvard Street, also in Cambridge. See *The Cambridge Directory* (Boston: W.A. Greenough & Co., 1904), p. 369.

[518] Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change,* Vol. 1 (London: Cassell & Company Ltd, 1954). By a century later, Unilever—the conglomerate resulting from a 1929 merger between Lever Brothers and Dutch-based Margarine Unie—would boast an operating profit of $4.9 billion and sales on every continent except Antarctica. See Unilever, Inc., "Annual Review 1998 Supplement in United States Dollars," March 11, 1999 (accessed 27 July 2017), https://www.unilever.com/Images/1998-unilever-annual-review-sup-dollars_tcm244-424219_en.pdf.

Brothers' 1897 arrival in the U.S. was less an instance of risky investing than a pro forma exercise in avoiding international tariffs. With Lever's 1897 purchase of the Cambridge, Massachusetts soap factory, and his purchase two years later of a Philadelphia-based soap factory, Lever Brothers succeeded in insulating itself from stiff import taxes by producing British branded soaps on U.S. soil.[519] Company executives had been trying to break into the U.S. market for a least a decade, selling popular Lifebuoy and Monkey Brand soaps to buyers along the Eastern seaboard. With an eye to a growing number of American buyers, particularly those further from eastern ports, Lever made annual trips to the U.S. between 1894 to 1898. In 1895 he signed off on the opening of a Brooklyn sales office, staffed by four full-time employees and three traveling sales staff. Salaries ranged from $4 per week (the errands boy) to $8,000 per year (the manager). The office would be a hub for moving popular Lever soaps into American hands.[520]

One shift symbolized by Lever Brothers' 1897 arrival in Cambridge was the dawning of fat trade as a truly global enterprise. In breaking with generations past, where soap manufacturers had bought and sold at a city or regional scale, the late nineteenth-century marked the beginning of the global circulation of both soap-making raw ingredients and branded soap itself. In Britain, the value of soap exports hit $451,246 in 1887.[521] In the U.S., soap exports doubled between 1899 and 1906, climbing from $1.5 million to $2.8 million worth of trade—an amount nonetheless in size to other growing U.S. export industries like glass and glassware

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[519] Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change*, Vol. 1 (London: Cassell & Company Ltd, 1954). Wilson notes that raw materials were taxed at a much lesser rater than manufactured goods in 1898, thus motivating Lever's purchase of factories behind tariff walls in the U.S. Future research will use the *Oil, Paint, and Drug Reporter*, the primary U.S.-based trade publication of the nineteenth-century, to determine the level of these tariff rates at the turn of the century. This can help me assess the relative weight of financial motivations for Lever's investments versus considerations like securing

[520] Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change*, Vol. 1 (London: Cassell & Company Ltd, 1954).

[521] James Cameron, "Appendix: Export of Soap and Candles," *Soaps and Candles* (London: J.&A. Churchill, 1888), 293.

($2.4M), gunpowder ($3.6M), and half that of tobacco ($5.4M).[522] By 1906, almost half of U.S. soap exports were going to Europe, and European-based companies like Lever Brothers were galvanized to expand in the opposite direction toward the U.S.[523]

Lever Brothers' 1897 arrival in Massachusetts marked a middle point in a 20-year drive to find new fat sources and soap consumers. Between roughly 1892 and 1910, the company lavished considerable capital and political clout on fat-accumulating ventures. In 1894 the company bought a cotton seed-crushing plant in Vicksburg "in the very heart of the Mississippi and Yazoo valley's cotton plantations," as a bet on viscous yellow cottonseed oil. In the Solomon Islands, Lever Brothers agents purchased 51,000 acres of copra plantation from the Pacific Islands Company, which held the property as a 99-year lease from the British Government. The purchase of a second property in the Solomon Islands, named Lever's Pacific Plantations Limited and incorporated in England in 1902, was also a bet that white coconut butter could be made into usable soap.[524]

Beyond the Pacific, Lever Brothers turned its sights towards the west coast of Africa. Eying the facilities already producing palm oil and palm kernel oil up and down the coast, Lever's agent marveled at the "inexhaustible supply … only awaiting development and the opening up of markets."[525] In 1911, the Belgian Parliament ratified an agreement that identified

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[522] "Exports of Manufacturers, 1899-1906" (p. 29) in U.S. Department of Commerce and Labor, Bureau of Statistics, *Exports of Manufactures from the United States and Their Distribution by Articles and Countries, 1800 to 1906* (Washington: Government Printing Office, 1907).

[523] "Distribution of Exports, 1906" (pg. 32) in U.S. Department of Commerce and Labor, Bureau of Statistics, *Exports of Manufactures from the United States and Their Distribution by Articles and Countries, 1800 to 1906* (Washington: Government Printing Office, 1907).

[524] Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change*, Vol. 1 (London: Cassell & Company Ltd, 1954). David Kenneth Fieldhouse, *Unilever Overseas: The Anatomy of a Multinational, 1895-1965* (London: Croom Helm and Stanford, California: The Hoover Institution Press, 1978).

[525] As quoted in Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change*, Vol. 1 (London: Cassell & Company Ltd, 1954), 165.

five palm-bearing areas in the Belgian Congo as "domainal land" of Lever Brothers Limited: plantations centered on Bumba and Barumba on the Congo, Lusanga on the Kwilu, Ingende on the Ruki, and Basongo on the Kasai. The agreement described Levers' Brothers production territory as any area within a radius of 60km from these central points. In exchange for favorable lease terms, Lever Brothers was to set up an oil mill at each site to process a minimum of 6,000 tons of palm fruit per year within six years. Lever renamed the mill areas under his corporate charge after his family: Elisabetha, Alberta, Ingende, Leverville, and Brabanta. If the company met the terms of an agreement, the land would be held on lease from its imperial landholder, the Belgian government, until January 1, 1945, when it would pass into the possession of the Lever subsidiary *Huileries du Congo Belge.* Congolese people had no role in the decision.[526]

Meanwhile, in Nigeria, Lever Brothers' erected mills in Opobo and Lagos in 1910, a bet on bright red palm butter that smelled of violets, and a similar mill in Sierra Leone in 1912.[527] By 1922, those landholdings had expanded to include a very large plantation in Jabbe, Nigeria.[528] By the end of the fats-accumulating frenzy, in 1922, advertising director William R. Resor congratulated Ed Perrin of Lever Brothers with a laudatory memo: "Owning the Niger Company, Africa, Lever Brothers dominates the palm oil market."[529] Domination was key.

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[526] Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change,* Vol. 1 (London: Cassell & Company Ltd, 1954).

[527] Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change,* Vol. 1 (London: Cassell & Company Ltd, 1954).

[528] "The Lever Business in 1906: A Diagrammatic Impression" in Wilson, p. 111.

[529] Telegram, March 14, 1922, W.G. Resor to Ed. Perrin, as quoted in "The Advertiser: Lever Brothers Company" J. Walter Thompson Company Information Center, p. 3, Box LB1, Account Files, 1885-2004, Folder "Advertising and Company Histories, 1944, 1959, 1963, n.d." Hartman Center. By 1955, the company's sourcing was even more global: tallow from Australia, New Zealand, and the U.S.; palm oil from West Africa, Malaysia, and Indonesia; groundnut oil from West Africa and India; cottonseed oil from the U.S. and Egypt; soybean oil from China and the U.S.; palm kernel oil from West Africa and Malaysia; and whale oil from a number of sources. "Raw Materials and Technology of Soap Manufacture" in *Unilever: A Study by Smith, Barney & Co.,* (New York: Smith, Barney & Co., 1955)

William Lever and his company associates had not used the term "imperialism" to describe the accumulation of fat resources and agricultural labor forces, now secured, that would form the basis of the company's success. But virtually all of the raw ingredients making possible the manufacture of Lever soaps were possible because of British, Belgian, and American imperialism.

Both Procter & Gamble and Lever Brothers exemplified the new global reach of commodity chains founding the early twentieth-century global circulation of soap bars. But even with their access to capital, the two companies were far from the only ones thrusting paper-wrapped soap bars into consumer hands. In the U.S., more than 500 factories were operating in the continental United States in 1900.[530] Some of the companies in business boasted the names of their founders (Procter & Gamble, the Colgate Company, B.J. Johnson Soap Company, Swift & Company); others cited their location (Louisville Soap Company); still others made artful appeals to their hoped-for reach (Atlas Soap Company, Globe Soap Company) or effect in the washtub (Rub-No-More Co.). But regardless of company name or size, each understood the other as a source of competition. As such, companies adopted one additional strategy in the twentieth-century drive to secure raw materials and gain market share: buying each other.

In the U.S., industry consolidation stretched from 1900 to roughly 1930. An industry snapshot from 1920 shows a middle moment in a 30-year-long consolidation process: a decrease by 20 per cent in the number of soap-making plants between 1904 and 1919, during which the number of workers in those plants doubled.[531] By 1919, those plants producing more than $1 million in value had increased to 22 a decade earlier to 36. In this same decade-long period, all

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[530] U.S. Census Bureau of Manufacturers, "Table 1.-Comparative Summary, By Specified Industries: 1880, 1890, and 1900," in *General Tables. Specified Industries—Comparative Summary*, *1900 Census: Volume VII. Manufactures, Part 1. United States by Industries* (Washington, D.C.: Government Printing Office, 1900), pg. 14.

[531] U.S. Bureau of the Census, "Table 1.—Comparative Summary: 1919, 1914, 1909, and 1904" in *Chemicals and Allied Products, U.S. Census of Manufacturers* (Washington, D.C.: Government Printing Office, 1920), 767.

other sizes of facility (those producing less than $5000 up to those producing $1,000,000 in sales) shrank from 398 in 1909 to 312 in 1919.[532]

In 1931, consolidation has left its mark. Lever joined American-based companies Procter & Gamble and Colgate-Palmolive-Peet—the latter itself a product of a merger—as comprising the "Big Three" soap producers, where together the three companies accounted for a staggering 78 percent of U.S. soap sales.[533] These "Big Three" companies were not the only agents redefining consumer notions of cleanliness in an early 1930s moment. As we have seen in past chapters, racial anxiety was combining powerfully with manufacturer promises that electrification, washing machines, synthetic fabrics to push consumer expectations towards a fixation on cleanliness as indoor and automated work. But the size and reach of these three firms helps explain the totality with which corporate decisionmakers were able to usher in two changes. One was the standardization of heterogeneous fat supplies, in part via the increasing use of fragrance in commercial soaps to mask foul-smelling raw fat and to brand the item. The second was the shift from animal fat and vegetable oil as the raw material of industry to petrochemical products as the raw materials of soap-making. Each of these changes would transform what consumers expected cleanliness to smell like, and also make radically more toxic the ecological costs of washing one's garments. To accomplish either of these ends, the "Big Three" had to invest in commercial chemistry laboratories.

III. Standardizing Fat

The first step toward standardization began in the 1870s and 1880s, when industrial soap

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[532] U.S. Bureau of the Census, "Table 1.—Comparative Summary: 1919, 1914, 1909, and 1904" in *Chemicals and Allied Products, U.S. Census of Manufacturers* (Washington, D.C.: Government Printing Office, 1920), 767.
[533] "Procter & Gamble." *Fortune*, December 1931, 92–96, 98. See also Paul A. Laux, Emmett H. Miller, and John J. Siegfried, "Soap and Detergent," in David O. Whitten, and Bessie E. Whitten, eds. *Extractives, Manufacturing, And Services* (Westport: Greenwood Publishing Group, 1997), 217-234.

makers built a new language for categorizing raw soap-making ingredients. Echoing the domestic nomenclature of "tallow," "lard," "suet" and "drippings," commercial slaughterhouses and soap makers employed a schema that helped organize fats at facilities pumping out soap, candles, cooking oils, and pharmaceuticals made from as many as 500 animals daily. The schema included four categories: "prime tallow," "regular tallow," "lard" and "offal." "Prime tallow" came from around the kidneys of a cow and from the caul, the amniotic membrane enclosing a fetus. It would be melted and sold off to luxury soap makers. "Regular tallow," by contrast, was that solid fat gleaned from other parts of the cow: the haunches, bones, and trimmings. These parts of the animal were those most frequently used in soap making for industrial or household purposes.[534] "Lard," meanwhile, referred to pig fat, usually that subcutaneous layer taken from an animal's midsection. In the middle of the nineteenth century, lard had many pharmaceutical uses. But by the 1880s, manufacturers began worry about water or salt impurities in the fat that would hinder medical uses. With a turn towards other substances, lard became a chief cooking and soap-making ingredient.[535] Finally, "offal" referred to the internal organs, as well as bones and other discard parts, that could be boiled down for fat. For nineteenth-century producers, offal went mostly to fabricating cheap industrial lubricants.

The early twentieth-century frenzy to amass fats created a new problem for those firms that had succeeded at acquiring cottonseed oil, coconut butter, palm oil, offal, tallow, or lard: variety. Trade journals and industrial advice literature from the late nineteenth-century feature hefty chapters devoted to one topic and one topic alone: "Raw Materials;—Their Sources and

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[534] "Beef: From the Range to the Shambles," *Harper's New Monthly Magazine* No. 409 (June 1884), 292-302; Roger Horowitz, "'Where Men Will Not Work': Gender, Power, Space, and the Sexual Division of Labor in America's Meatpacking Industry, 1890-1990" *Technology and Culture* Vol. 38, No. 1 (Jan. 1997), 187-213.

[535] *A reference handbook of the medical sciences, Vol. 2*, 1st edition, Albert Henry Buck, ed. (New York: W. Wood & Company, 1885–1893). Buck remarks, "Commercial lard is so universally impure, either being mixed with water or salt, or having a portion of its liquid oil removed, that it is in general unfit for medicinal use." (380)

Preparation." 40, 50, even 80 pages of 150-page volumes detailed the different fat types a soap-maker might encounter: "Olive-oil. Tallow. Lard. Palm-oil. Cocoa-nut Oil. Castor-oil. Bone-grease. Horse-grease. Kitchen-stuff. Oleine. Fish-oils."[536] The drive to employ commercial chemists as soap makers, and eventually to create in-house research laboratories, originated as much in Filipino cocoanut groves and in American cottonseed fields as it did in corporate boardrooms. *How* to use any particular type of fat, as well as *whether* to use it, remained an open question for soap-makers acclimating to new scales of production and a global fat trade.

Soap makers found refuge in the discipline of chemistry. The same 1890 – 1920 period of fat accumulation also saw the addition of chemists to the payrolls at companies like Lever Brothers, Colgate & Co., and Procter & Gamble. In the 1890s, these efforts were piecemeal. Executives at Procter & Gamble, for example, contracted with Campbell Morfit as a "consulting chemist" through the 1880s and then hired a full-time chemist to head the new Alkali Department in the 1890s.[537] At Lever Brothers, executives retained Leebert Lloyd Lamborn from the Curtis David & Co. staff and also bought into the robust Mid-Atlantic chemical trade with the purchase of the Philadelphia-based company, Benjamin Brookes, in 1898. By 1920, Colgate & Co. had joined ranks with Lever Brothers and P&G in investing in an in-house industrial laboratory.[538]

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[536] Alexander Watt, *The Art of Soap-Making: A Practice Handbook of the Manufacture of Hard and Soft Soaps, Toilet Soaps, etc.* 5th ed. (London: Crosby Lockwood and Son, 1896); R. S. Cristiani, *A Technical Treatise on Soap and Candles; With a Glance at the Industry of Fats and Oils* (Philadelphia: Henry Carey Baird & Co., 1881), 389.

[537] *Memorable Years in P&G History*, 1987; A.S. Richardson, "Harley James Morrison" *Industrial and Engineering Chemistry* Vol. 23, No. 5 (1931): p. 594.

[538] *Annual Chemical Directory of the United States, 3rd edition*, B. F. Lovelace, ed. (Baltimore: Williams & Wilkins Company, 1920).

An equally large proportion of research took place in laboratories not operated by soap manufacturers themselves. By 1920, a genus of commercial laboratories had sprung up that sought breakthroughs they could sell *to* soap manufacturers. At the laboratory named for its head chemist, Arthur D. Little of Cambridge, Massachusetts, a 34-person research staff worked on research charges from "utilization of lumbering waste" to "soap, metallurgy, application to colloid chemistry." At a research laboratory operated by American Cotton Oil and Associated Cos., in Chicago, a staff of 12 researchers focused on general "theoretical and industrial applications in connection with vegetable oils." Soap was surely one among many such applications.[539]

Within soap manufacturing firms, decision-makers turned chemical analysis towards resolving several problems flowing out of scaled up production. In the 1890s, chemical analysis seemed to offer soap makers a means for evaluating competitors' soaps. Such assessments might allow one to adopt best practices from a competitor whose patent did not protect against the reverse-engineering of a soap-making process. At the Lever Brothers Cambridge facility, for example, chemist Leebert Lamborn labored over laboratory notes detailing the 11-day process through which competitor Procter & Gamble manufactured its top-selling Lucox soap through.[540]

Evaluating the chemical composition of a competitor's soap, for a short while, also seemed like business strategy for eliminating competition. By the early 1900s, federal laws like the Pure Food and Drug Act of 1906 used chemical specificity to distinguish between "pure" and

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[539] National Research Council, *Bulletin of the National Research Council: Research Laboratories in Industrial Establishments of the United States of America* Vol. 1, Part 2, No. 2 (National Academy of Sciences: Washington, D.C., 1920), 51.

[540] "The Chronology of a Boil of Welcome Soap. Arranged by E.D.M. Modified by L.L.L.," Leebert Lloyd Lamborn Notebook, May 1898. Othmer Library, Box 2005.107.

"adulterated" products. The widely-cited *Pharmacopoeia of the United States of America* set limits on how much water a soap could contain—no more than 33%—before it was legal considered adulterated. [541] Thus for some soap makers, one's business might thrive after catching a competitor in the act of adulterating their soap. Yet such intra-industry policing came with downsides: soap-makers evidenced simultaneous fears about adulterated stock fat alongside a willingness to include non-soap "fillers" in some of their own product, particularly cheap laundry soap.[542]

A second use of chemical analysis in the early twentieth century was as a means for standardizing production across disparate fat sources. Commercial chemistry offered tools for soap-makers to assess the quality of fats arriving by the crate and barrelful from increasingly distant places and of increasing unfamiliarity. "Classification of Soap Stock … is a subject of great importance. Every purchase of stock sent to the kettle room should be sampled and each sample receive the critical inspection of the superintendent" affirmed Lamborn in his 1898 laboratory notebook.[543] Practice among early twentieth-century chemists combined sensory observation with laboratory measurement. Lamborn, for example, suggested that factory

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[541] *The Pharmacopoeia of the United States of America,* Sixth Decennial Revision, the National Convention for Revising the Pharmacopoeia and the Committee of Revision and Publication of the Pharmacopoeia of the United States of America (New York: William Wood & Company, 1882); *The Pharmacopoeia of the United States of America,* Ninth Decennial Revision, The Committee of Revision and the United States Pharmacopoeial Convention (Philadelphia: P. Blakiston's Son & Company, 1916). Though both volumes offer strategies by which a commercial chemist might test for impurities like metallic salts, silica, and sodium hydroxide, both treat excess water as the chief adulterant degrading the quality of soap. The 1882 guidance names any soap greater than 34% water as adulterated; by 1916 this cut-off remained the same for unpowdered soap but stood at 10% for powdered soap, which was generally regarded as being the higher quality of laundry soaps.

[542] See for example, "Analysis of Pay Day Soap, Louisville Soap Co.," Leebert Lloyd Lamborn Notebook, May 1898. Othmer Library, Box 2005.107. Lamborn's analysis revealed that competitor Louisville Soap Company was putting bromine soda ash in the Pay Day Soap brand, a cheap non-fat filler would bulk up bars without contributing to their cleaning efficacy. In his laboratory notes, however, Lamborn stopped short of either praising or damning the practice. Using filler was, after all, an easy way to cut production costs, and he seemed as tempted to recommend the practice to his superiors at Lever Brothers as he was as reporting it to federal officials monitoring adulteration.

[543] Leebert Lloyd Lamborn Notebook, May 1898. Othmer Library, Box 2005.107.

superintendents scrutinize the following quantifiable characteristics when confronted with a new type of fat:

> Melting point in Deg. F.
> Per cent of Moisture
> Per cent. of Foreign Matter

But he also added two simple sensory scans:

> Color
> Odor.[544]

Indeed, the image of chemists bending noses over soap kettles is at odds with corporate histories that point to their technical sophistication. But it was common. Commercial production into the first decades of the twentieth century relied on chemists who used both sensory and technical to assess the usability of a fat.[545]

Why would soap makers worry about odor? Despite extensive processing, the smell of a fat could carry through to the end of the soap-making process, particularly for soaps made from increasingly low-grade fat. This fact had become apparent as early as the 1880s when, despite a wealth of odorless lard, competition for fats sent all manner of ingredients to the soap kettle. One guide from 1888 offered readers the following assessments to chemists: Horse-grease ("Odor—peculiar"); seal oil ("Smell—unpleasant"); palm oil ("Odour—like violets or orris root").[546] Commercial chemists across the first decades of the twentieth century began filing patents aimed at solving a smell problem: "Patent 992,525: Art of producing edible and odorless fat from

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[544] Leebert Lloyd Lamborn Notebook, May 1898. Othmer Library, Box 2005.107.

[545] See E.G. Thomssen, *Soap-Making Manual: A practical handbook on the raw materials, their manipulation, analysis and control in the modern soap plant* (New York: D. Van Nostrand Company, 1922); George H. Hurst, *Textile soaps and oils: A handbook on the preparation, properties and analysis of the soaps and oils used in textile manufacturing, dyeing and printing* (New York, Van Nostrand, 1904); *Packing-house industries; Cottonseed oil and products; Manufacture of leather; Manufacture of soap,* International *Correspondence Schools* (Scranton, PA: International Textbook Company, 1905); Leebert Lloyd Lamborn, *Modern soaps, candles and glycerin; a practical manual of modern methods of utilization of fats and oils in the manufacture of soap and candles, and the recovery of glycerin* (New York, Van Nostrand, 1906).

[546] See James Cameron, "Fatty Matters," *Soaps and Candles* (London: J.&A. Churchill, 1888), 18-22.

cocoanuts and other similar nuts" (1907); "Patent 929,925: Art of improving the odor of lard substitutes" (1908); "Patent 1,271,188: Method of Superrefining Fat" (1917).[547] Hovering noses over copper soap kettles and peering at glass flasks filled with different stocks of oil, soap makers used olfactory as well as quantitative cues when assessing a fat's viability for the industrial soap kettle.

But herein lay a challenge. For chemists and soap makers, what constituted a pleasant odor was itself not self-evident. Coconut oil, first commercially available in the late nineteenth century, serves as one telling example. As a fatty oil derived from pressed coconut flesh, coconut was the source of much confusion about chemists. Technical soap-making manuals disagreed stridently on whether it was a fat from which sellable soap could be made. "Pure coca-nut-oil soap … is very white, translucent like alabaster, exceedingly light, and forms a good lather, but always possesses a more or less offensive odour," cautioned James Cameron, chemist at Britain's Somerset House.[548] William Lant Carpenter, another chemist, disagreed vehemently, assuring readers that coco-nut or copra oil could be employed to make soap. "When fresh, its odour and flavour are sweet and agreeable," he enthused—but cautioned that the stock fat "quickly becomes rancid" when not properly strained because plant fibers turned the oil rancid when exposed to air.[549] Added soap-maker Alexander Watt, unconcerned with rancidity but worried

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[547] Patent 992,525, "Art of producing edible and odorless fat from cocoanuts and other similar nuts;" filed by George C. Ware of the Edfa Produce Company in 1907; "Patent 929,925: Art of improving the odor of lard substitutes," filed by John H. Filbert of Baltimore in 1908; "Patent 1,271,188: Method of Superrefining Fat" filed by Stewart Barnett of Belleville, Wisconsin in 1917.

[548] James Cameron, *Soaps and Candles* (London: J.&A. Churchill, 1888), 109.

[549] William Lant Carpenter, *Treatise on the Manufacture of Soap and Candles, Lubricants and Glycerin* (London: E&F.H Spon, 1885), 43.

about another odor problem: "cocoa-nut oil impart[s] an offensive smell to the skin after washing with it."[550]

What did Watt mean by an "offensive smell?" What were the features of olfactory offensiveness? How did one know? Perfumers openly acknowledged the "penetrating, disagreeable odour" of musk (the walnut-sized secretive gland cut from the muskrat or musk deer) and ambergris (a fatty substance cut from the intestines of a pot-whale), ingredients prized for their odor and their contributions to the longevity of scent on its wearer. It was only when "sufficiently diluted" in alcohol that such animal scents "possess[ed]… a pleasant odour.[551] "There is not classification of olfactory qualities, which is even provisionally satisfactory from any point of view," lamented the Wellesley faculty member and psychologist Eleanor Atcheson Gamble in 1898.[552] Gamble and her colleagues set out to codify odor perception as the applied science "olfactology," thus initiating a failed research endeavor that executives in the soap and perfume industry watched closely. Though the applied field of olfactology never gained commercial popularity as would peer fields like optics and acoustics, the problem of perception that it pointed at—the physical as well as cultural cues built into individual perception, and the imprecision of quantifying these qualities—remained at the heart of the debate over cleanliness through the twentieth century. How to distinguish between "good" and "bad" smells, and in

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[550] Alexander Watt, *The Art of Soap-Making: A Practice Handbook of the Manufacture of Hard and Soft Soaps, Toilet Soaps, etc.* 5th ed. (London: Crosby Lockwood and Son, 1896), 27.

[551] "Chapter IV. Animal Perfuming Substances" in Geoffrey Martin, *The Modern Soap and Detergent Industry: A Complete Practical Treatise in Two Volumes on the Manufacture of Laundry, Toilet, Pharmaceutical, Textile, Abrasive, Scouring, and Powdered Soaps; also Detergent Compositions and Soap Substitutes of all kinds Including Analyses of Raw Materials, Modern Patents and Literature, Recent Machinery and Processes, together with Numerous Practical Recipes, and Lay-out of Modern Soap Factories*, 2nd ed., Vol. 1 (The Technical Press Ltd: Surrey, England, 1931).

[552] Eleanor Acheson McCulloch Gamble, "The Applicability of Weber's Law to Smell" *The American Journal of Psychology,* Vol. 10, No. 1 (Oct. 1898), 89. Genealogical research suggests that Eleanor Gamble, the daughter of pastor Joseph Gamble of Plattsburgh, New York, was not related to James Gamble, the Cincinnati-based founder of Procter & Gamble, nor that the two were known to each other.

what language to express the smell of cleanliness, was a debate that only saw partial resolution with the advent of synthetic fragrances in the early 1920s.

Early twentieth century commercial chemists did find one matter to agree on, if not odor: that fat content dictated the quality of a given soap. Lamborn urged chemists, after inspecting and smelling a soap stock, to analyze the stock using three tests: a test for melting point (an imprecise indicator of how much saponifiable fatty acid was contained in the sample); a test for percent of moisture (higher moisture content indicated less fat present); and a test for percent of foreign matter (feared for the rancidity it would introduce in the finished soap).[553] By the early 1920s, commercial chemists were using more technically sophisticated methods to evaluate those identical qualities tested twenty years earlier. Phenolphthalein and neutralized alcohol helped chemists determine the percentage of free fatty acid; titering fat determined the temperature at which soap stock would solidify, reacting fat stock with potassium hydrate determined the amount of unsaponifiable matter in a given sample, and heating fat determined the moisture content of a fat stock.[554] But the basic principle prevailed: better soap contained more fat.

IV. Branding Fat

By the 1930s, the soap-making industry in the U.S. was dominated by few firms producing largely homogenous products. The "big three" soap producers—Procter & Gamble, Colgate-Palmolive, and Lever Brothers—accounted for a staggering 78 percent of total

[553] Leebert Lloyd Lamborn Notebook, May 1898. Othmer Library, Box 2005.107.

[554] E.G. Thomssen, *Soap-Making Manual: A practical handbook on the raw materials, their manipulation, analysis and control in the modern soap plant* (New York: D. Van Nostrand Company, 1922), especially "Analytical Methods," p. 127-164; I.V. Stanley Stanislaus, *American Soap Maker's Guide: An Up to Date Treatise on the Art and Science of the Manufacture of Soaps, Candles and Allied Toilet Preparations* (New York: Henry Carey Baird & Co., Inc., 1928).

American soap consumption, with their control of market share standing at 40, 24, and 14 percent, respectively.[555]

One outcome of consolidation and the resultant fierce inter-firm competition was enormous investment in advertising. In the early twentieth-century, for example, Procter & Gamble had spending roughly 60 cents of every dollar on the purchase of fat and alkali, the primary ingredients of soap; by 1939, that 60 cents had dropped by a quarter and labor costs had been shrunk to make space for a new line item: advertising. By the 1939, Procter & Gamble was spending nearly 35 cents per company dollar on marketing. They were spending almost as much on selling their soap, in other words, as they were on making soaps.[556]

Early twentieth century sales appeals had taken an explicitly racist bent, with advertisements featuring images of stereotypical black children or Asian workers set in opposition to the cleanliness buying bar soap might confer to its users.[557] By the 1930s, sales appeals focused on femininity realized through one's soft hands and pleasant bodily scent. "'Attractive, well-bred, but so careless about her hands,'" whispered two women in an advertisement for Lux soap, the subject of the pictured gossiping returning to the tea room with a tray of cookies in-hand. "Beauty Treatment for Hands … Lux in the Dishpan" the copy explained, exemplifying one genre of print copy that touted the skin benefits of washing with Lever Brand soap and invoked the power of peer social evaluation.[558] Lux soap, particularly its

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[555] "Procter & Gamble." *Fortune*, December 1931, 92–96, 98. See also Paul A. Laux, Emmett H. Miller, and John J. Siegfried, "Soap and Detergent," in David O. Whitten, and Bessie E. Whitten, eds. *Extractives, Manufacturing, And Services* (Westport: Greenwood Publishing Group, 1997), 217-234.

[556] "99.4% Pure Profit Record" *Fortune,* April 1939, 77.

[557] See "Chapter 5. Soft-Soap Empire: Commodity Racism and Imperial Advertising" in Anne McClintock, *Imperial Leather: Race, Gender and Sexuality in the Colonial Contest* (New York: Routledge, 1995).

[558] Ad. No. 732-A, *True Drug Story*, 1930; as included in Folder "Lever: Trade (incl. proofs), 1930," Box LB9, "J. Walter Thompson Company Domestic Advertisements collection, 1875-2006," Hartman Center for the History of Marketing and Advertising, Duke University. Advertising historian Roland Marchand credits the rise of advertisements invoking social evaluation and the gaze of peers to an increasingly secular and mobile society, "adrift

odor-removing abilities, was crucial in securing one's social position. "Most proposals happen in the Spring! Be especially careful about daintiness NOW," cautioned one advertisement, invoking the term for body odor, particularly undergarment odor, that advertisers had dubbed "daintiness."[559] "Avoid Offending[:] Girls who 'get ahead' in business are always dainty,'" offered a second.[560] "Luxing your own at college will save you scads of money!" trumpeted a third print ad.[561] In each of these appeals, marketers combined softness and odor as metrics of cleanliness.[562]

Advertising was just one piece of a broader strategy to differentiate otherwise similar soaps from each other. The 1930s also saw the creation of what Procter & Gamble director Neil H. McElroy would term the "brand man," a set of sales positions built into the company hierarchy. In an internal memo written in May 1931, just eighteen months after the stock market

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from a secure 'sense of selfhood'" leaving consumers who might "search for a secure identity, for 'self-realization,' … seeking clues and advice in those sources most conveniently and ubiquitously available: the mass media." (13) See Roland Marchand, *Advertising the American Dream: Making the Way for Modernity, 1920-1940* (Berkeley: University of California Press, 1985). Kathy Newman counters that such a view misleadingly characterizes consumers as passive audience members rather than active political actors. In the realm of soap advertising, she tracks the consumer debates and letter-writing campaigns sparked by 1930s radio soap operas, and radio more broadly as a medium that helped build consumer communities where consumers and advertisers themselves saw consuming as an active process. See Chapter 4. "Washboard Weepers: Women Writers, Women Listeners, and the Debate over Soap Operas" in Kathy Newman, *Radio Active: Advertising and Consumer Activism 1935-1947* (Berkeley: University of California Press, 2004).

[559] Ad. No. 6041-B, *Photoplay*, (May 1938); Folder "Lever: Newspaper Proofs, 1938," Box LB26, "J. Walter Thompson Company Domestic Advertisements collection, 1875-2006," Hartman Center for the History of Marketing and Advertising, Duke University.

[560] Ad. No. 4086, Newspapers proof (April 1938); "Lever: Newspaper Proofs, 1938," Box LB26, "J. Walter Thompson Company Domestic Advertisements collection, 1875-2006," Hartman Center for the History of Marketing and Advertising, Duke University.

[561] Ad. No. 9706; "Lever: Dealers (incl. actresses), 1934," Box LB19, "J. Walter Thompson Company Domestic Advertisements collection, 1875-2006," Hartman Center for the History of Marketing and Advertising, Duke University.

[562] Another genre of print advertising in this period explicitly marketing to women trying to wash rayon fabrics that might degrade in the washing machine. "If it's safe in plain water … it's just as safe in LUX," reminding readers that their delicate garments could be laundered without fear of fading, wearing, or holes made by a harsh soap. Ad. No. 6679-B, *Successful Farming* (May 1930); Folder "Lever: Trade (incl. proofs), 1930" Box LB9, "J. Walter Thompson Company Domestic Advertisements collection, 1875-2006," Hartman Center for the History of Marketing and Advertising, Duke University.

crash had dampened but not actually zeroed out Procter & Gamble's profit margin, McElroy's memo laid out the "duties and responsibilities" of a sales role that would be touted by later executives as *the* strategy remaking consumer marketing in the twentieth century U.S. The chief distinguishing characteristic between a "brand man" from generalized sales staff was the degree of responsibility this individual would have, particularly for stewarding one brand alone. "[W]hen the brand men have approached their fullest responsibilities, they should be able to take … a very heavy share of individual brand responsibility," McElroy affirmed, centering the brand as *the* business creation around which to organize the company's staff, rather than another company function (sales, transportation, product development) to fold into an existing department.[563] By clearly delegating responsibilities between existing managerial roles (Division Managers, District Managers) and proposed promotional roles (brand managers, assistant brand managers) McElroy was signaling a shift: organizing the company around the brand, rather than fitting the brand into existing corporate structures.[564]

McElroy was also unknowingly constructing an expectation that would prove problematic over the subsequent twenty years, one that it would take commercial chemistry rather than brand management to overcome. The problem was this: local ecology didn't operate along brand management lines. As he had conceived of them, brand men were defined by geography: working in what McElroy called "territories," or sales regions. By studying best practices ("the combination of efforts that seems to be clicking") and advertising histories, brand managers could

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[563] Neil H. McElroy, Memo to R.F. Rogan and W.G. Werner, (May 13, 1931), from Ed Rider, chief archivist, Procter & Gamble Heritage Center, as posted to "Inside the Box," June 14, 2010 http://www.innovationinpractice.com/innovation_in_practice/2010/06/brand-man.html (accessed July 20, 2017), 3.

[564] Thomas K, McCraw, *American Business, 1920-2000: How It Worked* (Wheeling, Illinois: Harlan Davidson, 2000). Alfred Chandler remains the seminal thinker on corporate form. See Alfred D. Chandler, *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, Mass.: Belknap Press, 1977).

recommend corrective action plans to Division Managers for places where sales were slow. That is, a brand manager's most important responsibility was to identify "any possible faults in our promotion plans for that territory."[565]

But ecological reality was not identical within a sales territory. Here was the ecological obstacle undermining the work of brand managers whose territories might include some ecological very different areas: hard water. "[Y]ou couldn't use soap in the water," recalled homemaker Doris Stephenson Warren of her childhood in Meeker, Colorado, one of the hard water districts Lever Brothers executives were shipping to. "It was so hard it would just make a scum around. So you didn't use soap; you just washed them in water, and they you scalded them with—you know, poured boiling water over them."[566] Making clothes clean was in part an ecological task, one requiring mineralogical hardness in one's local was water. It was a problem that generations of domestic workers had seen, felt, and smelled—but one of which brand managers were just becoming aware.

To create a national brand, one needed to design a soap that would function identically across regions with different water hardness. It was a problem that soap-making executives had wrestled with for decades. "We are now shipping into the so-called hard water districts Rinso [laundry soap] containing 45% fatty acids … which is sufficient and proved by all the tests we have made to insure high detergent value," reported company executive W. E. Lannefeld in 1916 to Francis Countway, the future president of Lever Brothers. Only changing the

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[565] Neil H. McElroy, Memo to R.F. Rogan and W.G. Werner, (May 13, 1931), from Ed Rider, chief archivist, Procter & Gamble Heritage Center, as posted to "Inside the Box," June 14, 2010 http://www.innovationinpractice.com/innovation_in_practice/2010/06/brand-man.html (accessed July 20, 2017).

[566] Julie Jones-Eddy, *Homesteading Women: An Oral History of Colorado, 1890-1950*, Twayne's Oral History Series No. 7 (New York: Twayne Publishers, 1992), 31.

composition of the soap could ensure it functioned identically in hard and soft water.[567]

By the 1930s, Lever Brothers was advertising Rinso to both consumers and sellers—grocers, druggists, and pharmacists—specifically as a hard-water laundry soap. The company suggested that retailers position Rinso alongside other best-selling Lever Brothers products in grocery store islands, implying complementarity of the products and recognition that single stores might serve multiple water hardness regions.[568] Regardless of communication with consumers and retailers, however, company executives were anxious to ensure that dollars invested were protecting fragile market share. Given finite resources, corporate investment in advertising posed a particular problem for those other beneficiaries of in-house spending: commercial chemists.

V. Replacing Fat

Executives had created in-house research laboratories at each of the big three soap manufacturers while fat accumulation and company consolidation were at their peak: in 1897 at Colgate-Palmolive, 1898 at Lever Brothers, and 1918 at Procter & Gamble. By the 1930s, corporate decision-makers understood their staff commercial chemists to serve as more than evaluators of raw materials and prescribers of standardization across facilities. Chemists were also responsible for creating new products. Lever Brothers' in-house laboratory had grown to a staff of 46 chemists, 4 physicists, and 3 engineers by 1940; Procter & Gamble reported "100 professional personnel" at their Ivorydale, Ohio laboratory and 100 "additional personnel" at

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[567] Letter to Mr. Countway from W.E. Lannefeld, June 9, 1924, as quoted in "Company Profile: Lever Brothers Company," J. Walter Thompson Information Center, Folder "Advertising and Company Histories, 1944, 1959, 1963, n.d." Box LB1, Hartman Center, Duke University.

[568] See, for example, "Lux Toilet Soap" advert, *Industrial Retail Stores* (January 1933), as included in Folder "Lever Trade Proofs (incl. Actresses) 1933," Box LB26, Hartman Center; "Dramatic, big-space advertising … *that will do it!*" advert, *Industrial and Retail Stores* (July 1930), as included in Folder "Lever Trade (incl. proofs) 1933," Box LB26, Hartman Center; and "She didn't even know she wanted soap but—THE 'FAMOUS 4' DISPLAY sold her," *National Grocers Bulletin* (November 1933), Folder "Lever Trade (incl. hotels) 1935), Box LB26, Hartman Center.

that same location. These staffing figures made P&G laboratories comparable in size to the main laboratory of General Electric. Compared with such storied research laboratories as Bell Labs, Eastman Kodak, or Dow Chemical, Procter & Gamble and Lever Brothers were one-quarter to one-sixth the size. This was precisely the point. By the 1930s, companies like P&G and Unilever—the rebrand of Lever Brothers—were committed to fat-based production lines: soap, butter, margarine, salad oil, and glycerin. The potential future uses of existing fats, or discovery of new sources, made investment in research imaginable at a scale akin to, if smaller than, that of other product-driven laboratories.[569]

Soap making executives did face a conundrum, however. Despite large in-house laboratories staffed with a growing number of researchers, commercial chemists working on soap in the 1930s openly acknowledged that they still did not understand how soap functioned to clean a piece of clothing. Did soap clean through a physical or chemical means? Some combination of both? "Many theories have been forward to explain the property of soap solution in removing dirt, although even now the question cannot be regarded as settled," wrote Dr. Geoffrey Martin in his commanding 1931 two-volume compendium, *The Modern Soap and Detergent Industry*.[570] Theories ranged from "Brownian motion theory" (the hypothesis that soap increased the pedesis of dirt particles, in effect helping dirt already prone to moving itself out of fabric do so) to "colloidal combination theory" (the hypothesis that soap formed a colloidal compound that

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[569] National Research Council, *Bulletin of the National Research Council, No. 104 Industrial Research Laboratories of the United States Including Consulting Research Laboratories* (Baltimore: The Lord Baltimore Press, 1940). See also David A. Hounshell, *Science And Corporate Strategy: Du Pont R&D, 1902-1980* (Cambridge, UK: Cambridge University Press, 1988).

[570] "Chapter VII. Theories of the Detergent Action of Soap" in Geoffrey Martin, *The Modern Soap and Detergent Industry: A Complete Practical Treatise in Two Volumes on the Manufacture of Laundry, Toilet, Pharmaceutical, Textile, Abrasive, Scouring, and Powdered Soaps; also Detergent Compositions and Soap Substitutes of all kinds Including Analyses of Raw Materials, Modern Patents and Literature, Recent Machinery and Processes, together with Numerous Practical Recipes, and Lay-out of Modern Soap Factories*, 2nd ed., 2 vols. Vol. 1—Theory and Practice of Soap Making (The Technical Press Ltd: Surrey, England, 1931): 47.

dirt preferentially clung to instead of to fabric). But two decades of industrial research had yielded more questions than definitive conclusions about how soap functioned to clean. Even the theory that soap molecules cleaned via emulsification was based on the "revelation" that soap particles possessed both hydrophobic and hydrophilic ends, a feature that facilitated the mixing of oily stains into wash water that would other repel each other. But this fell apart under scrutiny as chemists simulating the cleaning process acknowledged that "dirt" on clothing was so obviously more varied than just oil.[571]

Commercial chemists turned to two tools to resolve debate over how soap functioned molecularly. The first resolution was expansive—or, one could cynically say, distracting: a turn to creating a new research agenda called "detergency" separate from resolving the question how soap worked. "Detergency" or "detergent power" first began appearing in scientific journals in the 1920s but gained traction in the 1930s. Chemists used it to refer to the capacity of a chemical reagent to effect two changes: lower the surface tension of water, and emulsify—mix and suspend—oil into wash water. Even if how soap worked remained unknown, detergency constituted a concrete research agenda because soap was one of many chemical agents that lowered surface tension and promoted miscibility, or the mixing of water and oil. Advised the chemist Geoffrey Martin: "[T]he sodium and potassium salts of the fatty acids—i.e., what we know as soaps—are only a particular class of a number of substances which lower the surface tension of water … which result[s] in a detergent action."[572] Couched in these terms, detergents

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[571] W. Spring, *Bull. Acad. roy. Belg.,* 1909, 187, 1128; *Kolloid Zetischr.,* 1909, 4, 164; *Rec. Trav. Chim.,* 28, 511; Hillyer. *Jour. Amer. Chem. Soc.,* 1917, 111, 86; Pickering. *Trans. Chem. Soc.,* 1903, 25, 511; McBain, *Jour. Soc. Chem. Ind.*, 37, 249T; McBain, *Third Colloid Report of the Brit. Assoc. for Adv. of Sc.,* 1920, p. 24; McBain, Harborne, and King, *Joun. Soc. Chem. Ind.,* 1923, 42, 373T; R.M. Chapin. *Ind. Eng. Chem.,* 1926, 18. 1313-1316; H. Jackson. *Journ. Soc. Arts*, 55, 1101 et seq.

[572] "Section VII: Soap Substitutes and Fillers, Organic and Nonorganic," Geoffrey Martin, *The Modern Soap and Detergent Industry: A Complete Practical Treatise in Two Volumes on the Manufacture of Laundry, Toilet, Pharmaceutical, Textile, Abrasive, Scouring, and Powdered Soaps; also Detergent Compositions and Soap Substitutes of all kinds Including Analyses of Raw*

were a *new* field that warranted exploration, rather than a set of indeterminate chemical qualities that soap possessed but that chemists did not fully understand. Technical debates over how soaps functioned could be replaced by momentum-creating excitement about a search for soap-less alternatives to existing soap products.

Lever Brothers filed the first patents for hydrocarbon-based detergents in England in 1936; in the U.S., Procter & Gamble filed one that same year.[573] The timing of these patents was not coincidental. To resolve confusion over how soap cleaned, chemists engaged a second strategy beyond setting "detergency" as the research agenda for the field. They also strove to rename existing consumer expectations in chemical terms. New detergents needed the visible and lasting presence of a lather; the presence of a scent; and no visible soap scum on washing machine walls. Chemists acknowledged these properties contributed in unknown ways to the removal of dirt. Let us address each of these in turn.

Writing to explain the importance of the synthetic detergent he was patenting on behalf of Lever Brothers in 1936, chemist T.P. Hilditch observed, "the long-chain acyl ester confers the lathering power and other physical properties which make the material a good detergent" but slyly declined to explain what "physical properties" these included—a savvy choice because contemporaneous research acknowledged foaming in a washtub sometimes functioned to redeposit dirt on the surface of clothing rather than carrying it away with wash water, a fact that actually dirtied more than it cleaned.[574] Still, consumers treated lather as a visual cue for cleanliness that they valued. "Many women waste soaps … by using more than is needed,"

Materials, Modern Patents and Literature, Recent Machinery and Processes, together with Numerous Practical Recipes, and Lay-out of Modern Soap Factories, 2nd ed., Vol. 2—The Manufacture of Special Soaps and Detergent Compositions (The Technical Press Ltd: Surrey, England, 1931), 4.

[573] "Detergent Efficiency," *Soap and Sanitary Chemicals* 13 no. 6 (June 1937): 63-66.

[574] T.P. Hilditch, *Chemical Age*, Vol. 35, 558 (1936).

magazine writers at *Consumer Reports* chided. "Just enough to form good suds should be used," editors wrote, indicating the perceived importance of lather as an indicator that soap was present and working during the wash process.[575] Later research would, in fact, confirm that lather could reduce rather than augment the cleaning process. Management of suds—creating suds that would last, but not for too long—would become a research priority for chemists in the 1950s and 1960s. But in a 1930s moment, commercial chemists proffered it up as one important feature to build into the soaps they were designing.

Commercial chemists, similarly, agreed that scenting soaps was a crucial skill "requiring an extensive knowledge of the products to be handled" to ensure "the choice of a suitable odour for a specific soap."[576] But as with lather, they acknowledged that scenting soap did nothing at a molecular level to improve soap's ability to lift dirt from fabrics. Still, odor was an important feature from a consumer perspective. An ever-growing proportion of higher-grade fats were going towards the edible fats industry—margarine, salad oil, and commercial bakeries—and smellier soap stock was ending up in the soap kettle. This, in addition to the early twentieth-century advent of an essential oils industry and synthetic perfumes meant that consumers were learning to treat fragrance as a metric of cleanliness—and were expecting it in laundry soaps, not just beauty bars. Masking unpleasant odors and meeting consumer expectations meant that soapmakers were increasingly adding scents—lavender, geranium, rosemary, citronella—to

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[575] "Laundry Soap" *Consumer Union Reports* Vol. 1, No 4 (August 1936), 7-9.

[576] "Section IV. Perfuming Substances Used in the Soap Industry," in Geoffrey Martin, *The Modern Soap and Detergent Industry: A Complete Practical Treatise in Two Volumes on the Manufacture of Laundry, Toilet, Pharmaceutical, Textile, Abrasive, Scouring, and Powdered Soaps; also Detergent Compositions and Soap Substitutes of all kinds Including Analyses of Raw Materials, Modern Patents and Literature, Recent Machinery and Processes, together with Numerous Practical Recipes, and Lay-out of Modern Soap Factories*, 2nd ed., 2 vols. Vol. 1—Theory and Practice of Soap Making (The Technical Press Ltd: Surrey, England, 1931): 3. Beginning in the 1930s, advertisements for synthetic perfumes crowd the pages of *Soap and Sanitary Chemicals*, the most widely circulated trade publication of the industry. See, for example, "du Pont Presents a New Synthetic Aromatic," advertisement, Du Pont Aromatics, *Soap and Sanitary Chemicals* (March 1937), 4; "Soap Perfumes" advertisement, Firmenich + Co., Inc., *Soap and Sanitary Chemicals* (March 1937), n.p., Harry J. Monroe, "Geranium Oil," *Soap and Sanitary Chemicals* (April 1937), 31.

laundry soaps that, a generation previously, had sold themselves as removing unpleasant odors rather than adding specific fragrance.[577]

Finally, commercial chemists working in the 1930s invoked the imagined consumer when developing new soaps because fat-based soaps sold poorly in hard water regions of the country. In a 1930s moment of technical uncertainty about how soap worked, this appeared a technical problem that that commercial chemists could solve. This is not to suggest complete fabrication of a problem. Oral histories and women's diaries from the early part of the twentieth century, as well as adoption rates for water softeners in this same period, make clear that homemakers and consumers saw hard water as an impediment to cleanliness.[578] As discussed earlier, as early as 1916, Lever Brothers chemists had introduced Rinso, a brand specifically designed for sale in hard water districts of the U.S. that possessed a higher-than-average fatty acid content, making it more expensive to produce but devoid of some of the fillers that would react with calcium and magnesium to create soap scum. Soap makers were not completely ignorant of the problem of hard water.

But beginning in the 1930s, the problem of soap scum and building soaps for hard water districts became what we might call an obsession for commercial chemists at the Big Three soap manufacturers. Hard water was not new. But the urgency of addressing it as a problem was. Why this timing? In a word: competition. In 1929, British-based Lever Brothers had succeeded in securing their final and largest act of consolidation: a merger with fats-based behemoth

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[577] "The Fat Situation," *Soap and Sanitary Chemicals* (January 1937), 34-37; E.G. Thomssen and C.R. Kemp, *Modern Soap Making* (New York: MacNair-Dorland Company, 1937). "The soap manufacturer continues to be the largest consumer of perfuming materials, both natural and synthetic. Not only does he use a far more extensive line of perfuming materials for toilet soaps, liquid soaps, and shampoos, but hardly is there a laundry soap today which goes to market without some type of perfuming. … Standard aromatics of proved value find widest use among the chemical products, while the standard soap oils, such as lavender, geranium, spike, rosemary, citronella, bois de rose, and such, find constant use among the natural products." (Thomssen and Kemp, 64).

[578] Milwaukee Consumer Survey from 1931, 1933, 1935, 1937 on water softner adoption rates.

Margarine Unie of the Netherlands and Margarine Union in the U.K., yielding the new multinational Unilever that still operated globally today. Procter & Gamble and Colgate-Palmolive, as competitors, responded by pouring dollars into new advertising campaigns, radio and print combinations that could position their products more prominently before American and European buyers for whom all three firms were vying. At Procter & Gamble, a mid-tier executive who would later become company president named Neil McElroy coined the phrase "brand manager," and beginning in 1931 the company was reorganized around product lines rather than department function. Executives poured millions into contracts with advertising giants like J. Walter Thompson and D'Arcy Masius Benton & Bowles. But if one was to market nationally, one needed a product that could function identically across water regions of different hardnesses. Commercial chemists saw their opportunity. Here was a place where the concept of detergency, technical sophistication, and imagined consumer demand could come together in one research agenda. The charge of finding such a product could shore up faith in corporate R&D line items, reminding company executives that chemical expertise still warranted investment.[579] Soap scum even positioned chemists to be relevant in marketing and advertising meetings. In 1946, when Procter & Gamble executives created a new strategy for launching Tide in six test cities, their choice of launch sites was guided by water quality as well as population density: Springfield, MA and Albany, NY, communities served by soft water; Evansville, Indiana and Lima, Ohio, served by medium water; and Wichita, Kansas and Sioux Falls, SD, communities served by hard water. Chemists had successfully advocated for their worth.[580]

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[579] "Detergent Efficiency" in *Soap and Sanitary Chemicals* June 1937), 63. "Wetting Agents and Detergency (Excerpts from notes on a symposium held by the British Section of the International Society of Leather Trades' Chemists at the Imperial College of Science, Kensington, England)," *Soap and Sanitary Chemicals* (May 1937), 63.
[580] *Procter & Gamble: The House that IVORY Built*, Editors of *Advertising Age* (Lincolnwood, Illinois: NTC Business Books, 1988).

One final historical shift helped secure a change from soaps to detergents, and from fat-based to petrochemical-based soap commodity chains: World War II fat shortages. With the Japanese invasion of the Philippines in December 1941, American soap makers acknowledged an upending of production lines moving prized coconut oil to American soap plants.[581] Coconut oil constituted a crucial ingredient in soap, particularly because, unlike most fat sources, it was predominantly a soap making rather than edible product: American factories making edible products consumed 105 million pounds of coconut oil in 1941, American soap manufacturers consumed 484 million pounds of coconut oil.[582] So when wartime disruptions exposed the vulnerability of a supply chain based on coconut oil, many soap-making executives additionally saw detergency as an appealing alternative. If multiple synthetic compounds could be used for wetting fabric and emulsifying oils, then vulnerability could be reduced in production schemes. Further, glycerin was a waste product of the soap making process that was also a crucial precursor to nitroglycerine, the wartime explosive. As skyrocketing demand for fat inflated prices, producers additionally saw the appeal of shifting to a petrochemical source base that seemed more plentiful, or at least more malleable.[583]

The half-decade following the close of World War II saw a cascade of advertising for new synthetic detergents. Procter & Gamble marketers in particular strove to appeal to a variety of audiences, indicating their understanding that multiple actors—consumers, but also appliance sales staff, repairmen, and even dermatologists—might serve as barriers to widespread detergent

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[581] "Coconut Shortage Forces Revision in Soap Specs," *Soap and Sanitary Chemicals* Vol. XVIII No. 3 (March 1942), 41; Alan Porter Lee, "War Time Problems of the Soap Maker," *Soap and Sanitary Chemicals* Vol. XVIII No. 6 (June 1942), 23-26, 71.

[582] U.S. Census, as cited in "Table II. Comparative U.S. Factory Consumption of Coconut and Babassu Oils—1941—In Pounds," Alan Porter Lee, "War Time Problems of the Soap Maker," *Soap and Sanitary Chemicals* Vol. XVIII No. 6 (June 1942), 24.

adoption. So advertising campaigns sought to allay fears and showcase the appeal of detergents over soaps. To doctors reading *Modern Medicine*, Procter & Gamble executives invoked a definition of cleanliness had on molecular rather than visual terms: "The 'tailor-made' molecules of synthetics do not form these insoluble compounds in hard water. They leave surfaces cleaner ... free of any precipitated 'soap film' formed during rinsing. Also, unlike soaps, in solution, synthetics can be used at almost any pH," executives wrote. With an emphasis on surfaces rather than fabrics, the company positioned itself to sell industrial-grade cleaners as well as new hand soaps for use in hospitals.[584] To appliance manufacturers, by contrast, cleanliness had everything to do with keeping customers happy. "'I recommend Tide for washing Machines because it cuts complaints to a minimum!' says Frank Roark, owner of The Good Housekeeping Shop, Fort Worth, Texas, who sells Frigidaire Washing Machines."[585] Washing machines sales staff could and in fact were employed in the selling of detergents. In one of Procter & Gamble's most extensive and also successful marketing campaigns, boxes of Tide detergent were placed inside each new Frigidair Washing Machine sold—in effect conflating new post-war appliances and new post-war detergent-based cleanliness.[586]

The overtly educational tone of advertisements from this period reveals a shift in the perceived arbiters of cleanliness: manufacturers, in the new language of detergency, sought to position themselves as trusted authorities for *explaining* the miracles of modern chemistry. No

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[584] "Facts About Synthetic Detergents" advertisement, *Modern Medicine* (June 15, 1952), in Folder "Procter & Gamble, 1951-1953, 1955-1956. Tide. Trade: Magazines," Box 115, D'Arcy Masius Benton & Bowles Archives, Advertisements Series, Hartman Center for the History of Marketing and Advertising, Duke University, Durham, NC.

[585] Frank Roark advertisement, *Electrical Merchandising,* April 1952, and *Electrical Dealer*, February 1952, Folder "Procter & Gamble, 1951-1953, 1955-1956. Tide. Trade: Magazines," Box 115, Hartman Center for the History of Marketing and Advertising, Duke University, Durham, NC.

[586] Davis Dyer, Frederick Dalzell, and Rowena Olegario, *Rising Tide: Lessons from 165 Years of Brand Building at Procter & Gamble* (Boston: Harvard Business School Press, 2004).

longer was buying soap a simple matter of smelling a bar or trusting a brand—and it certainly was no longer a commercial alternative to a viable household activity. Conversely, no longer was selling soap a matter of producing uniform product and distributing it nationally; it also required research, development, and tools to explain the cleanliness meanings of that R&D.

By 1952, American soap manufacturers were selling two billion pounds of synthetic detergents annually, a ten-fold increase realized in a mere five years.[587] In April of that year, sales of synthetic detergents surpassed sales of soaps for the first time in the nation's history. Despite skepticism from executives at Lever Brothers, who voiced doubt that synthetics were more than a passing trend, Procter & Gamble claimed 40% of soap sales nationally and fully 69% of the detergent market by 1953.[588] A material shift that had been 80 years in the making was coming to fruition: from pan drippings to beef tallow to the petrochemical gas propylene, synthetic detergent had replaced lumpy homemade soap. In the process, chemists had birthed an expectation that cleanliness smelled of something—and that that something had a brand name.

VI. Conclusion: Making Fat Obsolete

Picture the scene: a seventeenth-story board room, floor-to-ceiling windows revealing the bustle of Lexington Avenue below. Dark wood paneling dignifies the space; around a table in the center of the room are eight suit-wearing brand managers in eight padded chairs: Hinks, Butler, Carman, McLean, Wolff, Young, Davison, and Findlow. One secretary is also present as an anonymous stenographer. She reads aloud the stated purpose of the gathering: "October 1, 1959. 2:30pm. Purpose of meeting: To review Hum advertising as recommended by J.W.T."

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[587] "Soaps," *Forbes* (January 1, 1952), 40-45.

[588] "The Cleanup Man," *Time*, Vol. 62, No. 14, (Oct. 5, 1953).

The men nod, pull out pens, and perhaps feel lunch settle in their bellies. Carman nods at the secretary to continue reading. She clears her throat. "Proposition: Hum is especially designed for today's and tomorrow's washing methods and conditions."[589]

Carman passes eight manila folders around the table, and for a minute the only sound is that of eight managers flipping through mimeographs of previous Hum detergent advertisements. Carman breaks the silence. "*Positioning* of our product is probably the single most important factor in success we believe.'" Hinks jumps in. "Lever is fearful that Procter & Gamble will beat us into this market—however, they also worry lest we have to educate the public to a new category of product." He turns to the room in expectant provocation. New category of product? New washing conditions? The other men warm to the underlying questions. "How about children's clothes?" one asks. "Farmer's clothes are dirtier today than those of a factory worker," another suggests. "Don't women feel that today's clothes wear out faster[?]" another asks. "Maybe you can say 'These *new* fabrics don't require the harsh detergents that the old ones did.'"[590] Carman nods as the stenographer takes notes. The men debate whether "no detergent residue" could work a sales proposition; they wonder whether marketing Hum as a detergent for ladies' hose and chiffon will expose the company to customer unhappiness over torn delicates. One brand manager, Young, cuts the hubbub: "Let me remind you that you've got to offer to solve a problem which the housewife already feels she has. The idea is to make her *stop and*

[589] Lever Hum Review Board, "Meeting Minutes," Oct. 1, 1959; 2:30pm. Box 17, Folder "J. Walter Thompson Company, Review Board Records, Meetings" J.W.T. Archives, Hartman Center for the History of Marketing and Advertising, Duke University, Durham, North Carolina.

[590] Lever Hum Review Board, "Meeting Minutes," Oct. 1, 1959; 2:30pm. Box 17, Folder "J. Walter Thompson Company, Review Board Records, Meetings" J.W.T. Archives, Hartman Center for the History of Marketing and Advertising, Duke University, Durham, North Carolina.

consider all the new elements involved in her wash today. Use a modern product."[591] And the conversation continues, with this new unifying task: how to make the housewife stop and consider. The marketing challenge was not inventing a problem: it was giving a name to a problem which previously had no name.

Far from this single 1959 marketing department meeting focused on inventing new cleanliness problems to solve, research on detergents continued unabated. It would continue for the subsequent four decades, motivated by two specific research agendas that would do little to change the efficacy of the detergents that, by the 1950s, had already successfully replicated the cleanliness possible in 1930s soaps. First, chemists for the second half of the twentieth century would debate how to assess the efficacy of the thousand-plus known chemical surfactants. The additives—literally "surface active agents," surfactants for short—helped lower the surface tension of water and thus helped wash water more effectively wet soiled garments. Wetting was a capacity prized by chemists within and beyond the P&G and Unilever laboratories.[592] For four decades, iterations of surfactants would gain in popularity and then face pushback from grassroots environmental groups pointing to their downstream effects, most notably the devastation of stream and wildlife health caused by phosphates. Hampered by not fundamentally stopped by any of these objects, chemists would continue their dogged search for new surfactant that would continue into the 1990s. By 1996, forty years of attempts to build new types of

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[591] Lever Hum Review Board, "Meeting Minutes," Oct. 1, 1959; 2:30pm. Box 17, Folder "J. Walter Thompson Company, Review Board Records, Meetings" J.W.T. Archives, Hartman Center for the History of Marketing and Advertising, Duke University, Durham, North Carolina.

[592] See William W. Niven, Jr., *Fundamentals of Detergency, Under the Sponsorship of the American Institute of Laundering, National Trade Association of the Laundry Industry* (New York: Reinhold Publishing Corporation, 1950); J.C. Harris, *Detergency Evaluation and Testing,* Interscience Manual 4 (New York: Interscience Publishers, Inc., 1954); Elaine Moore, *Detergents, A Unilever Education Booklet,* Revised Ordinary Series No. 1, Elizabeth McCreath, ed., (Suffolk: Information Division, Unilever Limited, 1967); *Detergency: Theory and Test Methods (in two parts),* W.G. Cutler and R.C. Davis, eds., (New York: Marcel Dekker, Inc., 1972); A. Davidsohn and B.M. Milwidsky, *Synthetic Detergents, Fifth Edition* (Cleveland: CRC Press, 1972); W. Herman de Groot, *Sulphonation Technology in the Detergent Industry* (Dordrecht: Kluwer Academic Publishers, 1991).

cleanliness into new branded products had led executives at companies like Proctor & Gamble to herald yet another reagent as "the ultimate high active surfactant."[593] That the "problem" of cleanliness might have been solved, and that new degrees of whiteness or new shades of brightness were in excess, was no part of research laboratory discourse. Sufficiency had been a necessity for nineteenth-century domestics with finite time to launder infinite garments; but sufficiency was anathema to the profit margin and innovation rhetoric protecting twentieth-century chemists from obsolescence.

Detergent chemists in the 1950s and 1960s also pursued a second research track: new scents and fragrances to bottle into liquid detergent form. Though this research charge was interrupted by environmental activism of the 1960s and 70s, it had redoubled by the 1990s. By the early 2000s, "fragrance encapsulation" had become the new frontier in detergent research. "If you are creating a fragrance to go into a customer's laundry detergent, the fragrance has to survive in that environment," advised Clint Brooks, senior vice president at International Flavors & Fragrances. Speaking to an audience of industry chemists, he reminded them the difficulty of the task: "You have a very complex chemistry in that bottle."[594] From fat + salt + lye to "a very complex chemistry." From soap to detergent. From domestic laborer to commercial innovator. Commercial chemists had radically changed the tools of cleanliness, as well as its smell.

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In this chapter, I have tracked how commercial chemists, advertising executives, and stinky fats themselves were agents in creating a century-long transformation in consumer

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[593] Susan J. Ainsworth, "Soaps and Detergents," *Chemical and Engineering News* 72, no. 4 (Jan. 22, 1996): 32-49, 54. DOI 10.1021/cen-v074n004.p032.

[594] Ivan Amato, "Innovations in Flavors and Fragrances Frequently Begin Along an Unassuming State Highway in New Jersey," *Chemical & Engineering News* 84 no. 44 (Oct. 30, 2006): 32.

understandings of cleanliness, particularly their sensory expectation for what clean should smell like. I have tracked the replacement of animal- and vegetable-based soaps by petrochemical products; and I have traced the forces making in-home production of soap outmoded and outdated. Short of celebrating or vilifying the gains ushered in by this shift in the domestic technology called soap, I have suggested that one of the most surprising drivers and results, both, of technological change has been that sense which we might assume to be biologically wired and timeless: our sense of smell.

The environmental historian Christopher Sellers has called for more "embodied" environmental histories, ones that treat human bodies as *both* historically instantiated ("artifacts of time and circumstance") *and* as sensing, sensual, biological apparatuses through which individuals construct knowledge of the world. Close study of the hybrid human body, Sellers argues, uses history to challenge the master narrative of a great human fall from nature. "Maybe nature has been with us—in us—all along," Sellers argues, pointing to the body as a site of hybridity, or perhaps *the* site of hybridity revealing that dual role of culture and non-human nature in shaping the body itself.[595]

In this chapter on the history of soap, focusing on the sensing human body pushes us to think differently about two sets of human actors: commercial chemists as sensing bodies, and domestic workers as sensing bodies. Focusing on the sensing body matters because it reminds us that seemingly rational business decisions—which country to source coconut fat from, how to package a new laundry soap, whether to install expensive drying towers at a manufacturer's most recent acquisition—relied as much on sniffing human bodies as savvy business acumen.

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[595] Christopher Sellers, "Thoreau's Body: Towards an Embodied Environmental History," *Environmental History* 4, No. 4 (Oct 1999): 486-514. Environmental historians have embraced Sellers' research charge in the last decade.

Focusing on sensing bodies reminds us of one other crucial tool: pleasure.[596] Recall Hanson's characterization of doing the wash: "I always enjoyed hanging clothes outside," she affirms to the oral historian interviewing her about the experience of growing up poor and female. There can be no doubt: washing laundry was brutal work: hauling, boiling, scrubbing, rendering, wringing, hanging, ironing, starching, drying, folding, mending—these are some of the verbs that better capture what is rendered too passive by words like "homemaking" or "consumption." But Hanson's testimony compels us to ask: what *else* was it? Drudgery, exploitation, mundanity, yes—*and* pleasure, source of dignity, ecological act.[597] Thinking about soap-making as ecological work, whether in the household or the commercial soap kettle, pushes us to ask about the ways in which our daily lives are still interconnected with the natural world, no matter how much distance has been introduced by a century of commercial chemistry.

The history of soap reminds us of the costs wrought by a century of commercial chemistry wrought only limitedly with cleanliness at its core. From shoring up imperial land claims to securing the relevance of chemists in marketing-centered soap manufactures, the creation of ever-new and ever-more-toxic detergents leaves us wondering about the ecological and experiential costs of making skills like soap making obsolete. Which of bodily experiences do we

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[596] Writes Kate Soper, the environmental philosopher, on the necessity of using pleasure as guiding device for distinguishing between ecologically beneficent and ecologically detrimental actions: "We have, in short, to be prepared to track the surfacing of desires for otherness [alternatives to capital modernity] on the ground *this* side of the precipitous face of such radical social change, even at the cost of finding them in the wrong places, desired by the wrong people, and contaminated by all the banality and political confusion and ordinariness of the everyday consumer culture out of which they will (since from where else?) be emerging." See Kate Soper, "Alternative Hedonism" *Cultural Studies* 22 (Sept 2008), 567-587. See also Kate Soper, *Troubled Pleasures: Writings on Politics, Gender, and Hedonism* (London: Verso, 1990).

[597] In her book tracing the forces creating "sick-building syndrome" as a named illness linking bodies and buildings, historian Michelle Murphy observes that "bodies, like buildings, can concretely be many things at once." Turning this argument for multiplicity into an analytic device, she explains her research agenda in her book: "Instead of asking, What *is* a building? I will be asking, What are its *ands*?" Michelle Murphy, *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, and Women Workers* (Durham: Duke University Press, 2006).

as citizens wish to retain as parts of our sensory experience of a twenty-first century world?[598] What costs—ecological, economic—can we justify in pursuit of more scented definitions of cleanliness? Situating domestic work historically exposes consumer culture's costs as well as gains. It is only with those costs laid bare that we can identify the overlooked places where solutions might be found.

[598] Sheila Watt-Cloutier, *The Right to Be Cold: One Woman's Fight to Protect the Arctic and Save the Planet from Climate Change* (Minneapolis, MN: University of Minnesota Press, 2018).

Conclusion: The Nature That Lingers

"[B]y associating pleasure itself with less economically fixated and materially burdensome passions and obsessions, can we contribute to the evolution of less destructive and exploitative, but for that reason all the more seductive, forms of enjoyment?"[599]
- Kate Soper, *Troubled Pleasures*

In 1970, after a ten-hour shift at a commercial washing facility in London, a laundry worker collapsed from nausea caused by exposure to perchloroethylene fumes. Perchloroethylene, also known as "perc," was the caustic reagent used to dryclean garments, and a bottle of the liquid had spilled on the floor. The worker lay in the liquid for several minutes before coworkers found him. Upon admittance to the hospital, British physicians reported the following of the worker: "[H]e was found to be unconscious with extensive erythema and blistering of the face, neck, both arms, chest, and left thigh." The worker survived the fall but suffered scarring to the face and body.[600]

Chemical burns in pursuit of cleanliness: this bodily burden stands in stark contrast to earlier burdens we have seen domestic workers shouldering in this 150-years history of washing laundry. Here again is 19-year-old Francis R. Paige, the New York homemaker who we met in the introduction of this dissertation. "Cold as Greenland today and such a searching wind," Paige had written in her 1862 diary. "I've had trying times this Monday, come near freezing in

[599] Kate Soper, *Troubled Pleasures: Writings on Politics, Gender, and Hedonism* (London: Verso, 1990), 8.

[600] Stanley Ling and William A. Lindsay, "Perchloroethylene Burns" *British Medical Journal* 8 (July 1971): 115. DOI: 10.1136/bmj.3.5766.115-b.

putting out clothes."[601] Cleanliness for Paige in 1862 meant weathering seasonal chilliness, a stark contrast to the nausea to which the 1971 commercial worker was exposed. Or here is muckraking journalist Rheta Childe Dorr, who wrote this about turn-of-the-century steam laundry work: "Bend, untwist, shake; bend, untwist, shake; bend, shake; bend shake, hours unending."[602] For Dorr, cleanliness was repetition and physical exhaustion.

From seasonal chills, to exhaustion, to the threat of chemical burns: these bodily burdens offer one through-line in the history of cleanliness additional to mechanization creating "more work for mother," to quote the historian of technology Ruth Schwartz Cowan. The 150-year history of washing laundry is a history of an increasingly toxic and increasingly invisible set of burdens placed on domestic workers. These burdens become particularly apparent when we dispense with any distinction between unpaid homemakers and paid domestics workers — a distinction, as we have seen, with sexist and racist origins.[603]

Given the commercial chemists dominating this dissertation, it may be surprising that I focus so little on the hypothesized neurological, carcinogenic, or reproductive implications of worker exposure to synthetic detergents, dyes, and microplastics sloughing off of synthetic fabrics,

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[601] Diary of Francis R. Paige, January 13, 1862, Cairns Collection of American Women Writers, Cairns Manuscripts—Paige.

[602] Rheta Childe Dorr, *A Woman of Fifty* (New York: Funk and Wagnalls Company, 1924).

[603] As discussed in the introduction to this dissertation, my use of the term "bodily burden" shares some overlap with the term coming out of toxicology and environmental health but as I use it, it denotes a larger set of physical afflictions necessitated by cleanliness standards than just chemical exposure. It is true that the scholarship on body burdens in part responds to a much larger literature on risk, exposure, and environmental justice. See Ronald Brickman, Sheila Jasanoff, and Thomas Ilgen, *Controlling Chemicals: The Politics of Regulation in Europe and the United States* (Ithaca, NY: Cornell University Press, 1985); Sheila Jasanoff, "Risk in Hindsight: Constructing a Politics of Resilience," in I. Richter, S. Berking, and R. Müller-Schmid, eds., *Risk Society and the Culture of Precaution* (London: Macmillan, 2006), 28-46. The sociologist Ulrich Beck has been the most widely-cited scholar theorizing risk, initiating an active research field on the topic with his 1986 hypothesis that a key feature of modernity was a shift towards social structures increasingly generating the notion of risk and organizing around managing such risks. See Ulrich Beck, *Risikogesellschaft: Auf Dem Weg in Eine Andere Moderne* (Frankfurt am Main: Suhrkamp, 1986); English translation as Ulrich Beck, *Risk Society: Towards a New Modernity*, Mark Ritter, transl., (Newbury Park, CA: Sage Publications, 1992).

as well as the role of regulatory bodies in governing these risks. On this topic, more has yet to be written. Such scholarship would contribute to a robust literature tracing the profiteering built based on constructed uncertainty around the bodily burdens of domestic technologies like synthetic textiles, synthetic estrogen, and home garden pesticides.[604]

Instead, in much of this dissertation I have tried to include the voices and experiences of domestic workers themselves. No domestic worker in 1870s New York, 1910s Alabama, 1950s Milwaukee or 1980s Idaho spoke about toxicity or chemical exposure. Instead, physical sensation was the language through which workers understood cleanliness: smell, whiteness, softness, exhaustion, and satisfaction. By centering these voices, I have tried to take cues from historians already doing this work: thinkers like Jennifer Guglielmo, Anneleise Orleck, Premilla Nadasen, Dorothy Sue Cobble, and Irene Ledesma. Their analytic efforts have taught us a great deal about the domestic workers over the past century who have organized on behalf of stronger workplace protection laws, greater economic visibility, and stronger legal recourse for sexual violence.[605] Organizing efforts in the last decade, drawing off this longer history, have yielded such wins as the passage of a Domestic Workers' Bill of Rights by eight state legislatures and the passage of fair work week legislation in five major U.S. cities. Further, ongoing organizing efforts

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[604] Michelle Mart, *Pesticides, a Love Story: America's Enduring Embrace of Dangerous Chemicals* (Lawrence, Kansas: University Press of Kansas, 2018); Paul David Blanc, *Fake Silk: The Lethal History of Viscose Rayon* (New Haven: Yale University Press, 2016); Frederick Rowe Davis, *Banned: A History of Pesticides and the Science of Toxicology* (New Haven: Yale University Press, 2014); Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven: Yale University Press, 2010); *Landscapes of Exposure: Knowledge and Illness in Modern Environments,* Gregg Mitman, Michelle Murphy, and Christopher Sellers, eds. *Osiris* Vol. 19 (2004); Jeffry L. Meikle, "Material Doubts: The Consequences of Plastics" *Environmental History* Vol. 2, No. 3 (Jul., 1997): 278-300.

[605] Jennifer Guglielmo, *Living the Revolution: Italian Women's Resistance and Radicalism in New York City, 1880-1945* (University of North Carolina Press, 2010); Dorothy Sue Cobble, *The Other Women's Movement: Workplace Justice and Social Rights in Modern America* (Princeton University Press: Princeton, NJ, 2004); Premilla Nadasen, *Household Workers Unite: The Untold Story of African American Women Who Built a Movement* (Boston: Beacon, 2015); Annelise Orleck, *Storming Caesar's Palace: How Black Mothers Fought Their Own War on Poverty* (Boston: Beacon Press, 2005); Irene Ledesma, "Chapter 19. Texas Newspapers and Chicana Workers' Activism, 1919-1974" in *En Aquel Entonces or, In Years Gone By: Readings in Mexican-American History*, Manuel G. Gonzales and Cynthia M. Gonzalez, eds. (Bloomington: Indiana University Press, 2000), 158-168.

have created the National Domestic Workers Alliance, begun in 2007 to advocate for the 2 million individuals who work as nannies, housecleaners, and elder care-givers.[606]

This dissertation has focused on the range of actors shaping domestic work: homemakers, domestic workers, commercial chemists, appliance manufacturers—and the non-human pervading the household. I have done so in order to understand a less studied but nonetheless transformative changes wrought by 150 years of industrialization: the rewiring of bodily senses. I have also focused on chemical and mechanical technologies changing the work of laundering. In doing so, I have tried to make a point about the intimacy of industrialization: a process that plays out in our very personal experiences of our immediate surroundings. I intend this point to build on, but not replicate, existing studies of mechanical domestic technologies. Historians of technology have amply demonstrated the limited social gains brought by the washing machine or microwave; I have focused, by contrast, on the ecological and sensory costs of the other crucial technology of household industrialization: chemical technologies. Be it via detergents that foamed, soaps that smelled of Oxygel, textiles that were dyed fluorescent, washing machines that agitated gently, or fabrics that were disposable, a century of commercial chemistry has rewritten how we inhabit our bodies. It has remade our sensory expectations for what cleanliness should look, feel, and smell like.

Much of my thinking about this project has been challenged and changed over the last four years. When first setting out towards archives four years ago, I thought of domestic work with this insistent ecological conclusion: domestic work constituted a form of noble self-sufficiency that served as space outside the commercial marketplace. Now four years later, I

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[606] National Domestic Worker Alliance website, https://www.www.domesticworkers.org/, accessed February 28, 2019. See also Ai-Jen Poo, "America's Most Invisible Workforce is the One We Need the Most," Health/Opinion page, *The Guardian*, Sept. 29, 2014.

cannot ignore the racialized labor systems making such valorized "stalwart homemaker" identities open to only a narrow nineteenth-century few—and mythologized, at that. When I began the project, I also sought to defend the endurance of households that had been, and continued to be, haven from industrialization's effects. But in examining trade journals and worker journals, I cannot ignore the effects wrought by 150 years of technological and political change played out in the home. Commercial chemists have transformed sensory expectations; the racialization of nineteenth-century expertise presaged the commercialization of that expertise in the twentieth century.

For all these changes to my own thinking, one of my goals coming into this project has remained unchanged: my commitment to giving voice to the full variety of domestic worker experiences had over the past 150 years. This warrants a small aside. Writing about the concept of multiplicity, the historian of science Michelle Murphy explains that the term serves as device for acknowledging the multiple modernities that can coexist simultaneously in a single material structure. "[B]uildings … can concretely be many things at once. … Instead of asking, What *is* a building? I will be asking, What are its *ands*? What did its historical relations make possible?" To answer her own question, Murphy argues that mid-century office buildings were at once gendered spaces, chemical-laden work environments where expectations of healthfulness prevailed, and technologies structuring social relations.[607]

We can productively think of housework, I argue, as a multiplicity: both gendered work *and* work historically shared between more than female-bodied workers; both unpaid work *and* work that individuals sometimes sought out for its modest financial restitution. Domestic work

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[607] Michelle Murphy, *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, and Women Workers* (Durham: Duke University Press, 2006), 12.

has never been one thing (though this dissertation strives to balance between noting historically specific heterogeneity and making generalizations that further my central argument). Multiplicity is useful, then, because naming it reminds me as a researcher to always assume alternative realities existed to the general current I am observing. Multiplicity always provides a means I use to write my way out of a bind: housework has certainly been an exploitative form of labor. And also: it has been a dignified, meaningful, and respectable form of work for its doers. Recognizing that both can coexist in a single work process does much to honor the past the present labors of domestic workers.[608]

The rubric "domestic work = burden" has collapsed a multiplicity of experiences, specifically working-class experiences, into one dominant narrative. It has rendered invisible the considerable social and environmental consequences of technological interventions, allowing the myths furthered by washing machine manufacturers and commercial chemists to characterize housework is only drudgery from which we—and the "we" is always a white female we—must be liberated.[609] Such myths introduce wedge between wealthy and poor, between white and non-white, and between individuals keeping their own house and commercial domestic workers doing the work for limited remuneration. My goal in some sense is to build a sense of shared interest

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[608] Writing about how ideas of race, health, and citizenship shaped public health policy in late nineteenth-century San Francisco, the cultural historian Nayah Shah movingly concludes: "In this book, I have attempted to interrupt the impulse of normalizing governance in order to view those outside the confines of standardized production or respectable domesticity in ways different from the normalizing frame. … The question for the new century is whether it is possible to embrace multiple modernities rather than judge all lived experiences from the vantage point of a single and universal standard that inevitably includes some and excludes others." Like Shah, I share this wish for the coexistence of multiple standards, in a way that affirm multiple ways of being. Shah, *Contagious Divides*, 257-258.

[609] In the last decade, several economists have revisited the topic of industrialization and its connection to gender equality, written for popular audiences. The economist Ha-Joon Chang, for example, has argued that "washing machines changed society more than the internet;" the economist Hans Rosling, similarly, has asserted that washing machines were the most important invention of the industrial revolution. See Ha-Joon Chang, *23 Things They Don't Tell You About Capitalism* (New York: Bloomsbury Press, 2010); Hans Rosling, "The Magic Washing Machine," TEDWomen 2010, https://www.ted.com/talks/hans_rosling_and_the_magic_washing_machine.

and of mutual loss: the shared sense of respect for domestic work, regardless of its doer; and the shared sense of loss of nineteenth-century expertise.[610]

"Reclaiming the joys of homemaking," women's historian Estelle Freedman reminds us, "would be less problematic if the ideal that women 'naturally' worked in the home for love, not money, did not have such profound implications for their identities. Historically, homemaking has been set in contrast to full citizenship."[611] I take Freedman's caution to heart. One goal of this dissertation has been to offer a historically- grounded and honest account of these limitations while still making space for the expertise that the term "homemaking" points to. One of the stakes of this book endures, from its inception until now: the presence of non-human nature in the household, and the ecological importance—as well as creative integrity—of domestic work. Our washrooms and rooftops and kitchens are places where we continue to rely on a set of ecological relationships rendered increasingly invisible over the past 150 years. One way to justly reclaim the joys of homemaking, I believe, is to better understand the work it once was, and the ecological costs of automating or synthesizing away that work.

Domestic work matters, ecologically. Our individual choices about how we eat, dress, bath, and play are always structured by economic and political power; both these individual choices and these collective options have important ecological consequences in places far away from our houses and homes. A growing branch of food studies and popular non-fiction makes this case for that which we eat. "Eating is … an ecological act, and political act, too," writes journalist Michael Pollan.[612] In this dissertation, I have argued that the same can be said about

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[610] The risk throughout is a naïve reductionism that assumes away any differentness in a way that, invoking the slogan of "one planet, one people," some environmentalist rhetoric still does today.

[611] Estelle Freedman, *No Turning Back: The History of Feminism and the Future of Women* (New York: Ballantine Books, 2002), 130.

[612] Michael Pollan, *The Omnivore's Dilemma: A Natural History of Four Meals* (London: Penguin, 2006), 11.

washing. Washing, mending, patching, and darning our garments are ecological acts, and also political acts. Though they cannot replace other forms of fighting for more just and sustainable economic systems, they nonetheless have a role in helping us imagine what it would mean to live rightly by the natural world.

A second goal for this dissertation has been to position domestic work as creatively meaningful, not just ecologically important. I think here of the experiences described by the domestic workers whose recollections I recount in this dissertation. Here is Ann Webb, of her experiences in Arkansas across the middle of the twentieth century. "It's kind of amusing to me, because for years I hung out clothes. Defending myself, [I used to say] I love to hang out clothes, and I love to listen to birds sing, and be out when the sun was coming up and it was such beautiful weather, and all that."[613] Or here is June Johnson, from Wisconsin: "I recall the lesson we had on lingerie made from tricot. [My friend,] … she made a nightgown for me out of lavender tricot and smocked it with pearl beads. I still have the nightie—it must be at least 15-years-old. The pearls are long gone but the nightie is still wearing real well."[614] What happens to upstream and downstream environments, and also to our relationship with the natural world right where we live, with the dawning obsolescence of such quotidian experiences of nature? What do we lose?

One word to describe these quotidian experiences is "pleasure." We must exercise caution when using a term with its own fraught and gendered history. But it is this sensation that the philosopher Kate Soper defends as crucial to forming an "alternative hedonism," one that

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[613] *Voices of American Homemakers: An oral history project of the National Extension Homemakers Council,* Eleanor Arnold, ed., (National Extension Homemakers Council, 1985), 168-169.

[614] June Johnson in *The Impact of Her Spirit: An Oral History,* Georgia Hoberg, Priscilla Hargraves, Betty Pipkorn, Ruth Dehne, and Lucille Storm, eds., of the Wisconsin Extension Homemakers Council, Inc. (River Falls, Wisconsin: River Falls Journal, 1989), 82.

might help us imagine desirable and durable alternatives to capital modernity. She calls on environmental scholars to track "the surfacing of desires for otherness on the ground this side of the precipitous face of such radical social change, even at the cost of finding them in the wrong places, desired by the wrong people, and contaminated by all the banality and political confusion and ordinariness of the everyday consumer culture out of which they will (since from where else?) be emerging."[615] This tracking is precisely what I have tried to do in this dissertation. For whom was electrification, appliance ownership, or the smell of Oxygel a pleasurable sensation? What images of modernity—as scented with birch bark, as boiled in the backyard—get lost with the collapse of heterogeneous cleanliness standards into their late twentieth-century norm?

This is not merely a philosophical point. As I hope to have shown you, the redefinition and selling of sensory pleasure has been, historically, *big* business. In the 1939, it did not escape journalists at *Fortune* magazine that of the leading U.S.-based manufacturers, soap maker Procter & Gamble was one of the few have avoided profit losses and layoffs.[616] In this same decade, from the depths of economic deprivation, chemical behemoth DuPont invested for the first time in an Aromatics division, focused primarily on fragrance technologies. 80 years later, by the early 2000s, home goods companies like Unilever and Colgate-Palmolive marveled at their global reach; according to one industry estimate, leading competitor P&G had sold one of its brands to four out of five households on the planet.[617]

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[615] Kate Soper, "Alternative Hedonism" *Cultural Studies* 22 (Sept 2008), 576.

[616] "99 $^{44}/_{100}$% Pure Profit Record," *Fortune* (April 1939): 77-83, 152, 154, 156, 158, 161-62, 164, 166,

[617] Davis Dyer, Frederick Dalzell, and Rowena Olegario, *Rising Tide: Lessons from 165 Years of Brand Building at Procter & Gamble* (Boston: Harvard Business School Press, 2004).

Washing's laboriousness makes it impossible to romanticize as we might be tempted to do with domestic tasks like kitchen gardening, cooking, or child-rearing.[618] Its endurance as work straddling the line between unpaid and commercial make it crucial to think with. Within the long history of domestic work, we can find models of washing work that are less resource intensive: I have turned some up here. Those models—even the ones found "in the wrong places," even the ones "desired by the wrong people"—are worth paying attention to.

[618] Some popular environmentalist writing lacks awareness of the ahistoricity of their appeals. This comes up most frequently in writing on back-to-the-land efforts and other domestically-grounded appeals. One aim of this dissertation is to point out the invisible work—women's work—underlying earlier less resource-intensive ways of living. See Annie Leonard, *The Story of Stuff: How Our Obsession with Stuff Is Trashing the Planet, Our Communities, and Our Health--and a Vision for Change* (New York: Free Press, 2010); Paul and Anne Ehrlich, *One With Nineveh: Politics, Consumption, and the Human Future* (Washington: Island Press/Shearwater Books, 2004); John De Graaf, *Affluenza: The All-Consuming Epidemic* (San Francisco, CA: Berrett-Koehler Publishers, 2002). Of course, the impulse towards finding a place beyond the social and political has deep historical deep roots, not least in critics of industrialization like Henry David Thoreau, Ralph Waldo Emerson, and John Muir. One wonders what a wilderness movement conceived by female advocates would have looked like.

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Notes

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American Viscose Company. Othmer Library of Chemical History, Science History Institute (formerly Chemical Heritage Foundation), Philadelphia, Pennsylvania.
Buss, Fran Leeper Papers. Schlesinger Library, Radcliffe Institute for Advanced Study, Cambridge, Massachusetts.
Buss, Fran Leeper Manuscript Collection. Wisconsin Historical Society, Madison, Wisconsin.
Cairns Collection of American Women Writers. Department of Rare Books and Special Collections, Memorial Library, University of Wisconsin-Madison.
D'Arcy Masius Benton & Bowles Archives, Hartman Center for Sales, Marketing, and Advertising History. David M. Rubenstein Rare Book Library, Duke University.
Home Economics Archive: Research, Tradition and History (HEARTH). Albert R. Mann Library, Cornell University.
J. Walter Thompson & Company Archives. Hartman Center for Sales, Marketing, and Advertising History. David M. Rubenstein Rare Book Library, Duke University.
Lamborn, Leebert Lloyd Papers. Othmer Library of Chemical History, Science History Institute (formerly Chemical Heritage Foundation), Philadelphia, Pennsylvania.
Little, Arthur D. Papers. U.S. Library of Congress, Washington, D.C.
Pamphlet Collection. Wisconsin Historical Society, Madison, Wisconsin.
Warshaw Collection of Business Ephemera. National Museum of American History, Washington, D.C.
Whirlpool Corporate Archives. Benton Harbor, Michigan.

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American Journal of Fabrics and Dry Goods Bulletin
American Laundry Journal
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The Electrical World
Forbes
Fortune
Good Housekeeping
Ladies' Home Journal
The Industrial Review and Textile Reporter
*Rayon Journal (*alternately named *Rayon Textile Monthly*, *Rayon and Melliand Textile Monthly*, and *Rayon and Synthetic Textiles* across the course of the publication's print run)
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