VISUALIZING TASTE

How Business Changed the Look of What You Eat

Ai Hisano

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Capitalism of the Senses

Business has shaped our sensory experiences of the world. Beginning in the late nineteenth century, food manufacturers, flavorists, and perfumers in the United States and elsewhere experimented with new technologies to standardize something seemingly personal and intangible—the senses. Just as they had begun to mass manufacture consumer products, they sought to create sensory perception by quantifying color and analyzing olfactory sensation based on chemical components.[1] In the interwar period, General Motors president Alfred P. Sloan developed business strategies around product diversification and appeals to the eyes of consumers, investing in different styles and colors. Around the same time, advertising agents and psychologists, including J. Walter Thompson, N. W. Ayer, and John Watson, began conducting new research on consumer behavior and the psychology deployed in corporate advertising campaigns.[2] It became not only possible but also crucial for manufacturers to determine the right smell, the right sound, the right touch, the right taste, and the right look of their products in order to elicit the desired response from consumers.[3]

The senses proved more challenging to control than manufacturing processes, however. After all, the human body was not a mass-produced product. Consumer preferences were difficult to measure, define, and standardize. Until the mid-twentieth century, when automatic equipment began replacing human senses, the measurement of sensory perception relied largely on individual researchers, whose judgment, necessarily, was not always uniform, depending on physical and surrounding conditions. As scientists, advertisers, consultants, and manufacturers from various industries began developing new techniques of measuring and reproducing sensory perception, there emerged a whole industry that created alternate realities and new worlds of sight, taste, sound, smell, and tactility.[4]

This creation of new sensations was an important and much neglected dimension of the evolution of capitalism. With rapid industrialization and market expansion in the United States from the 1870s on, firms began developing manufacturing and marketing strategies based on systematic management, large-scale operations, and knowledge of modern science.[5] Mass production and standardization allowed for unprecedented product variation in terms of color, scent, texture, and so on. The presentation of goods sold in outlets, first department stores and later supermarkets, became an important and effective means to stimulate consumer desires.[6] Contemporary scholars and cultural critics, including Thorstein Veblen, Theodor Adorno, and Walter Benjamin, identified and understood the new ability of business to employ psychological techniques to influence the buying and selling of goods. They emphasized the new strategies of capitalist enterprise to commodify human activity, taste, and feeling. In this new era of consumer capitalism, appealing to the senses and reinventing what consumers wanted became a crucial part of manufacturing and marketing practices to whet consumers' appetites.

But this was not just a new marketing strategy—the consequences of the management of the senses were profound and far-reaching. It was a new way for business to begin reshaping how people perceived the world. There had been business-driven changes of similar magnitude in the past, including the development of railroads, electric lights, and the telegraph earlier in the nineteenth century.[7] These new technologies had already altered people's perceptions of time and space. Now new techniques of stimulating and controlling sensory perception—ranging from fragrances for cosmetics and toiletries to artificially flavored and colored foods, synthetic fibers with a leather-like texture, and reproduced sounds of music—shaped how people understood their surrounding environments.

This book examines how business created this brave new world of the senses by focusing on the origins and development of the use of visual appeals—particularly color—as a key driver of demand in the food industry in the United States between the 1870s and the 1970s. The creation of lustrous, uniform color was a pioneering example of the employment of sensory appeals in the food business. Color turned out to be easier to control, reproduce, and commoditize than did other sensory factors. The smell of food, for example, was difficult to convey in print or other media. Color served as a powerful communication tool for the food industry not only to appeal to the eyes of consumers but also to stimulate gustatory, olfactory, and tactile sensations.

This management of food color was a business practice often invisible to consumers, yet it has proved an indispensable part of the expansion of the agricultural and food industries. In these pages, I unpack this untold history about the transformation of visuality in food production, marketing, and consumption.

Visuality was not a given but rather a historically contingent construct. As visual studies scholars have argued, the history of visual experiences cannot be reduced simply to the notion of ocularcentrism. The meaning of vision and visuality does not remain the same across time and space.[8] For Michel Foucault, for example, the preeminence of vision in modernity was historically distinctive and functioned in a very different way than it did in earlier times; it was, in David Michael Levin's words, "allied with all the forces of our advance technologies."[9]

By analyzing the rise of a vision-centered paradigm in the food business, this book illuminates historical connections between vision and knowledge, vision and power, and vision and ethics.

The "Garden" in the City

"The desire for color has come with us into the complexities of our modern life," contended Horace T. Herrick, who served as the principal chemist in the Color Laboratory of the US Department of Agriculture, in the trade journal *Food Industries* in 1929. In emphasizing fundamental and radical changes in agricultural production and food processing, he proclaimed the increasing importance of color in the buying of food:

> We do our gardening in the grocery or delicatessen, and in our selection of foods odor and taste have taken an inferior place to sight in an era in which a large proportion of our food is supplied to us in cans and bottles. We can judge only by what we see, and we choose instinctively the product that comes to our ideal.

Herrick argued that people used to consume foods "in the state in which it was provided for us by nature." But with the "advance of civilization the kitchen and the cannery [intervened] between the plant and the palate," and consumers increasingly purchased commercially manufactured and packaged food. As a result, according to Herrick, color—rather than odor or taste—became the primary means for people to judge food quality.[10]

The "complexities of . . . modern life" that Herrick conceived entailed changes not only in food production and eating habits but also in people's visual experiences and their knowledge about what they ate. In a "less fastidious time," when people prepared most of their foods by themselves, they could "blame any lack of appetizing appearance" on a certain preparation process or the cook's inexperience. But as consumers increasingly purchased commercially prepared foods by the late 1920s, "personal supervision" was no longer possible, Herrick noted.[11] Consumers lost knowledge about why the color of foods changed or where the food came from.

Herrick's argument epitomizes several key themes that I explore in this book: the transformation of food production and consumption; the creation of new visuality; and the connection between business, science, and politics. As food production became highly commercialized and the market expanded, food products increasingly became a subject of government regulation from the late nineteenth century. Federal and state governments became important gatekeepers of—as well as collaborators in—the food industry. Government scientists, like Herrick, who specialized in food color research not only encouraged but also served to authorize food producers and retailers to attend to and control the color of foods.

Colors that Americans today associate with certain foods are the result of economic, political, and cultural negotiations among food processors, farmers, grocers, dye manufacturers, bureaucrats, and consumers since the late nineteenth century. Government regulation of food coloring, for instance, restricted the kinds of dyes food processors could use. Climate and other environmental conditions were critical factors that determined the quality of agricultural produce harvested in certain regions, affecting how growers controlled the color of their produce. Intensive mass marketing and government grade standards helped define the color of foods on the market. Consumers' expectations about how food should look—in many cases what agricultural producers and food processors believed consumers wanted—in turn exerted substantial influence on the control and presentation of food colors.

The construction of food colors had a significant impact, not least because eating food was such a basic human necessity. Critically, as the color of food became a product of modern science and technology, the creation of new kinds of visuality altered how people thought of both food and, even more broadly, nature. Unlike other consumer products, the calibration of color in the food business was essential not only to satisfy, or create, consumers' insatiable appetite by expanding product variety but, more importantly, to "correct" natural variations and convey standardized ideas of freshness and naturalness—that is, to visualize the taste of food. Food manufacturers designed the color of some processed foods, including breakfast cereals, snacks, and candies, to show their variation, novelty, and uniqueness. But consumers often rejected a novel or what they considered an "unnatural" color for fruits and vegetables.

Corporate mandates to create profits and streamline production, on the one hand, and cultural expectations about the color of foods, on the other, combined to create a natural color for food that was, in fact, a hybrid of nature and technology, constructing naturalness through commercial and scientific intervention.[12] Scholars across disciplines have pointed to the control of the natural environment as a major aspect of capitalist development.[13] This book builds on their insights about the impact of the capitalist system and ideology on nature. Illustrating the historical construction of food colors, then, reveals not only how agricultural producers, food processors, and grocers capitalized on color but also how they reimagined and reinvented nature to capture value.

As Jackson Lears argued in his analysis of advertising images and rhetoric, factory-produced goods began to replace natural cornucopias as a common symbol of abundance in the late nineteenth century.[14] I extend Lears's analytical focus to the actual practice of creating, not just representing, "natural abundance." Not only did factories and technology replace nature, but they also became an integrated part of "natural" products, which manufacturers often believed to be superior to what nature offered because they were almost always more uniform and predictable. Consumers also accepted—and sometimes even preferred—certain forms of industrially manufactured "natural" foods. When consumers believed that the food colors before them, even when produced by human manipulation, were the natural colors of foods, the distinction between nature and artifice was effaced. As Raymond Williams contended, the idea of nature "contains, though often unnoticed, an extraordinary amount of human history."[15] The creation of standardized "natural" colors in the food business reveals the intricate and intimate relationships between nature and culture as well as the historical and cultural construction of ideas about naturalness.

Like naturalness, freshness became a contested characteristic of foods beginning in the late nineteenth century. So-called fresh foods—such as fruits, vegetables, and meat—came to represent what Susanne Freidberg calls "industrial freshness," engineered by agricultural growers, meatpackers, distributors, and grocers. In her work on the history of "fresh" foods, Freidberg maintained that agricultural producers' quest to manipulate perishable foods and consumers' demands for freshness lie "in the anxieties and dilemmas borne of industrial capitalism and the culture of mass consumption."[16] Modern technologies and economic changes transformed the scale and scope of agricultural production as well as the landscape of the countryside rapidly since the late nineteenth century.[17] This technological intervention into nature, however, was not necessarily the antithesis of the yearning for nature. As Leo Marx described as "the machine in the garden," the American pastoral ideal was built on contradictory relationships between nature and technology—the celebration of rural values and wilderness (which was also a cultural construct) coinciding with the embracement of industrial development and commercial values.[18] The emergence of supermarkets a few decades later embodied this machine–garden metaphoric relation. Food retailers sought to create the "garden" in the city, specifically in the supermarket, by prolonging the shelf life of "fresh" perishable products and displaying them in a visually attractive manner with a uniform, bright look.

A New Visual Regime

This book explores the emergence of a capitalism of the senses in concert with mass production and distribution through three central questions. First, how and why did business try to manage the visual appeal of food? The decades between the 1870s and the 1880s were a turning point for the American business: the development of transportation and communication infrastructure, innovations in manufacturing machinery and processes, and the rise of managerial business enterprise. These new technologies and business operations lowered the cost of mass-producing and mass-marketing standardized products.[19] In the food industry, research and control of color became a critical part of manufacturing and marketing strategies for product standardization. Agricultural producers, food processors, and retailers employed color-controlling technologies and knowledge in color science to determine and standardize the "right" color of foods, which many consumers would recognize and eventually take for granted.

The United States was at the forefront of the industrialization of agriculture and food processing, the emergence of the food-coloring business, and the growth of a modern food retailing system. The early development of the mass production and mass marketing of foods proved particularly conducive to the standardization of food colors. Food companies drove a huge growth in synthetic chemical ingredients used for foods. The United States became, and remained, by far the largest market of food dyes.[20]

Second, how did color management strategies in the food industry change over time? Advances in food technology and color science and the development of the chemical industry from the late nineteenth century afforded growers and food processors new ways of controlling the color of foods economically, consistently, and conveniently, allowing for a new level of control and standardization. Synthetic dyes, for example, were more intense in hue and less likely to fade compared to natural dyes extracted from plants. The transformation of merchandising systems and food purchasing patterns, particularly a self-service system, in the early to mid-twentieth century altered how retailers presented foods to consumers and controlled visual appeals in their stores. Networks and connections among different industries, such as food and chemical, became crucial for the development of new sensations. As agricultural production and food processing became increasingly industrialized, government officials and scientists became critical partners for many businesses.

Third, what were the consequences of color management for American society and culture? While I stress the importance of technological and scientific innovations for the creation of new visuality, this book breaks from narratives that center primarily on technological development. Instead, it explores what happened after the invention and development of color-controlling technologies, such as food dyes and packaging. What were the consequences of the development of synthetic dyes for food production and marketing? How did the federal government, the food industry, and consumers respond to them? How did standardized colors alter people's perception of food?

The efforts by the food industry to capture consumer desire facilitated the creation of a new kind of visual regime beginning in the late nineteenth century. This new visuality can be characterized as commercialized, gendered, and controlled. Food producers and retailers created new visual sensations and new visual environments to whet consumers' appetites through scientific intervention and constant management of color. This creation of vision-centered food purchasing experiences and retail environments rested on a gender-based understanding of shopping patterns and sensory perception. Marketers and grocers—usually male—sought to appeal to female eyes when selling food.

Women were not only a primary target of food marketing—cookbooks and popular magazines presented women as the creators of visually appetizing meals at home. The commercialization of visual senses and the creation of standardized food colors coincided not only with the expansion of mass production and mass marketing but also with substantial changes in domestic work: the introduction of modern kitchen technology and cooking ingredients, including the gas stove and oven, the electric refrigerator, and packaged food dyes.[21] Women's new relationship with home cooking was an important part of the rise of a new visual regime in twentieth-century America.

This book delineates the creation of food colors as a standardization process. Yet consumer experiences were far from uniform and varied significantly depending on consumers' social and economic status and region. On the one hand, the expansion of the food trade helped increase as well as standardize the variety of foods on the market. On the other hand, immigrant and African American families tended to resist "American" foodways, which typically represented foods from the New England region in the early twentieth century.[22] Nor could they afford the cooking ingredients, time, or equipment that their middle-class counterparts could enjoy. Even after the expansion of intensive marketing campaigns and the growth of popular magazines with colorful food illustrations in the 1930s, the major targets were middle- and upper-class, largely white, households. Besides, those targeted audiences did not necessarily follow marketing rhetoric or domestic advice. Rather, advertisements, popular magazines, and cookbooks helped construct and disseminate standardized images of food.

To analyze the political, social, and cultural implications of technological development and economic changes, this study builds on the growing body of interdisciplinary work that has depicted business strategies, entrepreneurship, and technological changes as key factors that helped create new ways of sensing the world. The rise of the music business in the United States between the 1870s and the 1930s, for example, facilitated the commercialization of sounds and helped shape the culture of listening to music by disseminating certain tunes and sounds as being more marketable than others.[23] The "color revolution" in the marketing and retailing of consumer goods, such as automobiles and clothes, transformed business practices and the broader visual environment in American society.[24] In the beauty industry, entrepreneurs played a critical role not only in expanding the global market but also in changing people's ideas about beauty. The shape and color of the body and face, smoothness of the skin, and bodily smell signified one's social and economic status. While an increasing array of beauty products seemingly offered consumers a wide variety of choices, the globalization of the beauty industry helped standardize what beauty meant across cultures.[25]

Visualizing Taste moves this literature on the role of business forward as a prime driver of changing sensory experiences by bringing together a wide range of agents across the realms of business and politics into a single historical narrative—particularly the agency of governments. Food was more regulated than some other consumer goods, such as beauty products. The creation of standardized food colors became not only a matter of business but also a subject of law and political decisions. Government officials and scientists were instrumental in legitimizing ideas about how food should look. They initiated food and dye research, established grade standards, and provided legislative definitions of food. The federal government also helped sustain and expand the color-controlling practices in the food business not only by regulating the food and dye industries but also by creating the new market for food dyes.

Historical studies about food regulations, particularly concerning food coloring and safety, have tended to interpret scientists and regulators in the Food and Drug Administration, most notably Harvey W. Wiley—a key figure in the passage of the 1906 Pure Food and Drug Act—as champions of public welfare, and corporate leaders as profit-seeking robber barons.[26] Scholars, including Gabriel Kolko, have criticized the focus on "public interest." They assert that the government was "captured" by big business, which supported and promoted the passage of food regulation to protect their own vested interests and eliminate their small business competitors.[27] Both the "public interest" and "capture" theories tend to view government and industry as monolithic entities. This book instead shows that the relationship between state and industry was dynamic, and that government agents and corporate managers held various interests and objectives.[28]

Visualizing Taste

Eating is a multisensory experience. My focus on color and visuality does not suggest that vision was the *only* important sense for the food industry or for consumers. Nor did sight replace other senses entirely in the selling and buying of food.[29] Sound, smell, and texture, as well as color, influence how people perceive the taste of food and whether they like it. Food manufacturers and food scientists have conducted extensive research on the creation of artificial flavor since the nineteenth century.[30] More recently, the impact of acoustic sensation, such as crunchy sounds, on the taste of food has generated growing interest among researchers. In a series of publications in the 2000s, psychologist Charles Spence argued that what we hear when we bite, chew, or sip significantly affects our perception of flavor. Food sounds serve as an indicator not only of texture but also of quality. They have a particularly noticeable influence on people's perception of crispiness because crispiness is synonymous with freshness in many fruits and vegetables.[31] Anthropologists and historians are now paying increasing attention to interactions among various senses in eating and drinking, not only from scientific but also from historical and cultural perspectives.[32]

The historical analysis of color is a missing piece in understanding this multisensory experience of eating and drinking. Food scientists and psychologists in universities, public institutions, and corporate laboratories have explored the function of color in the food business, such as the relationship between colors and flavors.[33] While their studies have shown the physiological and psychological impact of color on the taste of foods, they have generally neglected the historical and cultural aspects of both color and food. Foodstuffs are among the oldest of commodities, but the commodification of food through the control of sensory factors—including color—is a continual practice, remade in every new market context by human decisions and actions.

Visualizing taste by the food business involved two processes: meaning making, and the control of the physical features of food. Color was not simply a physiological characteristic of foods; it assumed a social and cultural meaning. Roland Barthes, writing in the late 1950s, pointed to the creation of myths attached to material objects, including photographs, automobiles, and food, in a capitalist system. Although Barthes was concerned with the "myths of French daily life," his analytical framework provides useful insights into deeper meanings of objects than mere practical functions.[34] The color of foods came to serve as a sign that represented notions of naturalness, goodness, and artificiality. Farmers, food processors, and grocers in turn sought to "match" the color of a particular food with its taste by, for example, controlling ripening processes, adding food dyes, and using refrigerators. The color of foods that many Americans came to conceive of as "natural" gradually dominated the market, although "unnatural" colors, such as green oranges, meat with brownish shades, and pale white butter, did not necessarily indicate the deterioration of eating quality.

The color of foods signified another set of taste visualization: one's likes and dislikes. The creation of colorfully arranged foods—with the help of commercially manufactured "convenient" ingredients, such as packaged dyes and cake mixes—served as the embodiment of one's taste in household cookery, symbolizing an ideal femininity and one's social disposition from the 1870s on. As Pierre Bourdieu contended, tastes constituted "an acquired disposition" to "establish and mark difference by a process of distinction."[35] Unlike a Kantian sense of universal aesthetic judgment, tastes for a certain color and knowledge about it serve as a social marker in mass consumer society. In this regard, sensory perception is not simply a matter of personal, physiological sensation but a shared cultural experience.[36]

The following chapters explain how and why this visualization of taste happened. Chapter 2 situates the creation of standardized food colors in a broader context of emerging color-saturated mass consumer society from the 1870s to the 1930s. It explores how scientists, advertisers, and business consultants (including General Electric physicist Matthew Luckiesh, J. Walter Thompson advertising agents, and "color consultants" Faber Birren and Howard Ketcham) helped transform the conception of food color by conducting scientific research and employing a new science of color in business strategies. Their innovations in color-controlling technologies and instrumentation helped food businesses create and standardize the "natural" color of foods. Color measurement and printing technologies in particular helped set the standard for a certain food's ideal color.

Once a means to determine whether a color of food was close enough to the standard became available, food manufacturers needed ways to actually change the color of foods and give them the ideal shade. Food dyes were among the most widely used materials in the food industry. The emergence of the food-coloring business and color standardization between the 1870s and the 1930s is the theme of the third chapter. The development of synthetic food dyes was an early transformative moment in how food businesses managed the color of foods. During the emergent era of large-scale production and marketing in the 1870s and

1880s, synthetic dyes provided food manufacturers with an economical means of standardizing their products and helped establish brand identities through consistent appearance. The expansion of the food-coloring business triggered new forms of government regulation, which facilitated the integration of color management practices into food businesses.

The next four chapters examine how agricultural producers, food processors, retailers, and consumers managed the visual appeal of foods by employing the new technologies and knowledge concerning color discussed in Chapters 2 and 3. Each chapter focuses on a site where the color of food was created: households (Chapter 4), farms (Chapter 5), factories (Chapter 6), and retail stores (Chapter 7). Chapter 4 focuses on the role of consumers, specifically women, in creating the color of foods. It explores how newly introduced commercial food dyes and processed products altered cooking in households as well as ideas about artificiality. Chapter 5 analyzes the creation of a "natural" color of agricultural products, or so-called natural produce, focusing largely on oranges. Growers and packers sought to create the color of foods that consumers would consider natural by manipulating a product of nature. Chapter 6 turns to the rise of the food processing industry. It demonstrates that what had initially been introduced as substitutes, particularly canned foods and margarine, came to redefine the color of original foods, like fresh produce and butter. Chapter 7 presents the management of retail environments—that is, supermarkets—to analyze how retailers controlled and presented the visual appeals of foods in selling their products.

Chapter 8 examines consumer responses against the "artificial" control of food colors and the emergence of new forms of naturalness during the 1960s and 1970s. Along with the rise of the consumer rights, environmental, and counterculture movements, a broad range of consumers increasingly demanded more "natural" foods. The rise of consumer movements against chemical additives, including the infamous

Red No. 2, expedited a major shift in business strategies in the management of food color, which continues today. The chapter concludes with the consequence of the rise of skepticism about standardized colors—the reinvention of the "natural." Unlike the rationalization of nature during the Enlightenment, this new "natural" did not necessarily mean exploitable resources. Nor was it the sublime nature as expressed in Romanticism.[37] During the 1960s and 1970s, consumer activists—including Ralph Nader, who advocated the elimination of synthetic dyes from the market—did not reject the artificial control of food colors entirely. While criticizing the use of synthetic chemicals, they accepted the use of plant-based "natural" dyes—for example, feeding chicken dried algae to make the skin and meat an "appetizing" color of yellow. Artifice merged into nature. This new artificial "natural" rested on consumers' desire for a nature that they could control. In the industrialized modern consumer society, there was no going back to the *old* natural—either the rationalism or the romantic anti-modernism.

The concluding chapter returns to the three central questions about the management of food color, changes in color management strategies, and the consequences of color-controlling practices. It explores the implications of the management of visual appeal in the food industry, including the democratization of food consumption, rising public concerns over health risks, and changes in ideas about the natural environment. The book concludes by situating the management of sight in the food industry in the broader context of how business has been instrumental in transforming the way we sense our world.

A Note on Images: The Consumption and Reproducibility of the Senses in the Past

This book includes nine color images and seven black-and-white images. It is impossible to perceive exactly how late nineteenth-century consumers saw color advertisements. People at this time probably experienced very different visual sensations when they happened upon a color image, which occurred much less often than it does in our modern rainbow world. Until the 1920s, popular magazines included few color images (one or two in each issue, if any). When I came across a color page in a magazine from the late nineteenth century in the research for this book, it was quite stunning. The color that beamed into my eyes after turning dozens of all black-and-white pages was unique, exciting, and astonishing. It is difficult to understand the significance of each image without understanding its context. I hope that my text will convey the historical and social contexts in which people first saw these images.[38]

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Food and Modern Visual Culture

Color played a pioneering role in the creation of a new sensory world of business from the late nineteenth to the early twentieth century. Color had long been a subject of inquiry among scientists and philosophers, including Isaac Newton, Johann Wolfgang von Goethe, and Michel Eugène Chevreul.[1] As science and industry began to converge at an unprecedented level in the nineteenth century, color was no longer limited to the realms of philosophical analysis or scientific investigation. The employment of color in business strategies became a crucial source of competitive advantage in multiple industries, including food.[2]

In the food industry, technological and conceptual changes in color research facilitated the standardization of color, beginning in the 1870s. Scientists developed color measurement technology and color notation systems, which helped measure and define how food should look; advertising agents and consultants served as a bridge between science and business by establishing ways to apply scientific knowledge to business strategies. Together they helped the food business capitalize on color, leading to the creation of new visuality.

A Chromatic Revolution in Capitalism of the Senses

The creation of bright, uniform colors in the food business was part of a new visual culture that many consumers, particularly the urban middle class, began to encounter in the latter half of the nineteenth century. After British chemist William Henry Perkin succeeded in processing and commercializing the first synthetic dye in 1856, chemical companies began expanding the palette of synthetic colors.[3] As Warren Susman noted, "chemically produced colors made possible a world of color never seen before."[4] Industrially manufactured dyes allowed not only economies of scale but also ever-increasing varieties in color.

Color lithography was one of the earliest ways of enriching visual environments in the late nineteenth century. Lithograph companies, including Louis Prang & Company and Currier & Ives, were producing elaborately colored images by the 1870s. Their colorful artworks and advertisements became popular means for middle-class people to decorate their homes and brighten an otherwise "dreary visual environment."[5] Grocery stores used colorful lithograph advertisements to catch customers' eyes, hanging them on storefronts and walls. A number of companies used lithographed trade cards to promote their products. Colorfully illustrated cards came with packaged tea, coffee, soap, and various goods; retailers also distributed them to their customers. Trade cards were popular collectible items, especially for women and children.[6]

While late nineteenth-century Americans enjoyed colorful images in print media, it was not until the early twentieth century that the use of color pages in popular magazines and advertisements expanded substantially. Color in the nineteenth century was expensive. In addition, the quality of color reproduction was not reliable: shades were often unnatural, and it was practically impossible to mass-produce color images with uniform results.[7] With the improvement of color printing technology and the reduction of costs in the 1920s and 1930s, what

Roland Marchand dubbed the "color explosion" in print media transformed people's visual experiences in their everyday lives.[8]

The "color explosion" became apparent not only in print media but also in a wide range of product designs by the first decades of the twentieth century. In the automobile industry, the president of General Motors, Alfred P. Sloan, established annual model changes, creating what he called the "modern era of color and styling" in the 1920s.[9] Sloan's decision to invest in design contributed to the firm's fast sales growth, as its competitor Ford sold only the black Model T until 1927.[10] In addition, a colorful array of kitchenware, numerous shades of house paint, and rainbow colors of clothes became increasingly available during this period. A 1928 *Saturday Evening Post* article titled "The New Age of Color" noted that with "the craze for colored glassware for table and parlor use," "even the humble agateware of pantry and kitchen refuse[d] to be denied a part in the general symphony of color." "The effects of our chromatic revolution [were] everywhere apparent," the author argued.[11] The splashes of color and lights in store windows and department stores became a symbol of a new world of goods.[12]

Product variations became an important factor in mass producing and mass marketing standardized products. Standardization led to experiments with colors and styles while allowing manufacturers to reduce production costs; consumers were thus able to buy more goods and to feel greater levels of attachment to those goods. In contemplating the implications of standardization, the iconic automobile manufacturer Henry Ford asserted in 1931 that standardization "introduced unheard-of variety into our life" rather than "making for sameness." "Machine production," continued Ford, "diversified our life, [and gave] a wider choice of articles than was ever before thought possible."[13] His statement—seemingly contradictory, since Ford at first manufactured only black cars—points to the many new variations that entered American life with standardization. By the mid-twentieth century, color had penetrated all facets of modern life, whether automobiles, street signs, advertisements, textiles, or food.[14]

Depending on the type of business, standardization posed different challenges and had different consequences.[15] In the food industry, color standardization meant asserting the idea of naturalness even as manufacturers imposed a natural color through artificial means. Standardization also brought the constancy of appearance, allowing manufacturers to consistently create the color of foods that consumers came to expect. This reliability and predictability were crucial factors in manufacturing and marketing foods for the mass market.[16] Color became a signal of quality that would be visually appealing to consumers. A growing variety of foods with bright, uniform colors in food stores and households constituted modern consumer culture at the turn of the twentieth century.

Food producers and retailers believed that the appearance of food was a crucial factor not only in helping consumers judge product quality but also in getting them to buy foods on impulse. They underscored the eye appeal that the color of foods generated as the stimulator of consumers' desire for buying food. Particularly after the expansion of self-service grocery stores during the first decades of the twentieth century, consumers relied less on store clerks' assistance in selecting foods. The luscious color of foods instead enticed consumers, whetting their appetite. In a 1917 article in the *American Food Journal*, the secretary of the National Confectioners Association argued that the sense of sight had "direct relation" to the palate: "The color attracts the eye, desire is created, and the color increases the palatability because the taste nerves are stimulated."[17] Colors did not add flavor to food but helped consumers imagine its taste, as well as its smell and texture. As one grocer noted, color became "one of the greatest forces in the world" in selling food.[18] With glances at beautifully arranged foods in window displays and shelves filled with colorful foods—yellow pasta; pink and red sausages; red, green, and blue candies—glaring, bright mixtures of hues beamed into consumers' eyes.

Science and the Commercialization of Color

Close connections between science and business became a key to the rise of the "chromatic revolution" during the 1920s and 1930s. Scientists who worked on the visual sense and color science generally believed that vision was the most important sense for human beings and that sensory perceptions could, and should, be examined based on scientific knowledge. Physicist Matthew Luckiesh, who served as the director of General Electric's Lighting Research Laboratory from 1924 to 1949, developed theories on color and its physiological effect on people. According to Luckiesh, the improvement of visibility and visual environments was closely connected to the advent of modern civilization. His views on the visual sense encapsulated contemporary understanding of the human body as a machine.[19] Luckiesh and coauthor Frank K. Moss argued in their 1934 work, *The New Science of Lighting*, that "seeing is the most universally important activity of human beings" operating as "human seeing-machines."[20] Color was a crucial element that improved the function of these "human seeing-machines." "We [could] exist without the ability to see color but color-vision add[ed] a magical drapery over our surroundings," they contended.[21] Their strong belief in scientific and technological progress, rationalization, and professionalization—what Michel Foucault conceived of as characteristics of modernity—helped facilitate the integration of visual sensation into modern consumer culture.[22]

The scientific analysis and quantification of color in the food industry embodied a new understanding of food that was becoming common in the United States and Europe at the turn of the twentieth century. After research in nutrient science took off in mid-nineteenth-century Europe, scientists began to analyze every component of food. As foods were increasingly understood based on their nutrient content, the perception of food in science, business, and politics was transformed fundamentally by what Uwe Spiekermann calls a "nutrient paradigm."[23] Based on research in food science and technology, food manufacturers created new products by isolating and recombining various nutrients and raw materials, including color. Government officials also believed that control of nutritive contents and other ingredients, such as color additives, was the most effective way of regulating fraud in food production and sales.[24] And for the first time, scientists and food manufacturers understood color as a food component that could be analyzed, transformed, and isolated from the product.

For the sensory evaluation of products, including color investigation, food manufacturers relied primarily on the knowledge and experience of individual experts. Flavor chemists, coffee tasters, winemakers, and color scientists evaluated the flavor, taste, and color of individual foods and determined whether the product was marketable.[25] The simplest method to analyze color was to compare the object with a standard by eye. British brewer Joseph W. Lovibond developed an instrument, called a tintometer, for measuring the color of beer in 1887 (plate 1). An examiner placed a sample glass of beer on a tray and matched its color with one of the sixteen glass plates attached to the equipment. Each plate was assigned a number, beginning with the lightest (no. 1).

By giving each color a number, Lovibond sought to eliminate ambiguity in the description of colors. The naming of colors had been a grave problem for color scientists as well as for food manufacturers. Color names, such as dark brown and light yellow, did not have clear, standardized definitions. "Dark brown" could mean various degrees of darkness and different shades, depending on the viewer. The Lovibond tintometer provided a common scale and language that color examiners could share simply by using the number of each color plate. The tintometer was initially used primarily by the brewing industry. As the equipment became popular, Lovibond created similar scales for red, blue, and yellow that could be used for various food and beverage products.[26]

Color charts and color dictionaries were other means of establishing standards without using descriptive color names. One of the systems that was widely used (and is still used today) in the food industry was the Munsell system, originated in 1905 by Albert H. Munsell, a drawing professor at the Massachusetts Normal Art School in Boston. Munsell created what he called an "Atlas" of color charts, which arranged different colors in order (plate 2). Each color, or hue, was arranged based on the scale of value (the lightness or darkness of a color) and chroma (the saturation or brilliance of a color). Munsell published charts for forty different colors.[27] Matthew Luckiesh of General Electric was a strong advocate of the Munsell system. Lamenting a lack of universal color notation, Luckiesh asked, "Is there a more ridiculous instance of neglect? Those who work in color often find themselves helpless in describing colors to others."[28] He believed that the standardization of color names and systematic categorization of colors were indispensable for establishing the science of color.

Munsell's main objective was to make "the recording of color easy and convenient" in teaching color—particularly to children. But his Atlas and related color notation systems soon became a commercial tool for various businesses, including food and agriculture.[29] Dorothy Nickerson—Munsell's research assistant and secretary, and one of the few female color scientists at the time—contributed to the application of color measurement and standards, including Munsell's Atlas, to the grading of agricultural products and other industrial use during the 1930s and 1940s.[30] After working for Munsell from 1921 to 1926, Nickerson started a new career as a color scientist at the US Department of Agriculture (USDA). Along with her government job, Nickerson actively participated in the Inter-Society Color Council (a nonprofit organization founded in 1931) and the Munsell Color Foundation to promote the advancement of color knowledge and standardization (she became the president of the foundation in 1972). Like many other color scientists, Nickerson stressed the importance of color standards and the standardization of color terminology, arguing that "there must be a basis for common understanding" about color to solve "color problems" in industry.[31] The standardization of color nomenclature and measuring methods, including Munsell's Atlas, would provide businesses with a viable tool to employ color in their grading and marketing practices.

Scientists Aloys John Maerz and Morris Rea Paul developed color charts similar to Munsell's Atlas and published *A Dictionary of Color* in 1930. The *Dictionary* contained 7,056 colors—the largest number in a color dictionary at the time. Maerz and Paul's primary objective in publishing the *Dictionary* was to provide "a reference source for all the recorded color names" used in English and to exhibit color samples acceptable as a standard by presenting "a complete range of colors." They contended that "while standardization [had] been arrived at in practically all other fields," attempts at identifying color sensations were usually "chaotic" and could lead to financial loss in business.[32] One disadvantage of using the *Dictionary*, however, was that some of the neighboring color samples on the charts looked so similar that it was difficult for examiners to specify which named color on the chart corresponded with the color of the product.[33]

In setting color standards for canned fruits and vegetables, the USDA used the color charts of Maerz and Paul, primarily because their dictionary had the widest variety of colors. An examiner simply compared the color of the sample with a plate illustrated in the *Dictionary* to determine whether the product had attained the desired color.[34] For example, frozen green peas would not be graded above US Grade B if their color was lighter than the color designated as "L-9" in Plate 17 in the *Dictionary*.[35] US Grade A canned grapefruit juice needed to be no darker than "G-1" in Plate 10.[36] Like the Lovibond device and other colorimeters, the standardization of color description based on numbers as well as alphabets provided investigators with common vocabularies, allowing them to communicate more efficiently.[37]

Even though color scientists commonly understood the principles of color measurement by the 1930s, there was no single widely accepted way to present the results of measurement. Nor were there standardized light sources for measuring color, which were essential for accurate color measurement, since the perception of color depended on the reflection of lights. The Commission Internationale de l'Éclairage (CIE; the International Commission on Illumination), an international organization for developing standards concerning light and color, established methods for the measurement and specification of color in 1931.[38] The CIE system allowed an examiner to calculate and quantify colors by assigning values for the three primary colors (red, green, and blue).

Colorimeters and color charts provided examiners with a set of standards for investigating the "naturalness" or "rightness" of food colors and determining to what extent the color of the finished product deviated from the standard. But judging color with the human eye did not provide uniform or consistent results; rather, it depended on the physical and psychological conditions of the viewer, such as lighting, presentation of the sample, and the observer's fatigue.[39] Since no two persons respond to a given light or color stimulus in quite the same way, there were discrepancies in measurement data among researchers when they compared a sample with the standard. Moreover, as a range of product lines expanded in the food industry and as food production and food processing technology became more complex, it became increasingly difficult for individual experts to have precise and detailed knowledge about all products and to make accurate judgments.[40]

During the 1920s and 1930s, color scientists began experimenting with new equipment called spectrophotometers to replace the human eye for color investigation. Spectrophotometers provided a quantitative measurement of color by calculating the intensity of light reflected from a sample of foods and beverages.[41] In the late 1920s, Arthur C. Hardy of the department of physics at the Massachusetts Institute of Technology developed one of the earliest spectrophotometers.[42] Hardy assigned his patent rights to General Electric, which began the commercial production of his equipment in 1935.[43] Food industry trade journals reported Hardy's development as revolutionary. The trade journal *Oil and Fat Industries*, for example, introduced Hardy's spectrophotometer as new technology with no visual errors.[44] The instrument, however, was difficult to use. It was not automatic and required too much calculation by its wielders to evaluate a color. It was not until the mid- to late twentieth century that colorimeters became fully automatic.

Nonetheless, spectrophotometers and other colorimeters of the 1920s and 1930s allowed researchers to detect colors more uniformly and consistently than did earlier equipment.[45] Managers and manufacturers of food companies were well aware that "small differences in color [meant] thousands of dollars in the sales" of their products.[46] In addition to the elimination of human involvement in measuring color—not to mention errors of calculation and discrepancies of individual perception, spectrophotometers provided "a definite and permanent record" of color.[47] The original shades of the color standards—such as the glass plates of a Lovibond tintometer and the color charts of Munsell's Atlas and Maerz and Paul's *Dictionary*—tended to fade over time depending on storage conditions of the instruments and prints. Because spectrophotometers measured color by calculating reflected light rather than using color samples, the result was almost always consistent.

The spectrophotometer epitomized a turn away from the individual body and, thus, a turn toward a standard that was above and beyond what any single person or body could measure. In the 1939 article "How to Obtain the Right Food Color," published in the trade journal *Food Industries*, USDA chemist Benjamin I. Masurovsky asserted that color was a kind of "yardstick" in the selection and judgment of foods: "Doubtless this eye appeal depends in good part upon the appeal of the color of the food by association through our sense of sight to our memory. Hence, to gain this eye appeal the color of a given food must be normal and right."[48] His emphasis on the "normal and right" color of foods suggests that memory and the sense of sight were not simply personal sensations or perceptions; rather, the visual modality was a shared experience that could be normalized and standardized. Moreover, according to Masurovsky, individual memory and sight were not reliable in and of themselves, whereas the measuring machine was more reliable than one's bodily apparatus of sight in telling a consistent "truth" about color.

To make foods look "normal" and "right," it was crucial for food producers to know what exactly the right color meant, or how it looked. How green was a green bean? How yellow was butter? How orange was an orange? Understanding how a certain food should look, as well as reproducing its color, had a direct impact on the marketability of the product. One food chemist noted in 1941 that color, as a means of quality control, would "help keep the enterprising business out of the red."[49] By measuring and quantifying color, food manufacturers sought to translate expectations about the "right" color of foods to the actual appearance of their products.

Color notation systems and measuring equipment provided scientists and food producers with "objective" knowledge about colors and a means for quantifying and standardizing the color of foods. As Jonathan Crary has shown in his study of nineteenth-century visual culture, the new ways of measuring and seeing colors marked a significant advance in the process of "capitalist modernization": they trained food manufacturers and scientists to "recode the activity of the eye, to regiment it, to heighten its productivity and to prevent its distraction."[50] The colors presented to the eye at the market no longer represented the full, variable range that nature's bounty would ordinarily possess but rather the narrower range chosen by mass producers using new tools of color measurement. The apparatus for color analysis altered how people understood colors fundamentally, and the rationalized and standardized perception of color became essential for manufacturers to give foods a "natural" color consistently.

Colorimeters did not eliminate human involvement in measuring and judging the right color of foods entirely, however. The measurement of food color was a complicated task that crossed over diverse disciplines, including physiology, physics, electronics, optics, and psychology.[51] In particular, the psychological effects of color on food purchasers were problematic. Color scientist Dorothy Nickerson contended in the late 1920s: "To measure color we must deal with it psychologically—in terms of what we see, not in terms of the wavelength stimulus."[52] Quantitative data obtained from photoelectric measurement offered no information about consumer preferences in color or whether they would like, or even accept, the color of a particular food. Understanding psychological effects of color and consumer preferences became a critical part of marketing strategies in the food industry, resulting in new professions such as color consultant and marketing agent.

"Selling with Color"

A "chromatic revolution" that occurred in the first decades of the twentieth century went beyond the scientific arena and transformed visual environments in department stores, grocery stores, and urban streets.[53] The application of color theory to marketing became critical for many businesses for understanding consumer preferences regarding design and effective ways of using color. Advertising agents and so-called color consultants helped facilitate this visual change by employing newly introduced color printing and photography, as well as scientific studies of color, to present appetizing food images to consumers.

The presentation of food in visual media has a long tradition. Since ancient times, various fruits—including figs, peaches, and grapes—have been symbols of natural abundance, beginning with the Greeks and Romans. By the seventeenth century, still-life painting had become an established genre of art in Europe, most notably Flemish painting.[54] Dutch painters presented colorful images of food as well as other natural objects, like flowers, as a symbol of global power and the affluence of the nation. As Simon Schama noted, the still-life painting with its colorful food items, which can be seen as an early form of commodity fetishism, also signaled anxieties over the propriety and durability of wealth.[55] Food images—such as half-eaten bread, citrus skins hanging from a table, oyster shells, and plump grapes—symbolized connections between life and death, chaos and order, indulgence and abstinence, abundance and frugality, and materiality and spirituality. These images often served as an iconographic sign that conveyed allegorical messages and biblical references.[56]

The representation of visual and gustatory sensations became an object of artistic and commercial creation for lithographers and photographers in the mid-nineteenth century. In 1845, William Henry Fox Talbot shot one of the earliest food photographs, *A Fruit Piece*, in which he arranged a basket full of peaches and a pineapple on a table so as to look like a still-life painting.[57] The mechanical reproduction of art gradually accelerated the commercial use of food images.[58] A box of breakfast cereal or a can of fruit or vegetables increasingly replaced, or sometimes accompanied, images of sliced beef, hanging fowl, and fresh peaches. As Jackson Lears argued, food advertisements in the late nineteenth and early twentieth centuries increasingly disconnected people from the material world by promoting disembodied imagery of abundance, rather than embodying beliefs and symbolic meanings of a particular society.[59] Advertisers did not necessarily eliminate allegorical messages from food images but refashioned iconographies of abundance for the primary purpose of selling goods.

The "chromatic revolution" in advertising and other print media was slow to develop, however. Although a number of leading popular magazines reduced the rate for color printing in the 1920s, the cost of four-color space was still nearly 50 percent higher than the cost of black and white.[60] In 1922, an advertising agent at the J. Walter Thompson Company (JWT), one of the largest advertising agencies of the 1920s in the United States, noted in an in-house newsletter that unless color played a considerable part in selling goods, its expense could not be justified.[61] But the justification for using color was not straightforward. Some advertisers believed that black-and-white prints were as effective as color printing, or at least good enough. In his 1925 book on illustration techniques in advertisements, *Printers' Ink* columnist W. Livingston Larned contended that by employing a black-and-white illustration skillfully with "immeasurable detail and a close adherence to realism," monochrome images, with their "artistic charm and novelty," could "overcome somewhat the handicap of lack of color, in the midst of color."[62] Some advertisers even believed that because people were surrounded by all kinds of colors in nature, black and white would look "novel" and catch consumers' eyes more effectively than would color images.[63]

Advertising agencies, printing companies, and publishers promoted the value of using color partly because color pages were more profitable than black-and-white pages. "Color [was] the National salesman," the US Printing & Lithography Company declared to advertisers in a 1923 issue of *Printers' Ink Monthly*, suggesting that color images would increase the sales of their products.[64] The journal also noted in its 1929 issue that a "nation's habits can be changed by the winsome coloring of Lithographed Advertising." Featuring a colorful Sunkist advertisement as an example, the journal stressed the "sales success" for advertisers assured by color images.[65] In 1925, the Curtis Publishing Company began requiring advertisers who chose to use color to purchase four-color pages for its *Ladies' Home Journal*. Even when advertisers wanted to use two colors, they needed to pay the rate for four-color printing. Moreover, Curtis required advertisers who wanted to use color to publish at least six four-color pages in the *Journal* within a year.[66] The share of advertising revenue that the *Journal* generated from color prints increased from 11 percent to nearly 50 percent between 1913 and 1938.[67]

The advantages of color for advertisers included its distinctiveness, its appeal to emotions, and its realism. Color distinguished goods and brands from those of competitors and aroused consumers' attention. It also helped the merchant as well as the consumer in visualizing the goods. General Electric physicist Matthew Luckiesh contended in his 1926 book that color was particularly important in advertising and merchandising goods because advertisements appealed to consumers "chiefly through the visual sense," which he believed was the most effective way of attracting their attention. He maintained that few people had "the ability to visualize things as they [were] when merely verbally described or depicted in black and white."[68] Many advertisers likewise asserted that color not only caught viewers' attention but also affected their actions by exerting emotional and psychological influence on them. The realism that color brought to an image was particularly important for food advertisements.[69] Realistic color images made foods look "good to eat" in a vivid manner and made them attractive.[70] After all, who would want to eat a black-and-white meal?

The value of color became gradually recognized in the wider commercial world during the 1920s and 1930s. Yet there were, in Luckiesh's words, "many instances of thoughtlessness or of lack of acquaintance with the many fundamental principles" concerning color.[71] While scientific studies could provide marketers and manufacturers with knowledge about color mechanisms, advertisers still needed to learn a way to employ color in a more practical manner, and most of them were still experimenting with it.[72]

Color consultants became an emerging profession, providing firms with advice on the effective use of color in advertisements and product design. Faber Birren was one of the most prominent consultants specializing in color, working for various enterprises, including the food, chemical, and automobile industries. Born in Chicago in 1900, Birren began his career in publishing. At the age of thirty-five, he moved to New York City and established his own business as a consultant. Interested in the effects of color on people, both physical and psychological, he played a pioneering role in research on "functional color"—the employment of color that would increase productivity and safety in work spaces, including factories, hospitals, and schools. For example, Birren advised a manufacturing plant to change its wall color so as to reduce workers' eye fatigue. By the late 1940s, he had acquired a wide range of clients, including DuPont, Walt Disney, and the US Navy.[73]

Birren's contemporary, Howard Ketcham, also made important contributions to the emerging field as a color consultant. After graduating from Amherst College and studying at the New York School of Design, Ketcham served as an art director for the advertising agency H. K. McCann from 1925 to 1927, when he joined DuPont as the director of the Duco Color Advisory Service. After leaving DuPont in 1935, he established his own color consultancy, Howard Ketcham Inc., in New York City, and worked for such firms as DuPont, General Electric, and Pan American World Airways.[74]

As authorities on the professional use of color, color consultants like Birren and Ketcham facilitated the colorization of food marketing based on what they considered the "scientific" law of color. Birren argued that color was not simply a matter of artistic taste; rather, he believed its influence on human beings could be described in terms of practical rules and objective knowledge. In his 1929 article in *Printers' Ink Monthly*, Birren contended that color in advertising was a "democratic" and "scientific" practice rather than "solely within the realm of art" or "some sort of godly genius."[75] But color did not always "wave a magic wand," argued Birren in his 1945 book *Selling with Color*. The value and effectiveness of color depended largely on a "wise and appropriate application of its powers." According to Birren, for example, "the most 'edible' colors" were "a warm red, orange, a pale yellow, peach, a light green, tan, and brown" when selecting colors for food packages, plates, and restaurant interiors. "Dark blue and bright red" were the "outstanding colors" for food packaging.[76] Ketcham also stressed the significance of color in selling foods to stimulate consumers' gustatory sensation. At a 1939 convention of the National Confectioners Association, Ketcham noted that "color dominate[d] the world . . . in all fields and in all uses." For the food industry in particular, color served to emphasize "purity, freshness, and gaiety" of the product and "affect[ed] the appetite," argued Ketcham.[77] The power of color—and effective ways of executing it—was becoming an established concept.

By the mid-1920s, a growing number of companies began seeing color advertisements as more beneficial and attractive than black and white.[78] Many popular magazines featured four-color printing, which presented more vivid images and "faithful pictorial effects" than two-color images.[79] The *Saturday Evening Post*, for example, ran 5 percent of its advertising pages in color in 1907; the percentage grew to 28 in 1922.[80] "The outstanding, the most striking and most arresting feature of the modern magazine" was color, according to one advertising agent.[81]

Food businesses were among the principal users of color in their promotional materials because they believed that realistic color images would "whet the appetite."[82] Advertising agents' understanding of creating colorful images reflected the contemporary understanding of food shopping patterns and color effects based on gender. They commonly believed that those who purchased and cooked food were primarily women, and that color was more effective particularly for attracting female consumers. In a 1931 grocers' manual, the author conceived that a woman's sensory perception was "more keenly developed than [a] man's."[83] Similarly, a 1937 grocery trade journal stated that "she buys meat with her eyes."[84] Advertisers contended that women were more susceptible to colors, so that the extra cost for four-color printing would be worth spending in order to appeal to "feminine interest."[85]

As more advertisers turned to color images and as popular magazines began reducing their prices for color pages, colorful images of foods increasingly appeared in advertisements, giveaway cookbooks, and popular magazines. "The food producer these days has learned to say less about his products and to show them more, at the same time taking advantage of the growing habit of the American people to see what they eat before they select it," a 1926 article in the trade journal *Citrus Industry* declared. The author emphasized the importance of eye appeal, particularly the color reproduction in advertisements, in selling oranges as well as other agricultural produce.[86]

The California citrus industry and canning companies were some of the earliest advertisers among the wider food industry to carry out extensive national promotion using color printing. The California Fruit Growers Exchange had already used colorful images of citrus fruits in various promotional materials since the early 1910s, reinforcing the association between an orange color and ripe oranges. From the beginning of the century, canning companies, such as Del Monte, Libby's, and Campbell's, also employed color printing in their advertisements and product labels (plate 3). In fact, canners became a prominent user of color printing. According to a 1941 survey of 1,755 labels used by 120 leading canners, nearly half of them used more than four colors on their labels.[87] Because consumers could not see the contents at the point of purchase, images on labels were the best way for canners and grocers to attract consumers' eyes—and appetites.[88]

The naturalness and harmony of color in published images were critical for the presentation of foods. Meatpacking companies, particularly Swift & Company and Armour & Company, had been running national advertising campaigns for their cured meats since the late 1890s, but their advertisements had been printed mostly in black and white. Some meatpackers published color advertisements and recipe leaflets, but the industry was relatively slow in employing color media for its promotional materials. One breakthrough was, according to a

JWT agent, "the discovery of a certain shade of orange."[89] It improved the reproduction quality of meat color, and allowed advertisers to recreate the natural, and realistic, images of meat products. By the late 1920s, meatpackers had begun presenting both fresh and cured meat products in bright pink and reddish shades in their advertisements and recipe leaflets.

The relationships between the color of meat and its quality were by no means natural; rather, the idea that a bright red shade was an indication of good-quality meat was historically and culturally constructed. Traditionally, words such as "bright" and "cherry red" were used to describe the preferred color of meat, particularly beef, and "white" and "creamy white" for beef fat.[90] The color of meat did not always indicate eating quality: meat color turned to gray or brown with little change in taste, though grayish and brown shades could suggest bacteria. The yellow color of fat and tissues was sometimes a sign of disease.[91] The fat of aged animals also assumed a yellowish color, and the meat was usually tougher than that of younger cows.[92] Yet in many cases the color of fat varied from white to straw to yellow, depending on the kind of cattle feed: when cows were fed primarily corn or grass, fat assumed a deep yellow color.

Partly due to the association with disease and aged meat, government inspectors usually graded bright red meat with creamy-white fat higher. These were the colors consumers found in meat advertisements, recipe leaflets, and cookbooks.[93] A food-purchasing manual for housewives, published in 1934, asserted that the color of good beef was "bright cherry red and the flesh firm and fine grained, well mottled with a creamy-white fat and having a good outer covering of brittle, flaky, white fat."[94] Meatpackers' promotions of a particular color of meat and the industry's grading served to create consumer expectations about "good" meat colors, while colorful illustrations in advertisements and cookbooks instructed consumers visually on how meat should look.

Enticing food images in print media not only stimulated consumers' visual appetite but also offered them "color education," showing how food should look. Cookbooks and women's magazines had long taught housewives how to choose foods based on color. Yet chromatic information in nineteenth-century recipes was based primarily on written texts, printed in black and white. An 1823 cookbook advised readers that a salmon should be "of fine red, (the gills particularly,) the scales bright," and there should be "a whiteness between flakes."[95] In 1893, an article in the *Ladies' Home Journal* noted that high-quality beef was "clear red in color; a pink hue signifie[d] the presence of disease, while that of a dark purple indicate[d] that death resulted from natural causes."[96] Because there were no visual references in these recipes, what "fine red" salmon or "clear red" meat meant depended largely on consumers' experience and local market conditions. As colorful food advertisements increasingly appeared in national magazines during the 1920s and 1930s, images of products such as Sunkist oranges and Swift's Premium ham presented to consumers the idealized and standardized image of the "right," "natural" color of various food products.

The reproduction of more realistic and natural color gradually became a norm in the advertising industry with the introduction of a new medium in the 1930s: the use of color photography. After the financial crash of 1929, advertisers of various products increasingly turned to color images to bring attention to their sales messages. While many firms lost the financial means for advertising, those businesses able to pay for color printing sought to stimulate consumer demand by featuring their products in color, particularly through color photography.[97] Most of the earlier color images had not been "truthful" enough, as these had been so-called pen-and-ink illustrations drawn by designers. Even when photographed, the reproduced image had often looked unnatural due to inadequate printing technology.[98] Criticizing the poor quality of color photography, a JWT agent had insisted in the late 1920s that a great amount of photographic work was "uninteresting and tiresome" because of a look of "cheapness."[99] The technological development of color photography reproduction in the 1930s met advertisers' and food producers' demands for "true" color and "real" images of goods.[100]

Advertisers asserted that photography brought to food advertising a convincing actuality and great credibility, while pen-and-ink drawings, even in color, presented only a pictorial fantasy.[101] But, in a sense, color photography was also a pictorial fantasy, since its composition and colors were usually carefully manipulated by photographers. Yet food advertisers believed that the actuality and reality that photographic images provided would serve as an effective selling tool by presenting the appetite appeal of the food because consumers would see the image as a scene from the actual world rather than as a painter's imagination.[102]

As the production of commercial photography became increasingly professionalized during the 1930s and 1940s, the use of photography for print media expanded. Publishers and advertising agencies signed exclusive contracts with commercial photographers, who provided their work for editorial pages and advertisements in national magazines.[103] For example, JWT offered prominent photographer Edward Steichen a renewable contract from 1924 to 1935.[104] In 1932, photographer Anton Bruehl was paired with publisher Condé Nast's color technician Fernand Bourges to work as a team. Condé Nast published *Color Sells* in 1934 to publicize the work of Bruehl and Bourges, emphasizing that color would create new markets, attract attention, and display merchandise better.[105] The book included color advertisements of sixty-six companies, including food manufacturers such as Coca-Cola, Heinz, Kellogg, and General Mills, that had used Bruehl and Bourges's color photographs.[106] *McCall's* magazine commissioned Nickolas Muray, a photographer and Olympic fencer, to create color photographs for its homemaking and food pages from 1935 to 1945.[107] In its vivid color images, Muray's food photography provided viewers with idealized and standardized yet "realistic" food images.

With sharply focused, carefully composed, and lusciously colored photographs, food advertisers sought to show consumers "real" images of foods and to whet their appetites. They asserted that the effectiveness of photography lay in its "explanatory power" rather than simply in its "esthetic" element.[108] The use of color photography for food advertisements did not exceed the number of pen-and-ink illustrations until the mid-twentieth century, yet the shift to color photography was well under way.[109] Magazines and advertisements were increasingly filled not only with color but also with the "real" images of photography. By "explaining" their products in color photography, advertisers believed that they could reproduce and present images of how food "really" looked more effectively than color lithography or other illustrative media could. With improvements in printing and photographic technology, color images became a powerful selling force for many advertisers.

Conclusion

The rise of consumer capitalism came with fundamental changes in the look and appearance of the material world during the first decades of the twentieth century. The management of color in the food industry was a crucial part of this process. Scientists and technologists provided the tools to determine and standardize the color of foods; advertising agencies, editors of leading journals, and individual consultants promulgated a vision of how food should look. Color measurement technology and notation systems, through the quantification of color, helped set a standard for agricultural producers and food processors, and allowed them to determine whether a certain shade of food color met the standard. Advertising agents and color consultants became a profession that provided firms with advice on the design and color of their products. They helped create an ideal image of certain products by employing newly introduced color printing and photographic technology.

This new visuality was not only more colorful than before but also mass produced, standardized, and rationalized. Color became a commodity to be reproduced and consumed. Scientists and food processors examined and measured the color of foods as a substance separate from the product rather than an intrinsic feature. In so doing, they sought to quantify visual sensations and attain "objective" knowledge about the right and natural color of a certain food. Colorful images disseminated by popular magazines, advertisements, and other print media served to represent, disseminate, and reiterate those ideas about the "right" color of foods. The new way of looking at the color of foods laid the groundwork for the expansion of the food-coloring business, the regulation of food dyes and of grade standards, and the creation of standardized, albeit artificial, notions of naturalness and freshness throughout the twentieth century.

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The Color of Dye

The story of color standardization in the food industry makes an important leap forward with the introduction of synthetic food dyes in the 1870s. In the emergent era of large-scale production and marketing, characterized by low margins, low prices, and national mass distribution, standardized food color bestowed a competitive advantage on pioneering firms using synthetic dyes, particularly the dairy and confectionery industries. With the growth of the food dye industry, food manufacturers began coloring a wide range of products, including butter, margarine, cheeses, sausages, pasta, canned foods, ice cream, jellies, and candies by the 1930s. Uniform coloration thus became a norm in the food industry. As the use of food dyes expanded, however, real and perceived health risks emerged. As a result, ensuring the safety of dyes, as well as their uniformity, became a source of advantage for food manufacturers. The technological development and regulation of food coloring altered how people saw foods and what they understood from the color of foods.

The rise of the food-coloring business came with the creation of new forms of food safety policies. Government regulation was a standardization activity that occurred at the intersection between the dye industry and the federal government. Food-coloring regulations specified criteria for safe dyes and helped standardize the color of foods on the market.[1] Government policies on food safety stimulated the integration of color manipulation into food businesses by regulating, and endorsing, the industry's color-control practices. In turn, dye manufacturers—particularly H. Kohnstamm & Company and the Schoellkopf, Hartford & Hanna Company—made, in Donna J. Wood's words, "strategic use of public policy" by stressing the importance of complying with food law and by actively participating in the establishment and implementation of food dye standards.[2]

The Rise of the Food-Coloring Business

Controlling the color of foods had been a common practice across cultures for millennia, at least since the ancient Egyptians used saffron to color various foods. In ancient Egypt, saffron was an important trading good, coming mainly from Asia. It was almost literally worth its weight in gold. In many civilizations, its golden color signified enlightenment, illumination, and knowledge. Due to its economic and cultural significance, the use of saffron, as well as foods colored with it, often indicated wealth and wisdom.[3] Cochineal (red dye extracted from insects) had been very popular for textile and art painting as well as for food coloring among European aristocrats and upper-class consumers since the Spanish conquest of Central America in the sixteenth century. Because of its beautiful, vivid red shade and its stability, cochineal became a profitable commodity for European settlers.[4] In the late 1880s, cochineal was traded for about $2 to $2.50 per pound ($54.50 to $68.10 in 2018 dollars) in the New York market.[5] Until the late nineteenth century, these natural dyes had been the major source of food coloring for both manufacturers and consumers in many parts of the world. Yet the use of natural dyes in foods was limited because they were expensive.

Beginning in the 1870s, food manufacturers turned to newly introduced synthetic dyes. These chemically synthesized colors afforded food manufacturers new ways of coloring foods that were economical, consistent, and convenient. Synthetic dyes were generally more stable and stronger in their coloring properties than were natural dyes. Due to their intensity, the amount of synthetic dye required to color food was much less than that of natural colors; hence, synthetic dyes were more economical. Moreover, while the color of most natural dyes faded when exposed to direct sunlight, synthetic dyes were less vulnerable to light.[6]

The versatility of synthetic dyes enabled dye and food manufacturers to mass-produce uniform products consistently and economically. Dye makers could manufacture and sell the same dye for a variety of products. Food processors, too, benefited from mass-produced, inexpensive synthetic dyes, as they could create various colors for different products by changing the amount of dye added to foods and by mixing several colors. For instance, the synthetic color Brilliant Blue FCF added bluish, sometimes greenish, shades to canned peas, ice cream, cake icing, and soft drinks.[7] Food manufacturers used the green of canned peas to help consumers visualize naturalness and freshness, while green and bluish shades of ice cream and icing indicated flavor and aesthetic variations.

The early manufacturing of synthetic food dyes was part of the development of the chemical industry in the late nineteenth century. Germany was the global leader in the industry and dominated global synthetic dye production between 1870 and 1914. By 1881, German firms manufactured nearly half of the world's synthetic dyes. Unlike the United States, where antitrust legislation restricted cartel operations, the German government established policies on patents, cartels, and research to promote the development of the chemical industry. In addition, German firms' global market and sales strategies, as well as their pioneering research laboratories, boosted industrial innovation. With its immense economic power and advanced technology, the German chemical industry helped build the global markets of the late nineteenth century.[8]

German immigrants were among the first to recognize the potential profit of food colors, helping to establish the American dye business in the mid- to late nineteenth century. Joseph Kohnstamm moved to New York City in the 1840s to expand his family business in synthetic dye trading to the American market. In 1851, he opened his office as an importer and supplier of dyes to the textile, printing, and paint industries. After Kohnstamm's death, he was succeeded by his brother, Hesslein, and later by his cousin, Heiman Kohnstamm, who reorganized the firm and established H. Kohnstamm & Company in 1876. Four years later, Heiman ventured into the manufacturing of synthetic dyes mainly for textiles and paints, and soon began developing food dyes, which he marketed under the brand name Atlas Colors. For this endeavor, he used dye ingredients imported from Germany and refined them for food use.[9]

Another pioneer of food dye manufacturing was the Schoellkopfe Aniline & Chemical Company of Buffalo, New York. Its founder, Jacob Frederick Schoellkopf, was a foresighted businessman, who had successfully expanded several different businesses, including tanning, flour milling, and dye manufacturing, in the United States. Trained as a tanner in Germany, he moved to the United States in 1842 at the age of twenty-three. Schoellkopf founded the Schoellkopfe Aniline & Chemical Company in 1879 to meet increasing demand for cheap synthetic dyes from the textile and paper industries. Schoellkopf was engaged primarily in management and hired a German chemist to consult on the production of synthetic dyes with his two sons, who had studied chemistry in Germany. After Schoellkopf's death in 1899, his sons incorporated the Schoellkopf, Hartford & Hanna Company in 1900 by consolidating three dye firms that Schoellkopf had established.[10] After the merger, the company began experimenting with food dye production. By the early 1910s, it had become the leading dye manufacturer in the United States, with a 50 percent market share, including both food and non-food dyes.[11]

These German immigrant entrepreneurs realized the economic potential of dyes that could rival products imported from Germany. Imported dyes were subject to high tariffs; hence, domestically produced colors would be significantly less expensive than their German counterparts. Yet dye manufacturers in the United States faced vigorous competition with the German industry. German firms manipulated the American chemical market by charging high prices on dyestuffs not produced in the United States. In 1883, due to pressure from the textile and paper industries demanding inexpensive German dyes, Congress significantly lowered import duties for all dyestuffs. The tariff of 1883 forced at least nine synthetic dye plants to close in the United States.[12] H. Kohnstamm and Schoellkopf managed to survive and expand their businesses by relying on German resources, including imported dyestuffs, education, and human capital.[13]

The dairy industry was one of the earliest in the food industry to employ synthetic dyes. The deliberate coloring of butter had long been a widespread practice in Europe, where dairy farmers were already coloring butter in the fourteenth century.[14] The actual shade of butter fluctuated seasonally, from bright yellow in summer to pale white in winter, depending on the kind of cattle feed, the breed of cows, and the period of lactation. During the summer months—especially from late May to June—when cows were fed on green pasture, rich in yellow pigments called carotene and xanthophyll, the color of butter was bright yellow. In autumn and winter, when the pastures began to dry up and cows were primarily fed on dry roughage and grains, butter became faintly yellow. The Channel Island cattle breeds generally produced a more highly yellow butter than did Holsteins and Ayrshires. At the beginning of the period of lactation (usually early summer), cream and butter had a deeper shade of yellow than they did in winter, after the cows had been milked for a period of months. The carotene-rich fresh feeds of early summer also added richer flavor, as well as more nutrients, to butter. The bright yellow color signified for producers and consumers better eating quality.[15] Dairy farmers and merchants often referred to the bright color of early summer butter as "June shade" and considered it the natural and standard color of butter.[16]

Prior to the expansion of synthetic food dyes, among the most often used butter colorings were extracts from plant seeds called annatto. Annatto gave a more desirable color to butter than did other ingredients, such as carrot juice. But the preparation of annatto coloring was a time-consuming process—it usually took three to four days.[17] Annatto was extracted from the seeds of a tree called *Bixa orellana*, indigenous to Central and South America.[18] In these regions, annatto had traditionally been used as body paint and a hair dye to ward off evil spirits, including illness, and to produce success in hunting. Indigenous communities also used the dye for life-cycle ceremonies and war paint, as well as for coloring foods.[19] After the Spanish conquest of Mexico in the early sixteenth century, annatto was introduced to Europe. Britain, Spain, and France imported the dye from their colonies, including Ecuador, Guyana, Jamaica, and Guadeloupe, to color not only foods but also silk and other textiles. In these European colonies, annatto became one of the staple products shipped to Europe and North America.[20] Jamaica was one of the first colonies to produce annatto extracts commercially, and the majority of its product was exported to the United States.[21]

The consumption of annatto dyes rapidly increased in the 1870s, as the coloring of butter, margarine, and cheese became commercialized in the United States and Europe. Dye manufacturers, including Christopher Hansen's Laboratory Company and Wells, Richardson & Company, introduced annatto-based color solutions, called "butter colors," prepared specifically for coloring butter.[22] Dairy farmers diluted butter colors in a small amount of cold water, then added it to the cream before churning. The amount of color added to butter depended on the market demand, the season of the year, the strength of the color, and the color and richness of the milk fat.[23] Traditionally, dairy farmers had made their own dyes by extracting colors from carrots and annatto. Commercially produced butter colors allowed them to dye butter by simply adding a coloring solution from a container purchased at a nearby supply house, without going through the time-consuming process of extracting vegetable juices.

Christopher Hansen's Laboratory and Wells, Richardson introduced their first synthetic butter colors in the late 1870s. The Heller & Merz Company of Newark, New Jersey, also developed synthetic dyes, called Yellow AB and Yellow OB, for coloring butter and other food products.[24] These synthetic dyes were oil soluble, meaning that they easily imparted color into fats, such as butter and cheese. The new synthetic butter color "will not turn rancid; gives the brightest color; is the cheapest color made," Wells, Richardson assured readers of the farm journal *Western Rural*.[25] By 1900, synthetic butter colors had displaced annatto dyes almost entirely.[26]

The cost of coloring butter decreased significantly. The price of natural-dye butter colors was roughly $2.00 ($55.10 in 2018 dollars) per gallon in 1907, whereas synthetic dyes cost about $1.60 to $1.70 ($44.10 to $46.90 in 2018 dollars). The amount of natural dyes required to impart satisfactory color to butter was two to three times more than the amount required of synthetic dyes.[27] Dye makers touted the economic benefit of their products by stressing that color was an essential factor that determined the grade and commercial value of butter. In a 1916 advertisement—"Better butter color means bigger butter profits"—Wells, Richardson stressed the higher profitability of the "rich golden hue" of butter dyed with its product.[28] With such phrases, butter color makers stressed that only a few cents invested in their products would bring dollars to the pockets of dairy farmers.

These packaged solutions also helped standardize the color of butter. When individual farmers made their own coloring solutions from various ingredients, the shade of the dye—and thus of the butter—differed significantly among producers. In fact, uniformity of color was one of the qualities that butter color makers stressed to their customers. Wells, Richardson claimed in a 1905 advertisement that its color "never varies—it never fades."[29]

Butter color makers promoted the use of their specific brands as well as the coloring of butter in general by taking an active part in dairy contests. At a contest, a group of judges, usually officials from the state dairy department and cooperative representatives, ranked butter and cheese manufactured by creameries and individual farmers. Color, as well as flavor, was a major criterion for judging butter quality. Butter color makers offered cash prizes to those who won using the company's dyes. The Preservaline Manufacturing Company, for example, offered a five-dollar cash prize to the butter maker using its dye product who scored highest at the Minnesota State Fair.[30] Butter color producers often publicized that contest winners used their products, seeking to demonstrate the quality of their wares.[31]

The confectionery industry was another pioneer in the use of synthetic colors and the largest consumer of dyes in the food industry. The cost proposition was especially attractive to confectionary producers because only "a few grains" of synthetic dyes could "color hundreds of pounds of candy."[32] Inexpensive so-called penny candies became increasingly available in the latter half of the nineteenth century due to the mechanization of candy manufacturing and the decline in sugar prices. By the early 1870s, penny candies had become ubiquitous, available in candy shops, corner stores, five-and-dimes, and newsstands.[33] Confectioners quickly adopted synthetic dyes to increase their profits.

Chemically synthesized dyes also provided confectioners with color varieties and uniform shades, so they could use distinct colors to designate individual flavors. Dye manufacturers promoted the use of their coloring products to confectioners by distributing recipe booklets and production manuals. These recipes commonly included formulas for making certain shades by mixing dyes. A mixture of Tartrazine (yellow dye) and Orange I by a ratio of 85 to 15 became "egg yellow"; Tartrazine and Guinea Green B, by a ratio of 97 to 3, made a "lime green" shade.[34] Coloring formulas and instructions helped confectioners make a specific shade the "natural" color associated with certain flavors and foods, such as eggs and limes, although the actual food did not necessarily look like the color created by the synthetic dyes. The use of food coloring and the arbitrary associations between color and flavor allowed confectioners to standardize the colors of their products.

H. Kohnstamm's food dyes were particularly popular among confectioners, who in turn helped promote them as safe ingredients (figure 3.1). At the 1906 annual convention of the National Confectioners Association (NCA), the NCA's president "express[ed] gratitude" to H. Kohnstamm for its "persistent and highly intelligent efforts to overcome the prejudices" of government officials against the use of synthetic dyes.[35] The NCA's executive committee also recognized the firm's "constant, able and scientific work" in the interest of the confectionery industry.[36] Confectioners were eager to eradicate government officials' and consumers' "prejudices" against dyes used for their products. Newspapers and trade journals reported a mounting number of incidents in which brightly colored candies caused illness in children and sometimes death. Confectioners vehemently denied that their products were injurious to health. But medical professionals and government scientists asserted the toxicity of dyes used for confectionery, particularly inexpensive candies.[37]

The use of synthetic dyes had become increasingly common in the food industry in general by the early twentieth century. Meatpackers began using them to give a "natural" red color to cured meat products, including bacon, sausage, and ham.[38] A 1905 meatpacking manual advised butchers to mix red dyes with sausage stuffing or soak casings in a color solution to give the finished product "a heavy, smoked appearance" and a "wholesome" look.[39] A chemical manufacturer in Chicago, William J. Stange Company, provided food dyes in "exact-weight"

Figure 3.1 This food dye advertisement, featured in a confectionery trade journal, was published before the enactment of the 1906 Pure Food and Drug Act. Due to the growing concerns over the safety of synthetic dyes, the company stressed the safety and purity of its dye products. H. Kohnstamm & Co. advertisement, *Confectioners Journal* (1906), reproduced from the Library of Congress collection.

packages. Each package contained a certain amount of food dye necessary for coloring a meat product. This allowed meatpackers to add uniform color to finished products consistently, without having to measure the dyes.[40] A 1900 meatpacking manual featured a meat preservative advertisement insisting on the importance of giving meat products a "natural" color: the product "makes a NATURAL, BRIGHT, FRESH MEAT COLOR, and when used properly an expert *can not tell* that the color in sausage is artificial."[41] Meatpackers also used various kinds of sweeteners, including glucose and corn syrup, which brightened and stabilized the red color and added flavor to the finished product.[42] The "natural" meat color became a product of artificial means, and the line between the natural and the artificial became difficult to discern—even to an expert's eyes.

The expanding use of synthetic food dyes paralleled innovations in processed food products. Until the last decades of the nineteenth century, commercially processed foods had not been widely available, except for a few items, such as bread and butter. Most Americans relied on food products supplied by local farmers and produce that they grew themselves.[43] In the early 1830s, the typical grocery list of an American family consisted largely of bread, meat, butter, potatoes, sugar, milk, and tea.[44] The production and consumption of processed foods increased rapidly between the 1870s and the 1920s. By 1900, manufactured food accounted for almost a third of the value of all finished commodities produced in the United States.[45] Although processed foods made up about 20 percent of food items traded by a grocer in the early 1870s, more than half of food products in a 1915 grocer's catalog were processed.[46] By 1920, virtually all households purchased some form of commercially processed foodstuffs, including margarine, canned food, and candy.[47]

Processed foods were more likely than agricultural products to be colored with synthetic dyes. During food processing, the colors of the finished products changed due to heat and other handling: canned green peas looked dark green, and sausages turned brown. It was thus necessary for manufacturers to add dyes to these processed foods to make them look appetizing. In 1895, for example, more than 80 percent of dyes used for coloring margarine in Ohio were synthetic.[48] The Jell-O Company had replaced vegetable colors with synthetic dyes for coloring its popular gelatin dessert by the early 1930s.[49] For many manufacturers, synthetic dyes became one of the crucial ingredients in making foods look enticing and uniform during the first decades of the twentieth century. As a result, Americans were consuming ever-increasing amounts of these dyes in their everyday diets.

Regulating Food Colors

The use of chemical substances, both toxic and harmless, increased rapidly in the early twentieth century. Government officials, journalists, home economists, and social reformers harbored suspicions about the safety of synthetic dyes. Until the late nineteenth century, there had been no federal or state regulation of food-coloring practices. Without effective regulatory systems, more than eighty additives used for coloring foods were on the American market, and some of them were toxic.[50] Some producers used poisonous metals and chemicals. Chalk was used to whiten bread, lead and copper were added to canned foods to preserve color, and lead chromate was used to give milk a yellowish creamy shade.[51] Calls for reform and regulation grew steadily over time.

The "natural" color of foods became a matter of significant complexity, created in a matrix of government regulation, technological innovation, and corporate interests. An increasing number of states began enacting regulation on food coloring during the 1900s. By the 1910s, Minnesota and North Carolina had prohibited the use of synthetic dyes in all foods; Colorado and Wisconsin had specifically banned the coloring of sausages with synthetic dyes.[52] These regulations provided definitions of food safety, adulteration, and naturalness.

The passage of the Food and Drug Act of 1906 brought the use of coloring in food products under the supervision of the federal government. The act prohibited the coloring of foods (without labeling) to conceal damage or inferiority and the addition of poisonous substances to confectionery (partly due to the frequent use of harmful ingredients in candy at the time).[53] The act marked the beginning of national food regulation as well as the rise of one of the most powerful government agencies—the Food and Drug Administration (FDA).[54] It was not until the 1938 amendment of the 1906 act that the FDA gained sole national authoritative power over food and drug regulation. Yet under the 1906 act, the Bureau of Chemistry (the predecessor of the FDA) in the US Department of Agriculture (USDA) played an important role in the enactment and implementation of food dye regulation. The bureau served not simply as a gatekeeper but also as a federal agency responsible for investigating dyes and other food additives and establishing standards of scientific evidence. A few months after the passage of the 1906 act, the Bureau of Chemistry began conducting research on color additives to determine which dyes were safe for use in food.

In establishing food-coloring regulatory policies and dye standards, USDA officials relied on scientists from the chemical industry.[55] Bureau of Chemistry chief Harvey W. Wiley appointed chemist Bernhard C. Hesse as an outside consultant for the bureau's New York laboratory, as there was no in-house expert on food dyes. Born in Michigan in 1869, Hess studied pharmacy at the University of Michigan and earned his PhD in chemistry from the University of Chicago. Before working for the USDA, he had worked as a research chemist for Badische Anilin-und Sodafabrik (BASF), one of the largest German chemical companies, from 1896 to 1906. He served as an important liaison between the federal agency and the dye industry until he left his Bureau of Chemistry job in December 1915 to work as a research consultant for the General Chemical Company in New York City.[56]

Legislators and government scientists served not only to regulate food-coloring practices but also to expand the food dye business by endorsing the use of certain synthetic dyes as harmless. In June 1907, the USDA issued Food Inspection Decision 76, which certified seven synthetic dyes as safe for food use, based on Hesse's investigations.[57] Hesse had selected the seven dyes not only because he considered them harmless but also because they were "most heavily used" by the dye and food industries. Since these dyes included the colors "yellow, orange, blue, green, red, bluish scarlet, and brilliant cherry red," food manufacturers could create virtually any shade by mixing them.[58]

To have dyes certified by the USDA, dye makers were required to submit each batch (a single lot of dye processed at one time) separately, along with an affidavit specifying the ingredients in the proposed mixture, the weight of each ingredient, the total weight of the batch, and the method of mixing. Scientists in the Bureau of Chemistry then investigated whether the dyes submitted met the USDA's quality standard. If the seal on a package of certified colors was broken, the contents were no longer considered "certified." If certified colors were mixed with liquid or other dyes (certified or uncertified), manufacturers had to resubmit the finished product for certification.[59]

None of the seven certified dyes were patented, and thus their manufacture was open to any producer competent to make them.[60] Until the early 1920s, however, only two American dye companies were involved in certified-dye manufacturing—H. Kohnstamm & Company and the Schoellkopf, Hartford & Hanna Company. Some dye makers did not see the certified-dye business as profitable.[61] Others were not able to manufacture high-quality certifiable dyes. The quality standard for dyes was based primarily on their purity. Because most synthetic dyes were produced from by-products of coal processing, they contained substances such as poisonous metallic salts, sulfated ash, and arsenic derived from coal tar. During the distilling and purifying processes, these impurities were removed from the dye mixture.[62] The

Bureau of Chemistry's purity standard for dye certification was so high that many dye makers could not meet the requirement. The bureau had rejected one of the first samples submitted by Schoellkopf because it contained 0.09 percent of impure substances; the bureau's purity standard was 0.05 percent.[63]

The United States was a latecomer in food-coloring regulation. In Britain, the Sale of Food and Drugs Act of 1875 banned mixing injurious ingredients, including dyes, with food.[64] Germany's 1887 Color Act prohibited the use of food colors detrimental to health.[65] Japan began regulating the use of synthetic dyes in food in 1878.[66] Other nations, including Austria, France, Italy, and Switzerland, also passed legislation against the use of poisonous colorings for food in the late nineteenth century. These laws were, however, not consistent or effective because new synthetic dyes constantly appeared on the market, and processes of chemical analysis were not standardized; there was thus confusion among legislatures and chemists as to which dyes should be prohibited.[67]

Nor was the American legislation fully effective. Contrary to Hesse's proposition, the USDA did not require food manufacturers to use certified dyes. It was lawful to use uncertified dyes as long as the addition of coloring matter was marked on labels and the colors used for confectionery were not proved to be injurious to health. Yet there were so many dyestuffs on the market that it was virtually impossible for the Bureau of Chemistry to investigate every single dye and determine which dyes were unsafe for food consumption.[68]

Anti-monopoly and laissez-faire ideals in Progressive-era political culture hindered the USDA from establishing more stringent means of regulating food colors. USDA officials were not willing to require the use of certified dyes on the grounds that there were only two manufacturers who supplied certified colors, and they wanted to avoid a monopoly in the certified-dye business.[69] Hesse bitterly opposed the idea. In describing H. Kohnstamm as "the real pioneer in this certifying business," Hesse contended that the firm had "done nothing but what [was] open to every body else in this wide world to do." Neither H. Kohnstamm's nor Schoellkopf's certified-dye business should be considered a monopoly, insisted Hesse, because other dye makers simply "remain[ed] idle" despite an opportunity to enter the market.[70] USDA officials were not convinced. They also asserted that the government did not have the power to limit free trade or prohibit the use of commercial goods that had not been proven harmful.[71]

Sales of the certified dyes disappointed H. Kohnstamm and Schoellkopf. They complained to Hesse that their certified-dye businesses were "very slack" and that food and dye makers would not use their dyes "unless some pressure [was] brought to bear."[72] H. Kohnstamm's president, Edward G. Kohnstamm, had initially believed that without any government pressure, certified food colors would displace uncertified dyes once they became available in greater quantities.[73] Kohnstamm told Hesse in February 1909 that he was "surprised how little interest his announcement of [1909] with respect to certified food colors [had] awakened" and suggested that requiring certified food colors might be necessary.[74] Hesse repeatedly proposed to Bureau of Chemistry chief Harvey W. Wiley that certified food colors should be mandatory.[75] Frustrated by the slowness of USDA officials, Hesse wrote to Wiley, "Unless there are reasons unknown to me, I can not see why it would not be proper to give some official notice that on and after, say, March 1, 1910, nothing but certified colors could be used."[76]

H. Kohnstamm and Schoellkopf carried out marketing campaigns to promote the use of certified dyes. They asserted that government certification would serve as a marker of food quality and safety. "The advertising advantage to those using Certified Colors can readily be seen," H. Kohnstamm noted in its advertisement, featured in the trade magazine *American Food Journal*.[77] In its 1910 leaflet distributed to food manufacturers, H. Kohnstamm explained to its customers that it was necessary "to use the Certified Colors in order to be sure that one [would] have no trouble with the National and various State Officials."[78] The confectionery industry was one of the first industries that H. Kohnstamm approached as a major outlet for its certified dyes. The firm published advertisements in confectionery trade journals to inform candy makers as to the newly established certification system and to stress the safety of its products.[79]

Government agencies likewise urged food manufacturers to employ certified colors. The Bureau of Chemistry issued Food Inspection Decision 117 in 1910, announcing that the federal government strongly recommended certified dyes for coloring foods:

> Certified dyes are now on the market. Certified dyes may be used in foods without objection by the Department of Agriculture, provided the use of the dye in food does not conceal damage or inferiority. If damage or inferiority be concealed by the use of the dye, the food is adulterated. Uncertified coal-tar dyes are likely to contain arsenic and other poisonous material, which, when used in food, may render such food injurious to health and, therefore, adulterated under the law.[80]

Although the bureau still did not mandate the use of certified colors, it suggested a high risk of violating the law by using uncertified dyes. In the *American Food Journal*, the food commissioner of Iowa encouraged food processors to use only certified colors as a means of combating popular suspicions of the dangers of synthetic colors. He argued that there could be "no better rebuttal than colors the U.S. Government itself had guaranteed as safe."[81] Although uncertified dyes remained on the market, the promotion of certified dyes by the manufacturers and by government officials gradually led food producers to discard uncertified colors for certified dyes. H. Kohnstamm and Schoellkopf began receiving orders regularly from food and beverage manufacturers by the early 1910s.[82]

The domestic food dye business grew rapidly after the outbreak of World War I. As the blockade of Germany tightened during the war, American dye companies could no longer import sufficient dye materials from the country. The development of a strong domestic dye industry became an urgent necessity for the industry as well as for the federal government.[83] In 1916, Congress appropriated $50,000 to establish the Color Laboratory within the Bureau of Chemistry, to investigate and regulate dyes produced and used in the United States. One of the primary objectives in establishing the Color Laboratory was to assist and cooperate with American chemical companies "in every way possible" by "avoiding any direct competition with the commercial laboratories."[84] One of its primary responsibilities was to provide certification for synthetic dyes submitted from manufacturers in order to control and supervise dye manufacturing. To support the chemical industry, laboratory chemists undertook investigations on chemical substances of commercial importance and development of dye manufacturing processes. They also compiled American dye patents, which had not been published, and lent copies to industry.[85] The Color Laboratory centralized and institutionalized research on food dyes and functioned as a government agency that helped develop, as well as oversee, the American food dye industry.

During and after World War I, American chemical companies sought to ensure and increase domestic dye production by expanding their businesses through mergers and by creating new firms.[86] Schoellkopf merged with six other dye makers and established the National Aniline & Chemical Company in 1917, with nearly 60 percent of market share.[87] National Aniline joined with several other companies four years later to become the Allied Dyes & Chemical Corporation. The firm encompassed all necessary processes from raw materials to finished products. Allied became the second largest chemical company, after DuPont, and produced not only synthetic dyes but also a variety of organic chemical products. Since Allied was a holding company, its constituent firms retained their separate corporate identities.[88] National Aniline continued to sell its food dyes under its brand name, National Colors.

In marketing to food manufacturers, dye makers promoted the powerful impact of color on food consumption—both purchasing and eating. They emphasized that their colors could give foods an appetizing look with bright, attractive colors, which would appeal to the eyes of food shoppers. National Aniline's company brochure conveyed the message that "color and tints in foods" had "definite appeal to the eye and to the palate" and that "an attractive table, rich in color," was "first aid to a healthy digestion." While stressing the firm's leading role in the development of certified food colors permitted by the Bureau of Chemistry, the brochure stressed to food industry customers that synthetic dyes were indispensable for creating eye-appealing foods.[89]

Synthetic dyes filled various technical needs and provided economic benefits to food manufacturers, distributors, and retailers, which were facing new kinds of quality-control problems in the first decades of the twentieth century. Due to the expansion of the market, food products were being transported to various parts of the country and were thus becoming subject to changes in surrounding conditions, such as temperature and humidity. As self-service grocery stores began expanding in the 1920s, food products needed to retain a relatively long shelf life.[90] After transparent film, particularly cellophane, became popular in the 1920s, the appearance of food became an important tool in its marketing and sale.[91] Yet transparent packages posed a problem: foods were being exposed to bright light in grocery stores. Synthetic dyes were more stable and less likely to fade due to surrounding conditions than were natural dyes, allowing manufacturers and retailers to maintain bright, uniform colors for foods.

The government certification system and the dye industry's extensive promotion helped create and expand a new market for the certified-dye business. Government officials and scientists endorsed food coloring as an important food manufacturing process by certifying certain dyes as harmless. The certification system served to regulate, and to officially permit, the coloring of foods. While neither federal nor state governments explicitly encouraged the artificial coloration of foods, they recognized food dyes as legitimate ingredients as long as they were not poisonous and as long as the coloring did not conceal inferiority. By the mid-1920s, the number of certified-dye manufacturers had increased to five companies, including H. Kohnstamm & Company and the National Aniline & Chemical Company (the successor of Schoellkopf).[92]

The synthetic food dye market steadily expanded, with more than a 40 percent increase in total sales from 1922 ($0.7 million) to 1925 (nearly $1 million).[93] Color Laboratory chemist C. E. Senseman (whose name suited his job perfectly) reported that the amount of synthetic food dyes certified by the laboratory had increased from 333,330 pounds in 1922 to 639,000 pounds in 1925.[94] In observing the expansion of the food-coloring business, another Color Laboratory scientist stated that the kinds of food colored with synthetic dyes were so numerous that "hardly a person in this country could pass a day without swallowing dyes unsuspectingly in such foodstuffs as butter, cheese, cake, candy, ice cream, [and] soft drinks."[95] As the use of synthetic dye expanded and became a subject of government regulation, food-coloring practices became integrated into a general strategy of manufacturing and marketing in the food industry.

Creating "Safe" Colors

With the growth of the certified-dye market, the safety of synthetic dyes became a crucial part of the advertising rhetoric that dye manufacturers pitched to food processors, particularly after the passage of the 1906 Pure Food and Drug Act. While some dye makers replaced uncertified dyes with certified, others turned to natural colors instead of synthetic ones. Many butter color makers, for example, had switched back to annatto color extracts by the 1910s.[96]

To promote annatto butter colors, Christopher Hansen's Laboratory Company noted in its 1907 advertisement that "purely vegetable annatto color has again forged to the front as the only reliable coloring medium for fine butter" as "Pure Food became the watch word in all quarters of the country."[97] Wells, Richardson & Company similarly advertised its butter color as "purely vegetable," which met "the full requirements of all food laws—state and national." While stressing its products as harmless, the firm also suggested that its dye product was even better than synthetic dyes with regard to strength, stability, and uniformity.[98] Synthetic dyes now became so common in the food industry that these coloring features, as well as safety, became crucial for selling food dyes. Butter color makers stressed that their natural, harmless products were as uniform and bright as coal-tar-based colors, which were usually less expensive and stronger in color than natural dyes.

Government regulation and public concerns over food adulteration reallocated the competitive advantage that dye makers and food processors had retained. When synthetic dyes were introduced to the American food industry in the late nineteenth century, many dye and food producers abandoned natural colors as uneconomical. Technological and scientific advances in the chemical industry afforded synthetic dye makers and users a competitive edge over their competitors. By the 1910s, however, due to changes in the political and social climate, natural dye became an important commodity as a "safe" coloring material. Synthetic dyes were still used more widely by food producers than were natural colors and remained highly competitive in the dye market. Yet the commercial value of natural dyes increased after the enactment of the 1906 act. After annatto regained popularity among some dye and food producers (particularly butter makers), the amount of annatto imported from Jamaica to the American market increased, from 364,000 pounds in 1887 to 914,000 pounds in 1935.[99] By the mid-twentieth century, the United States became the world's largest importer of annatto, representing approximately one-fourth of the total global trade.[100]

The definition and understanding of adulteration and safety differed among researchers and government officials. Harvey W. Wiley of the Bureau of Chemistry regarded the addition of almost any substance to food as adulteration.[101] In his talk at the 1905 Conference of Sanitary Officers, Wiley argued that the "idea of adding an artificial color to food [was simply] to cause a food product to imitate a natural product of higher quality." He particularly criticized the artificial coloring of butter, which led to the "corruption of the public taste," since many consumers had become accustomed to butter of what he considered an unnaturally rich yellow color.[102] And yet the bureau's dye expert, Bernhard C. Hesse, did not oppose food-coloring practices entirely.

The views of government scientists and legislatures regarding "safe" dyes also shifted due to the dye industry's strong demand for certain colors and state officials' reinterpretation of "harmlessness." In August 1907, a few months after the Bureau of Chemistry issued Food Inspection Decision 76, the president of Heller & Merz Company, one of the leading American dye manufacturers, complained to the bureau that none of the seven certified dyes would give butter and cheese a satisfactory shade. The bureau had certified only water-soluble synthetic colors as safe for food use, and these were not useful for coloring oil-based products like butter. Heller & Merz requested the certification of oil-soluble dyes, specifically the firm's Yellow AB and Yellow OB, which had been used extensively for coloring butter, cheese, and margarine.[103] According to Heller & Merz's president, the two dyes were "the most desirable yellows for coloring butter and other fats," while other yellow dyes' oil solubility was not satisfactory.[104] Food and dye producers demanded both Yellow AB and Yellow OB. The two dyes created similar yellow shades, but they were not identical. Yellow AB alone was "too much of a lemon shade," and Yellow OB was "too orange"; it was hence essential to mix the two dyes to make a desirable butter color.[105]

When Carl Alsberg succeeded to Wiley's position in the Bureau of Chemistry in 1912, he began conducting a new investigation of oil-soluble colors and their suitability for food use, suspecting their toxicity.[106] A researcher at the USDA's Pharmacological Laboratory reported that after feeding rabbits one to two grams of Yellow AB or OB, the animals died in four to nine days due to "loss of appetite." When only twenty-five to forty milligrams of the same dyes were given to rats for four and a half months, there was no sign of health effects.[107] According to USDA chemists' calculation, the maximum amount of these colors that a human could safely consume in butter was ten milligrams per day.[108] They thus concluded that the single dose required to cause any effect was so large that neither Yellow AB nor Yellow OB was detrimental to human health.[109] One of the chemists even contended that the two dyes were "the best colors" not only because they were relatively "harmless" compared to other yellow dyes but also because they were "sufficiently soluble in oil."[110] In 1918, convinced by the research data, Alsberg decided to add the two dyes to the certified list.[111] By 1931, the Bureau of Chemistry had increased the number of certified products to fifteen synthetic dyes.[112]

Throughout the 1920s and 1930s, journalists, consumer groups, and cultural critics condemned both the government's ineffective and inadequate food regulation policies and corporate greed, which endangered the public's health.[113] *100,000,000 Guinea Pigs*, published by economist Arthur Kallet and engineer Frederick J. Schlink in 1933, aroused consumers' suspicion of corporate activities and various commercial goods, especially foods and medicines. Kallet and Schlink argued that the American public was being "used as a guinea pig" by companies that marketed their products with little knowledge or concern about their impacts on consumer health.[114] The book went through thirteen printings in its first six months and became one of the best-selling books of the decade.[115]

The book also catalyzed a movement for reform in the food regulatory system under the 1906 Food and Drug Act. It became clear that the act did not go far enough to protect the public from misbranded, adulterated, and toxic products.[116] One of the shortcomings identified was the act's lack of authority to mandate the use of certified dyes. To implement food regulation more effectively, the federal government reorganized the Bureau of Chemistry in 1927. The bureau's research function was transferred to the newly established Bureau of Chemistry and Soils in the USDA. Another new agency, the Food, Drug, and Insecticide Administration (FDIA), took over the major regulatory responsibilities of the Bureau of Chemistry, including enforcement of food regulation and investigations of adulterated foods. In 1930, the FDIA was renamed the Food and Drug Administration (FDA). The new government body, however, did not transform the existing food regulatory policies.

After years of debate over more than a dozen proposals, Congress passed the Food, Drug, and Cosmetic Act in 1938 as an amendment to the 1906 act. The act increased government oversight of food and drugs and, for the first time, regulated cosmetics and medical devices—although the regulation regarding cosmetics was extremely limited.[117] Under the new legislation, the use of certified colors became mandatory.[118] The FDA also established three categories of certified dyes by standardizing their nomenclature: FD&C for colors certified for use in foods, drugs, and cosmetics; D&C for colors certified for drugs and cosmetics; and Ext. D&C for colors not certifiable for ingestion but considered safe for use in products applied externally. Each certified food dye was called FD&C, followed by the name of its basic shade and a number. For instance, trade name Guinea Green B became FD&C Green No. 1; Light Green SF Yellowish was called FD&C Green No. 2.[119] The new names enabled dye users not only to standardize the description of colors but also to distinguish certified colors from uncertified products much more easily because trade names, such as Guinea Green B, had not indicated whether a color was certified.

Although the 1938 act amended some of the flaws in the 1906 legislation, the new provisions did not fully resolve the ambiguity in defining "harmlessness" and "safety." Under the statute, a dye could be used if it was "harmless and suitable for use in foods," and a food was deemed adulterated if the dye used was "not harmless." The FDA interpreted the terms "harmless" and "not harmless" based on the quantity of substances that people consumed. If the quantity of dyes involved in human consumption was so small that it did not render food injurious to health, the substance was deemed "harmless"—even if there was evidence that it had a poisonous effect on laboratory animals.[120]

The regulation and increasing use of synthetic dyes helped to distance food production from consumers. Understanding the chemical composition of synthetic dyes required specialized knowledge. Dye names, such as Ponceau 3R and Naphthol Yellow S, or even standardized FD&C names, meant little to most consumers. Although they saw such terms as "certified dyes" and "pure food" on an increasing number of food packages and advertisements, food quality remained uncertain. The government's standardization and certification of synthetic dyes required manufacturers to disclose certain information about food processing and dye production. Standardized colors, however, made it difficult for consumers to understand the relationships between color and food: Where did the color of food come from? Which dyes were safe to consume? What did "safe" color mean?

Conclusion

The food-coloring business had become a central and permanent component of food marketing strategies by 1938, when Congress enacted the Food, Drug, and Cosmetic Act. This was an immense change from six decades earlier. Before the 1870s, food coloring had held a marginal place in food businesses, as manufacturers simply dyed foods to make them look fresher, often by making coloring solutions themselves. Food dyes were not consistent in quality, and some of them were actually injurious to health. With the development of the synthetic food dye industry, standardized color became a source of competitive advantage and evolved over time as a norm for food manufacturers.

The implications of the growth of the food-coloring business were complex and manifold. For the food industry, economical and stable synthetic dyes afforded manufacturers a new way of coloring foods uniformly in desirable hues at greatly reduced prices. Standardized, clean, and bright food products became an indispensable feature of modern supermarkets. The use of synthetic dyes in unprecedented volume for a variety of foods also raised questions about public health. Food-coloring legislation established the needed authority for government agencies to regulate food adulteration and to oversee the dye industry. The standardization of food colors had become not only an interest of business but a matter of law.

The dye-certification system and government regulation helped accelerate the commodification of food colors. By conducting food dye research, establishing grade standards for certified dyes, and providing legislative definitions of food and color additives, government officials and scientists endorsed food coloring as a crucial food manufacturing process. Dye makers in turn employed the term "certified" in their advertisements to add credibility to their products as safe colors. Trademarked dye products and brand names, such as H. Kohnstamm's Atlas Color and National Aniline's National Color, also served as a marker of product quality—particularly uniformity and safety—in the mass market. As various colors of less expensive synthetic dyes became available, with government endorsement, food manufacturers increasingly capitalized on the color malleability of food by making it look natural, fresh, and appetizing.

· 4 ·

From Natural Dyes to Cake Mixes

The color of food in the modern era was not just a matter of business; it was also a crucial part of the history of women's work. During the last decades of the nineteenth century, the commercialization of synthetic food dyes transformed cooking practices in households, as well as manufacturing and marketing strategies in the food industry. Before then, households—predominantly women—had extracted fruit and vegetable juices themselves to color foods in their kitchens. The introduction of commercially produced food dyes eliminated the dye-making practice from home cooking while helping to standardize the appearance of homemade desserts and other dishes. With each such innovation, the nature of domestic work changed: it became seemingly less time consuming and less laborious but required women to meet new kinds of expectations as mothers and wives.[1] The eye-catching appeal of newly possible colorful dishes is a critical element in this history.

During the late nineteenth and early twentieth centuries, home economists, cookbook writers, and food advertisers collectively created a new domestic ideal for female consumers: the need to create colorful, ornamental foods. Cookbooks are, and have always been, ideologically loaded texts. In addition to teaching their readers how to cook and use new products, they impart ideological lessons on femininity and class. In her studies on the consumption of cosmetics, Kathy Peiss has shown that consumer culture not only offered seemingly infinite choices of goods but also altered how women presented and understood their identity.[2] Cosmetics served as a visible marker of social and economic distinctions among women in the nineteenth century. Likewise, the color of foods—or, more precisely, creating and serving colorful dishes—signified social and gender dispositions. Like a carefully made-up face, a bright, colorful meal sent a deliberate message about the woman behind it.

Not all women could take advantage of the new possibilities offered by commercial food colors. Making colorful dishes was a luxury limited to urban middle- and upper-class women with economic means. The creation of elaborate foods required time, kitchen space, equipment, and expensive ingredients, including food dyes. Working-class women, many of whom were immigrants and African Americans, could not afford most of these. Nor did lower-class households have access to print media that provided advice on the new ideal American womanhood, due to language barriers and economic limitations.[3] Even if they did have access, first-generation immigrants in particular tended to be resistant to the Americanizing effort of domestic advisers.[4]

Cooking and serving visually appealing dishes became one way that middle-class women could demonstrate genteel respectability to the world—and to themselves. Ideals of gentility, refinement, and civility first emerged in the Renaissance and were well established among elites in the English-speaking world by the mid-eighteenth century. The aspiration for genteel lifestyles, or what Richard Bushman called "vernacular gentility," had spread widely among the American middle class by the mid-nineteenth century. Middle-class households strove for vernacular gentility by, for example, purchasing less expensive substitutes for what elites possessed and sending their children to free public schools instead of elite academies; adding a "parlor" to their small homes; and practicing "polite" behavior, such as carrying handkerchiefs. Vernacular gentility was something one could acquire and learn rather than inherit; one proved one had it simply by performing it in view of others.[5]

As Bushman has contended, capitalism and gentility were "allies in forming the modern economy."[6] Ideas about gender and female sensibility became embedded in food marketing and narratives about the color of foods. With the expansion of mass consumer culture, femininity and artificiality became closely intertwined. The creation of elaborately decorated, colorful foods involved the artificial manipulation of nature: foods were molded into new shapes, fruits and vegetables were cut and arranged in an orderly manner based on a color scheme, and food dyes were added to give dishes colorful shades. In making and eating eye-appealing dishes, middle-class women accepted certain kinds of artificiality partly out of convenience and partly because domestic advisers and food advertisers touted artificiality as a necessary element for the presentation of gender and class identity.[7]

The Luxury of Artifice

Making Natural Dyes

Until the last decades of the nineteenth century, the major sources of food colorings used at home had been natural dyes, extracted from fruits and vegetables, including carrots, beets, and spinach. Eliza Leslie, a well-known nineteenth-century cookbook author, explained in her 1840 cookbook how to "heighten the green" of asparagus soup by adding the juice from spinach.[8] Saffron gave foods bright yellow and orange shades. Cochineal—dye made from an insect indigenous to Mexico—imparted bright red and pink shades to many dishes. Mid- to late nineteenth-century cookbooks directed readers to use these colorings not only for desserts—such as cake icing, candies, and jellies—but also for meat dishes, pickles, sauces, and soups.

Domestic writers often mentioned saffron and cochineal as ideal sources for coloring foods. The shades of cochineal and saffron were so intense that only a small amount was typically necessary for coloring food. The consistency of the food changed little, whereas fruit and vegetable juices tended to water down the foods they colored. Saffron and cochineal lasted a long time, whereas fruit and vegetable colorings did not store well.[9] Leslie noted in her 1840 cookbook that "a few grains of saffron" would improve the color of orange jelly without affecting the taste.[10] She recommended cochineal to give "a good red" color to pickled red cabbage and to preserved quinces and apples. For cake decoration, Leslie asserted that cake would "look extremely well" with icing tinted with "pink by the addition of a little cochineal."[11] In *Miss Beecher's Domestic Receipt Book*, published in 1846, Catharine Beecher likewise recommended cochineal for coloring candies and desserts.[12]

One problem was that both cochineal and saffron were expensive. The limited household budgets of the time did not allow many middle- or working-class women to purchase these dyes. Leslie and Beecher offered recipes for less expensive coloring sources, usually plant-derived colors. Leslie recommended alkanet—red dye extracted from an herb called alkanna. It was "much cheaper" than cochineal yet still imparted "a beautiful red colour" to foods. "You can purchase [alkanet] at any druggist's, and at a trifling cost," Leslie stated.[13] In her recipe for blanc-mange, Beecher advised: "Color the blanc mange in separate parcels, red, with juice of boiled beets, or cochineal; yellow, with saffron; and blue, with indigo."[14] Cookbook authors also suggested egg yolks and carrots as cheaper alternatives to saffron.[15]

Even creating these less expensive colorings was probably not part of household work for working-class women. Making dyes required time and labor. To make green dyes, fresh young spinach leaves were pounded, then twisted through a cloth into a stewpan. The juice was then put on the fire to simmer, and when it was well curdled, water was strained off from the curd.[16] Making more expensive cochineal dye was also a time-consuming process. Druggists sometimes powdered dried cochineal insects and sold them to customers, including professional confectioners and bakers as well as housewives.[17] But in many cases, customers purchased a bag of insects and pounded them at home to make dyes. A typical recipe for cochineal dye called for one ounce of cochineal insects, one ounce of cream of tartar, two drams (¼ oz) of alum, and half a pint of water.[18] After cochineal was pounded into a fine powder, all the ingredients were boiled together until the water was reduced by half, about half an hour. Finally, the liquid was strained through muslin and put in a small bottle for later use.[19]

Although working-class women did not have time or money to make elaborate dishes for their own households, their cooking skills and labor were an important part of the creation of colorful dishes for upper-class families.[20] In nineteenth-century popular discourse, colorfully ornamented foods symbolized the gentility and femininity of ladies.[21] But the actual making of delicate desserts was often the work of servants. In fact, one of the issues often discussed in mid- to late nineteenth-century cookbooks was how to educate servants.[22] Domestic service was one of the few jobs that young (mostly unmarried) female immigrants could find. In the antebellum South, African American women performed much of the domestic work for white slave-owning households. Even after emancipation, the main employment available to them outside the home was as domestic servants.[23] African American and immigrant women provided the domestic labor of producing luxury foods in affluent white households.

The development of synthetic dyes altered food-coloring practices at home, as well as in the food business, significantly since the late nineteenth century. For example, French chemists created one of the earliest synthetic red dyes, fuchsine, for textile and paint colors in 1859.

Textile dyers replaced cochineal and other natural dyes with synthetic ones, which were much less expensive and more stable.[24] Consequently, the price of cochineal had decreased substantially by the late 1880s. It had been traded for five dollars per pound in 1807 ($112 in 2018 dollars), whereas it cost only fifteen to twenty cents per pound in 1887 ($4–$6 dollars in 2018 dollars).[25] Since synthetic dyes were not yet available for food use, natural dyes, including cochineal, continued to be the main source of food coloring. (Saffron remained an expensive spice and food color throughout the nineteenth and twentieth centuries.)

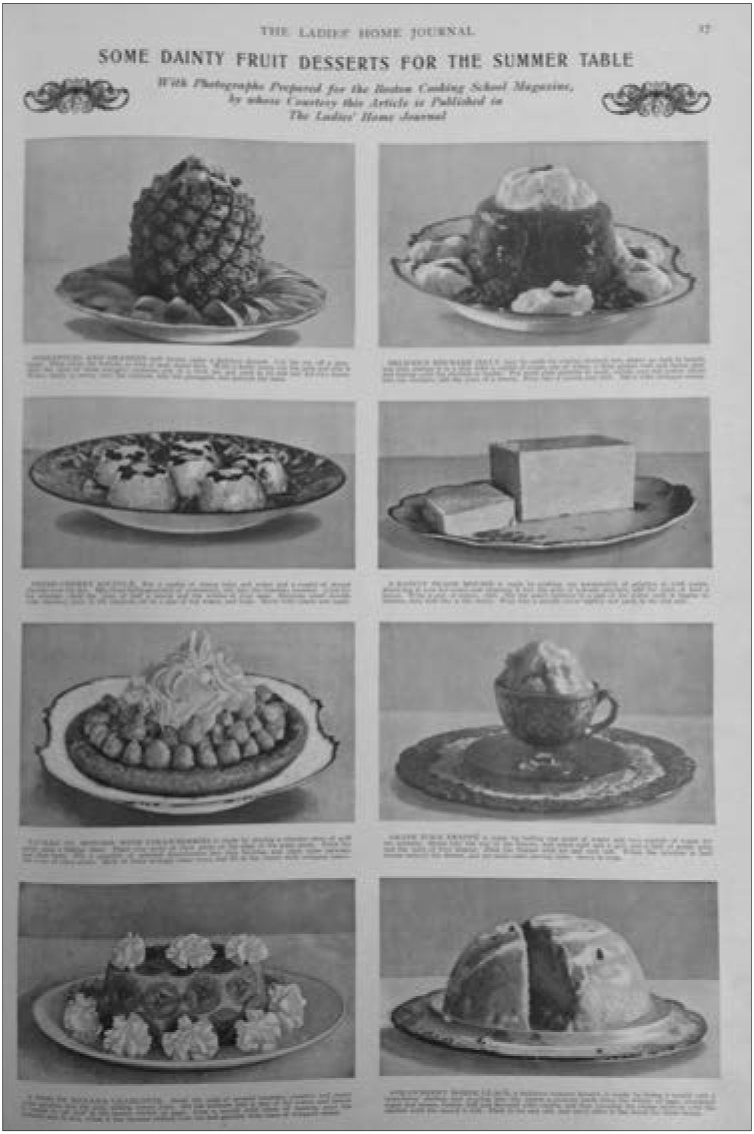
The use of cochineal had become not only less expensive but also more convenient to use by the 1870s. Druggists began supplying "prepared cochineal"—among the earliest commercially prepared food dyes—for a few cents a bottle. It was usually a liquid, which contained cochineal insects poured into alcohol (sometimes synthetic dyes were added to the solution). Housewives no longer needed to pound the insects or boil them for more than half an hour; now they could use the prepared cochineal solution straight from the container. Until then, most recipes that called for cochineal had mentioned the amount of cochineal by weight, such as "ounces" or "grains," indicating that cochineal was purchased and used in a solid or powdered form. These recipes had commonly explained how to make the cochineal dye.[26]

With cochineal dye making no longer a part of domestic cooking, many late nineteenth-century recipes mentioned simply "a few drops of prepared cochineal" when red or pink color was necessary, without any directions on how to make the dye. Marion Harland's *Common Sense in the Household*, originally published in 1871, used "prepared cochineal" for coloring marbled cake and jelly desserts.[27] In her 1875 cookbook, Harland contended that although readers could use strawberry or currant juice for coloring cakes, cochineal was "much better," since it took "only a few drops to color the whole cake." Cochineal had no taste or odor, and it was "perfectly harmless," added Harland.[28] Beginning in the 1870s, an increasing number of newspapers featured recipes that called for cochineal. The farm newspaper *Pacific Rural Press*, for example, printed a recipe for orange jelly colored "with prepared cochineal" in 1875.[29] Nevertheless, housewives still needed to go through the time-consuming process of extracting juice from fruits and vegetables when they needed green, yellow, and other colors. Moreover, the prepared cochineal dye was still a luxury for working-class households.

Creating "Dainty" Dishes

Colorfully decorated dishes, such as gelatin molds and ice cream, embodied sweetness, purity, and delicacy—features that symbolized the disposition of "true" ladies in the mid- to late nineteenth century.[30] The term "dainty" was one of the most often used adjectives in cookbooks, women's magazines, and food advertisements for describing ornamental, delicate, and light dishes, including tea sandwiches, salads, decorated cakes, and gelatin desserts (figure 4.1).[31] According to the *Oxford English Dictionary* (*OED*), the meaning of "dainty" includes "pleasing to the palate." It also means the delicate disposition of persons as well as something valuable, pleasant, and delightful. One of the earliest usages of "dainty" in association with foods appeared in the late fourteenth century in Chaucer's *Canterbury Tales*: "to gete a glotoun deyntee mete and drinke."[32] The word continued to be used without a particular gendered connotation in the nineteenth and twentieth centuries. Yet in the nineteenth-century United States, as well as in Britain, popular media—particularly cookbooks and women's magazines—began using "daintiness" to describe delicate and light dishes and desserts, associated with femininity. (Under this specific usage, what Chaucer described was far from "dainty" foods.)

Cookbooks, women's magazines, and advice books presented daintiness as an ideal that middle-class women should aspire to.[33] Men who liked visually appealing dainty foods were regarded as effeminate.[34] Popular media used "dainty" not only for foods but also for the proper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SOME DAINTY FRUIT DESSERTS FOR THE SUMMER TABLE

With Photographs Prepared for the Boston Cooking School Magazine, by whose Courtesy this Article is Published in The Ladies' Home Journal

Figure 4.1 These "dainty" dishes were featured in a number of cookbooks and women's magazines in the late nineteenth and early twentieth centuries. The dishes included on this page are (left, from top) Pineapples and Oranges, Fresh Cherry Soufflé, Gateau St. Honore with Strawberries, Banana Charlotte; (right, from top) Rhubarb Jelly, Dainty Peach Mousse, Grape Juice Frappé, and Strawberry Bombe Glacé. "Some Dainty Fruit Desserts for the Summer Table," *Ladies' Home Journal* (1899), reproduced from the University of Delaware collection.

characteristics of women themselves. It also referred to ladylike objects, such as lace and lingerie.[35] The creation of ornamental desserts and the coloring of foods became important parts of the construction of class as well as gender identity.

Daintiness was closely associated with visuality, since ornamental, colorful food was the essential feature of dainty dishes. Hence, "dainty" foods meant not only the *OED* definition of "pleasing to the palate" but also pleasing to the eye. An 1890 article in the *Ladies' Home Journal* contended that "by the exercise of a little good taste and ingenuity," dishes that were "so exceedingly dainty-looking" could make the table "wear a most tempting aspect." "When the various colors [were] skillfully intermixed, and the flavors pleasantly varied," argued the author, "the result [was] something quite delightful both as regards the palate and the eye."[36] The *Boston Cooking School Magazine* similarly insisted that if food delighted the eye, it was "more certain to delight the palate also."[37] In fact, home economists promoted the ideal image of ladies who were not overly attracted to the taste of food.[38]

The arrangement of foods based on color scheme was critical for creating decorative dishes and presenting women's aesthetic taste. A recipe for lobster salad, featured in the 1898 *Boston Cooking School Magazine*, was carefully composed of different shades: "The vivid color of the shells, in pleasing contrast with the delicate heart leaves of lettuce, together with the yellow of the mayonnaise, put on in ornamental stars, makes this a very showy dish."[39] Domestic advisers also recommended that women serve color-coordinated meals. The entire table was themed according to a single color, such as a red dinner or a white luncheon. A recipe for a "green color luncheon" could include cucumbers, asparagus loaf, watercress-and-egg salad, and white cake with pistachio decorations.[40] These color-coordinated menus appeared in magazines and cookbooks not only for special occasions like Christmas and Easter but also for regular meals. Women were encouraged not only to cook color-themed dishes but also to decorate the dining table, and sometimes the entire dining room, to suit the color theme.[41]

Cookbook writers introduced a variety of colorful desserts, including yellow and orange gelatin molds and green blancmange, throughout the nineteenth century. But the color of cake frosting was predominantly white until the turn of the twentieth century, with the exception being a light pink shade.[42] White and pink frostings were relatively easy to make and store. Recipes for white icing required primarily egg whites and sugar.[43] For the pink color, women had to go through several additional steps. But since cochineal dyes could be stored for a long time, they did not have to make the color anew every time they made pink icing. Moreover, as previously noted, prepared cochineal was one of the few commercially prepared food dyes available on the market during the 1870s and 1880s. In contrast, making green colors from fresh spinach took time, and the extract did not last long. Saffron for yellow was relatively expensive compared to other ingredients.

In addition, white and light pink were the shades that domestic advisers promoted as fitting the ideal female taste. Although some cookbooks included other colors, such as yellow, blue, and green, for icing, these recipes stressed the significance of using light shades.[44] "Heavy colors are not the correct thing in icings, and are objectionable to many people," contended the author of an 1896 confectionery cookbook.[45] Lighter shades were preferable not only for cake icings but also for other confections and desserts. In an 1898 food column in the *Ladies' Home Journal*, a home economist declared that "ice cream may be colored blue, but I cannot imagine that blue ice cream would be even artistic." The author advised to "keep foods their natural color."[46] Likewise, the *Boston Cooking School Magazine* asserted that readers should color ice cream "very delicately."[47]

How light the shade of food should be and how much dye should be added were difficult to discern. In an 1888 *Good Housekeeping* column, responding to an inquiry from a reader about how much cochineal was required "to make a pretty coloring for icing," the editor stated: "It is quite impossible to give the quantity of cochineal, use it drop by drop, stirring the while until the tint is attained."[48] The quantity of dye needed for coloring food depended on various factors, including the strength of the dye, the kind of dish, and the preference of cooks and diners. There was no single criterion. The lightness of shades, as well as knowledge about how much dye should be added to food, was one way to represent women's aesthetic taste and cooking skill.

Ornamental cooking and color-coordinated meals indicated not only women's taste for colorful decorative dishes but also their ability to control foods and create orderly arrangements on the table. An 1897 recipe in the *Boston Cooking School Magazine* claimed: "Whipped cream should always be served with sliced peaches, to hide the discolorations that cannot be prevented."[49] Without refrigeration systems for transporting and storing perishable foods, it was difficult for housewives, as well as for grocers, to maintain the quality of fruits and vegetables, including their colors. Without grading standards or national marketing systems, the supply of perishables was not reliable, and their quality and availability depended on region, climate, and season. Whipped cream, sauces, and food colorings were an important means for women to cope with natural varieties and to create dishes pleasing to the eye.[50]

The Proliferation of Artificial Ingredients

A wider variety of commercially prepared food dyes became available for household use during the 1890s, affording housewives a means for coloring foods conveniently. These pre-made and pre-packaged food colors were not only a time-saver for women but also generally less expensive than cochineal and saffron, and more economical than fruit and vegetable colors. As packaged dyes were usually more intense than homemade food colorings, only a small quantity of dye was needed to give food a desirable shade. Commercially made colors were more uniform. By trying out packaged dyes several times, women were able to get a sense of how much color they needed in order to create a certain shade. In contrast, it was likely that the intensity and overall quality of fruit and vegetable dyes differed almost every time women made the colorings. It was much more difficult for them to predict the amount of dye to be added until they actually poured it into food. Consequently, packaged dyes, along with other processed foods and ingredients, helped standardize the shades that women imparted to their dishes.

The Joseph Burnett Company was one of the earliest manufacturers of packaged food colorings for home consumption. Druggists Joseph Burnett and Theodore Metcalf established the Metcalf and Burnett Chemical Company in Boston in 1845 and manufactured a variety of chemical products, including medical supplies. After Burnett developed a vanilla extract for flavoring foods upon a customer's request in 1847, the firm began focusing on the food extract business.[51] The only commercial extract available in the American market at the time was an extract of lemon. Although some professional chefs had used the vanilla bean, extracting vanilla flavoring was time-consuming. Burnett developed extracts of vanilla and other flavors, including lemon, almond, rose, nutmeg, peach, celery, cinnamon, clove, nectarine, ginger, and orange. The firm's extract business had expanded rapidly by the mid-1850s. Burnett moved the company to a larger Boston facility to increase its vanilla extract production. He sold his share in the Metcalf and Burnett Chemical Company to his partner in 1855 and, two years later, established the Joseph Burnett Company as a vanilla extract manufacturer.[52]

After Joseph Burnett's death in 1894, his three sons inherited the company. Recognizing the increasing popular interest in fancy cooking, the Burnett brothers introduced "Burnett's Color Pastes" to the market.[53] By 1900, the Joseph Burnett Company had provided eight different shades of food colorings: leaf green, mandarin orange, fruit red, golden yellow, damask rose, violet, caramel, and chestnut.[54] One-ounce jars of color paste were available at grocery stores and usually sold for about ten cents each.[55] In the 1930s, the company introduced food colorings in liquid and tablet forms.[56] However, the color pastes were generally preferable to the tablet or liquid colors; the pastes did not change the consistency of foods, whereas the liquid colors slightly watered them down. In addition, pastes were generally stronger and deeper in shade than the liquid or tablet forms, as they were more concentrated.[57]

To color foods, the paste was first mixed with a portion of the materials to be colored. After the paste was thoroughly mixed, the colored portion was mixed with the rest of the material. It was important to create a shade a little deeper than the desired color; otherwise, the color of the finished product tended to be too pale. To make shades different from the regular colors, consumers could mix different pastes together. Vermilion, for instance, could be made by adding red to scarlet.[58] In teaching consumers various combinations, the Joseph Burnett Company indicated the almost infinite possibilities of creating colors while also encouraging them to purchase several jars at a time.[59]

Commercial gelatins also transformed many aspects of cookery in the late nineteenth century, especially the making of visually appealing "dainty" dishes. Packaged gelatins made it much easier to make gelatin that was aesthetically pleasing and palatable to the taste. Prior to the introduction of these products, cookbooks instructed readers in how to make gelatin, usually extracted from calf's feet. Calf's feet were boiled in water for six or seven hours to release a jelly, and egg whites were added to the pot to clarify the extract. The mixture was then strained through a flannel bag.[60] It was extremely important to make the gelatin clear and sparkling; otherwise, "much of its beauty [would be] destroyed."[61] Yet unlike commercial products, homemade gelatin often assumed yellowish shades and an "earthy" smell, derived from the calf's feet.[62] Gelatin dishes, which required a great deal of time and labor, indicated wealth and status. Neither working- nor middle-class women generally had time to spend more than five hours to make delicate gelatin desserts, which probably did not fill the stomachs of family members.

In the late 1880s, commercial gelatin was introduced by a number of manufacturers, including Nelson, Cox, and Knox. It became a popular ingredient for desserts as well as for main and side dishes. Because commercial gelatin was available only shredded or in sheets, it still needed to soak half an hour or longer before it could be used. In 1894, Knox introduced "Sparkling Granulated Gelatine," which consumers could readily use for cooking. Following Knox's development, other gelatin manufacturers began introducing powdered products.[63] Cookbooks now rarely called for "calf's-feet jelly." Instead, they simply listed "box of gelatin" in ingredient sections. The revised edition of *Mrs. Lincoln's Boston Cook Book*, published in 1903, noted in its preface that "since granulated gelatine and baking powder are now so universally used, the proportions of each are given where needed."[64] Powdered gelatin, along with baking powder, was one of the earliest "convenient" food products that transformed cooking methods and ingredients.[65]

Most of these commercial gelatins were unflavored and uncolored. Gelatin makers touted transparency as a proof of purity and high quality. Knox stressed in its 1899 advertisement that its product was "clear and sparkling."[66] Unlike earlier gelatin made of calf's feet, commercial gelatin was a quick- and easy-to-use product with a new sensory feature—the lack of color, as well as of smell and taste. Yet clear gelatin required women to add flavors and colorings to make colorful desserts, aspic, and salads.

While the majority of gelatin makers supplied only clear gelatin, Knox began enclosing a packet of flavors and food dyes in its boxes of gelatin. The firm had supplied two varieties of gelatin products by 1900: "No. 1 Plain" and "No. 3 Acidulated." Both No. 1 and No. 3 enclosed, under separate cover, powdered gelatins and pink food dyes, which could be "used to give a delicate pink tint to a dish."[67] The No. 3

variety, which Knox called "the busy housekeeper's package," included a small envelope of fruit acids as well as pink dyes. The acids could be used as a substitute for orange or lemon juice for flavoring the finished product. A certain amount of acid or fruit juice was crucial for creating the fruit flavor for gelatin molds.[68] The packet of fruit acids and pink dyes enabled "busy housewives" to bypass the processes of extracting juice and making food dyes. Capitalist enterprises were making domestic work seemingly easier while reinforcing and naturalizing the idea that color was an essential part of dainty dishes like gelatin molds.

The Genesee Pure Food Company of LeRoy, New York, even eliminated the process of adding flavors or colorings at home. The firm introduced gelatin products mixed with flavors and colors, which would become one of the iconic American food products—Jell-O. It was not, however, the first pre-colored gelatin product to be invented. Engineer Peter Cooper patented gelatin desserts, which contained flavors and colors, in 1845. But he did not venture into commercializing his invention.[69] A few decades later, Pearle B. Wait, a cough syrup manufacturer in LeRoy, developed a gelatin product with raspberry, lemon, orange, and strawberry flavors and named his product Jell-O. Primarily due to a lack of publicity, the Jell-O business was not profitable. In 1899, Wait sold his rights to Orator Francis Woodward, president of the Genesee Pure Food Company, for $450 ($14,100 in 2018 dollars).[70] (The Genesee Pure Food Company was renamed Jell-O Company in 1923, and merged with Postum Cereal Inc., in 1925.) Genesee's Jell-O business was slow at first, but with the firm's extensive marketing, the product began appealing to American women from sea to shining sea. By the end of 1906, Jell-O sales had reached $1 million. During the mid-1900s, Genesee introduced chocolate, cherry, and peach flavors for ten cents per package, as well as Jell-O Ice Cream Powder in four flavors at twenty-five cents for two packages.[71]

The luscious colors, varieties, versatility, and convenience were well suited to many women's demands for making dainty dishes with less time and less cost, appealing especially to urban, middle-class women who could not get immediate help from their mothers and relatives (plate 4). In its 1915 brochure, Genesee stressed the visual appeal that Jell-O brought to the dining table as well as its economic benefit: "There is always something festive looking about Jell-O. At a cost of a few cents it brings with it beauty of form and color, with which hardly another dessert can compete."[72] Making colorful delicate desserts was no longer a time-consuming or expensive process, nor did it require special skills or knowledge about food colorings. Manufacturers of commercial gelatins, particularly of pre-colored and pre-flavored Jell-O, marketed their products to women as a convenient and ideal way for presenting their taste for daintiness.

The introduction of less expensive, conveniently packaged ingredients, including food dyes and Jell-O, did not necessarily dissolve class differences with respect to dainty cooking. Commercial food dyes were no longer beyond the reach of lower-class women: a one- to two-ounce bottle of food dye was available for ten to fifteen cents.[73] The food budget of working-class New York City families in the early 1900s was around ten dollars per week, and they spent ten cents for a can of tomatoes and four or five cents for a loaf of regular white bread.[74] Even within their tight budgets, they might have been able to buy a ten-cent bottle of commercial food dye, especially because they usually lasted a long time. Nonetheless, food-coloring and cooking advice in cookbooks and women's magazines was predominantly directed at white middle-class women, reinforcing the association between gender, class, race, and visually attractive foods.

Daintiness, Artificiality, and Safety

Packaged food dyes did not entirely displace the old method of coloring foods with fruit and vegetable juices due to controversy over the toxicity of commercial food colorings during the late nineteenth and early twentieth centuries. As food manufacturers increasingly used synthetic dyes, including poisonous substances, for their products, home economists and cookbook writers warned women of the deleterious effects of these chemical additives. Commercial dyes manufactured for household use often included synthetic dyes, all the more so before the federal government enacted the Pure Food and Drug Act in 1906. The safety of the dyes and of foods colored with them became a central concern for households.

The adulteration of candies with cheap poisonous dyes posed a serious issue. Children who could not afford to buy expensive confections usually purchased penny candies. These inexpensive products were more likely to contain poisonous dyes, used only "for the silly purpose of pleasing the eye" of children, in the words of one cookbook author.[75] According to an 1865 confectionery cookbook, the poisonous coloring of candies was "becoming frightfully common," and it was "really unsafe to eat any colored sugar," especially cheap candies.[76] An 1877 *New York Times* article reported that penny candies often contained "some of the most deadly poisons," such as red lead, copper, gamboge, vermilion, and lead chromate.[77]

Cookbook authors and home economists commissioned housewives as the final bastion that would protect families from the adulteration of foods. They had generally deemed homemade dyes safer than commercial colorings. One confectionery cookbook author argued that the fact that "home-made candies were absolutely pure" was "certainly no secondary consideration to a thoughtful mother."[78] A 1897 *Ladies' Home Journal* article directed readers to use a few drops of cochineal dye for coloring candies pink to prevent any possibility of poisonous ingredients.[79] Sarah Tyson Rorer, director of the Philadelphia Cooking School, recommended in a *Ladies' Home Journal* article that housewives use spinach juice for green coloring, as it was "perfectly harmless." "I doubt if the green coloring matter sold in the market [was] made from spinach," Rorer noted.[80] An 1899 issue of the *Boston Cooking School*

Magazine likewise asserted that in making candies, "vegetable colorings [were] best," and suggested using such coloring ingredients as beets, cranberry juice, cochineal, fresh spinach, egg yolks, and carrot juice rather than purchasing food dyes.[81] Coloring foods at home, especially candies, became a way for women to prevent their children from purchasing poisonous products.[82]

To convince consumers that commercial food dyes were not poisonous, food-coloring manufacturers stressed the safety of their products as well as the economic benefit and convenience of using commercial colors. The Price Flavoring Extract Company of Chicago, which supplied Dr. Price food colors for household use mainly in the Midwest, claimed in its 1904 brochure that its dyes were derived only from vegetable sources, without synthetic dyes or "any other substance detrimental to health." The firm asserted that since "a love of daintiness" was "inherent in the heart of every true housewife," its pure and safe colors could help women create visually appealing dishes "without loss of health or comfort."[83]

The Joseph Burnett Company, whose coloring products were made largely of synthetic dyes, took advantage of the federal regulation as an endorsement of its food colors as harmless.[84] When the US Department of Agriculture admitted seven synthetic dyes as certified colors in 1907 (as discussed in Chapter 3), Burnett sent its color samples to the department's Bureau of Chemistry for certification.[85] Although the firm did not reveal its dye ingredients to consumers, it declared in its promotional materials that a sample of every batch was sent to the government for analysis. These materials stressed that the purity of the firm's colors had been certified by the federal authority. Burnett also touted the intensity of its colors to stress their economic benefit: as consumers needed only a small amount of Burnett's color pastes, a single jar could last a long time. In addition, the firm appealed to customers by emphasizing that its dyes were tasteless, easily soluble in liquids, and unchanged by strong lighting or high temperatures, necessary features when colors were used in cooking.[86]

Cooking authorities began to encourage women to use commercial dyes, including synthetic ones, by the early twentieth century. The *Boston Cooking School Magazine* frequently featured Burnett's advertisements for paste colors as well as for vanilla extract. An advertisement of the food dye manufacturer Christopher Hansen's Laboratory Company, which also supplied butter colors for the dairy industry, appeared in the revised edition of *Mrs. Lincoln's Boston Cook Book*, published in 1903; the earlier 1884 edition did not include any promotion for commercial dyes. The 1903 edition also featured "Additional Recipes," including dishes that required "color pastes." For "Sultana Roll," Lincoln directed readers to color it in "a delicate green with green color paste." To color frozen pudding, she advised readers to "color it a delicate tint with yellow, pink, or green color paste."[87] These cookbooks increasingly dropped their recipes for dye making. Food colors became an ingredient that housewives expected to purchase at stores rather than to make at home by themselves.

Women's magazines and cookbooks also promoted the use of food colors by suggesting that packaged dyes were not necessarily toxic. A 1901 *Ladies' Home Journal* article noted that the various dyes sold for icings were used in such small quantities that they would not have a detrimental effect on health.[88] A food editor of *Good Housekeeping* contended that she preferred one of the certified synthetic dyes called Amaranth to cochineal, since it was a "beautiful color and perfectly harmless."[89] Amaranth, later known as Red No. 2, was not necessarily "perfectly harmless." In the mid-twentieth century, scientists reported its poisonous effects on human health. But the dye had long been considered one of the safest synthetic colors in the United States and other countries. Cookbook writers and home economists helped provide endorsement that commercial colorings were safe to consume.

In appealing to female consumers, dye and gelatin makers often promoted not only safety but also daintiness as the key feature of their products. In its 1903 brochure, Christopher Hansen's Laboratory Company marketed its food coloring under the name Dainty Colors, sold in a one-ounce bottle for ten cents.[90] As its brand name indicates, the firm claimed that its products were particularly well suited for coloring so-called dainty desserts, including candies, ice creams, jellies, icings, and gelatin desserts, suggesting that women could present the ideal femininity by using its colorings.[91] The Joseph Burnett Company distributed recipe leaflets, including *Dainty Desserts and Confections* and *Dainty and Artistic Desserts*. These leaflets argued that women could easily create "artistic delicacies for the table" with the firm's color pastes. Burnett also warned women not to use too much of its color pastes, since their shades were strong and "delicate hues" were "more attractive and much desirable."[92] Leaflets distributed by gelatin producer Knox in the mid-1910s included *Dainty Desserts for Dainty People*, which provided recipes of colorful gelatin desserts and salads.[93] Through their promotional materials, food dye and gelatin manufacturers instructed housewives in how to give foods the "right" colors—those that represented the aesthetic taste of women as the new aspirational feminine ideal.

Burnett's advertising rhetoric echoed one of the principles of a home economics movement that called for scientific cooking.[94] Since the late nineteenth century, home economists' research had focused mainly on the digestibility and nutritional function of foods. Over time, the palatability of food rose in importance to become another essential consideration in food preparation. Ellen Richards, a pioneer of the home economics movement, noted in the leaflet for the Rumford Kitchen exhibition at the 1893 World's Columbian Exposition in Chicago: "The palate is the Janitor and unless he be conciliated, the most nutritious food will find no welcome."[95] Following home economists' interest in taste and digestion, Burnett claimed in its 1914 leaflet:

> By appealing to the eye with pleasing combinations of form and color, or to the palate by the occasional and judicious use of flavorings, the lagging appetite is aroused, the fluids that promote digestion are incited to flow, and even the plainest and most common articles of food are eaten with relish and avidity.[96]

In the following year, Burnett commissioned home economist Janet MacKenzie Hill, who taught at the Boston Cooking School and served as an editor of the *Boston Cooking School Magazine*, to write a recipe leaflet for the company. The "daintiness of Burnett's Standard Color Pastes [would] tempt the most discriminating appetite," Hill noted.[97] With the voice of a cooking authority, the leaflet conveyed a message that the color of food served not simply to please the eyes but also to stimulate the function of digestive organs.[98]

An increasing interest in nutrition was also apparent among gelatin manufacturers. While marketers of Jell-O continued to associate the product primarily with colorful dishes during the 1920s and 1930s, Knox began to place emphasis on the health benefits of gelatin products. By the mid-1930s, Knox had stopped enclosing food colorings in either its No. 1 or No. 3 package but continued to supply the fruit acid in the No. 3 variety.[99] The No. 3 package was terminated by the 1940s, after which the firm supplied only one gelatin variety with no flavor or color added.[100] The discontinuation of enclosed food colorings indicated Knox's change in marketing strategy to compete against colored products, particularly Jell-O. The firm's 1938 pamphlet read: its product "should not be confused with ready-flavored gelatin desserts," which were "85% sugar and factory flavored." "The protein content of such powders is practically nil and their high sugar percentage rule them out of the non-fattening diet!"[101] Knox associated its product increasingly with healthy meals, as opposed to sugar- and color-coated desserts. In its 1931 brochure, Knox claimed that many years of medical research had "proven that Gelatine aids digestion and is valuable in combination with milk for infants and adults where only a plain gelatine without sugar, color or flavoring can be used."[102] Yet the firm's promotional materials often included colorful dishes, and its recipes sometimes called for additional food colorings, particularly for making desserts. For making salads, Knox gelatin's transparency allowed consumers to create color variations by adding different vegetables such as tomatoes, carrots, and green peas to gelatin molds.[103] The color of foods continued to be an important factor in cooking and serving meals.

From Labor to Creativity in Postwar America

"The shapes of desserts and their prettiness, colorfulness, and playfulness embody symbols of femininity," declared Ernest Dichter, a prominent mid-twentieth-century market researcher, in his 1964 book, *Handbook of Consumer Motivations*. In analyzing the cultural significance of desserts as feminine symbols, he contended that a woman's "concern with the eye appeal of the dish, her ability to impart the telling decorative touch, the qualities of lightness, delicacy and grace all symbolize[ed] her essential femininity."[104] Dichter's market studies in general and his observations on food in particular rested largely on the contemporary understanding of gender roles and consumption patterns. His studies were by no means a "scientific" or "objective" analysis of the market; rather, his emphasis on the appearance of food as the representation of femininity and female virtue epitomized the relationships between gender ideology and visuality of food in the mid- to late twentieth-century United States.[105]

The artificiality and convenience of food coloring, and of cooking in general, had reached a new stage by the middle of the twentieth century. The development of food technology and science allowed manufacturers to create new kinds of processed foods, including cake mixes and canned frosting. The commercialization of cake mixes began in the early 1930s, after P. Duff and Sons—a molasses canning company in Pittsburgh—patented the first cake mix product.[106] But many of these early products were sold only regionally, and it would be another decade before the cake mix market took off. In 1947 and 1948, two major milling companies, General Mills and Pillsbury, introduced cake mixes, and the market expanded rapidly. Cake mix sales amounted to about $79 million in 1947. By the early 1950s, American consumers were spending more than twice the 1947 amount.[107]

In postwar America, food advertisers promoted to middle-class housewives the consumption of industrially processed products as an essential means to pursue modern lifestyles and to perform their roles as mothers and wives.[108] Women's employment outside the home became more common after World War II. Packaged ingredients offered less time-consuming, foolproof cooking aids for busy women.[109] They transformed cake baking to a simple process of just adding water and an egg to a mix. Hours of preparation, varieties of ingredients, and special skills were no longer necessary for creating decorative dishes to convey femininity. A *Good Housekeeping* columnist noted in 1950: "There's no need for you—today's bride—to quake in your boots when your husband begs you to make his favorite cake. Just take a package of cake mix from your pantry shelf and go to work." The first instruction the article gave to readers was this: "Read directions on cake-mix package or in special recipe . . . [and] heat oven to temperature given on package."[110] Convenience had come to the modern kitchen.

Cake mix manufacturers' advertising rhetoric combined artificiality and convenience with creativity. They believed that women would not accept convenience alone as an advantage of the new products. In conducting research on General Mills cake mix in the mid-1950s, Dichter argued that just adding water was so easy that women did not feel a sense of achievement or satisfaction in cake making. He advised the firm to change the formula to have women add an egg as well as water to the mix.[111] As Karal Ann Marling has noted, the cake served as "sculpture, frosted in living color. It was a test of mother love and womanly competence, the battleground between packaged mix and mastery of the culinary arts, between modern ease and old-fashioned, time-consuming kitchen drudgery."[112] Decorated cakes made with packaged ingredients represented a subtle balance between convenience and creativity.

Once "mother love" was no longer an ingredient in the baking itself, it was transferred to the decorating and style of the cake. In a 1950 article in *Better Homes and Gardens*, the author contended: "Beauties, every one! All these luscious cakes start with a mix." Success in cake making was "packaged right along with the precision ingredients." "You can put your effort into glorifying your cake with frosting, dreaming up an exciting trim that puts your own label on it."[113] Women's magazines featured a number of ways of making colorful frosting and decorating cakes. Some of them did not even include cake-baking recipes, mentioning only a box of cake mix and focusing on cake decoration. *Good Housekeeping* featured several series of columns focusing solely on cake decoration, explaining how to pipe frosting and create decorative shapes, such as stars and flowers.[114] General Mills even published *Betty Crocker's Cake and Frosting Mix Cookbook* in the mid-1960s. The book focused solely on making cakes with packaged mixes. In its introduction, General Mills retrospectively declared to women that the advent of cake mixes in the 1940s had been "the revolution": as "ease and convenience" became "the hallmarks of cake-making," a woman could become "a mix-minded artist."[115] Visual appeal, rather than taste, became a way to "set a cake apart."[116]

Color became a means for food manufacturers to convince housewives that they could display their personalities and creativity by using mass-produced goods. Cake mix manufacturers suggested almost infinite possibilities of cake decoration using different colors—cake mixes and frostings would be a foolproof tool for women to be "creative."[117] The light pink shade was still one of the most popular colors for frosting, often featured in advertisements of Betty Crocker and other cake mix brands. Yet creating a wide range of colors for frosting was important for making cakes for different occasions. The 1953 recipe booklet *Cake Secrets*, distributed by General Foods, introduced pink, white, green, and yellow colors of frosting for decorating cakes, cupcakes, and cookies. With colorful pictures, the booklet indicated that cake making and decoration were simple processes, particularly when a box of General Foods cake mix was used. The message was clear—women could easily demonstrate their creativity, femininity, and hospitality to their family and guests by using packaged ingredients and multiple colors of frosting.[118]

Packaged products became increasingly identical among different companies except for their brand names; color variations thus became the competitive edge for food processors to differentiate themselves from other firms. As consumers could buy different colors of the same brand product, color variations allowed the firm to encourage repeat purchases. In the early 1950s, the Quaker Oats Company introduced Aunt Jemima cake mixes, which enclosed a packet of flavor and color powder at no additional cost. "Change the flavor and color your cakes—like magic!" noted the advertisement. There were four varieties of "flavor-changer color-packets": yellow for "Golden Lemon" cake, green for "Delightful Winter" cake, pink for "Heavenly Peppermint" cake, and orange for "Old Time Spice" cake. Consumers could create these four different flavors and colors of sponge cakes by simply adding a packet of powder to the cake mix, which was originally a white cake. "Newest idea in cake mixes!" with an image of Aunt Jemima—a long-standing popular image of an African American domestic servant—the advertisement touted to consumers.[119] It also stressed a "festive" look and "gaily" colors of "homemade" cakes, indicating that a simple cake making process would not jeopardize women's creativity but actually help them excel at cooking without fail.[120]

The gaiety of colorfully decorated cakes became increasingly associated with motherly love during the postwar era. Mothers had long made colorful foods for children. When it was discovered that some commercial candies contained poisonous substances in the late nineteenth century, many recipes advised women to make colorful candies and desserts at home for the health of their children. Although children's health and nutritious foods were still an important part of domestic advice in the postwar popular media, the focus was increasingly on the significance of eye appeal to attract children. With the baby boom in the 1940s and 1950s, Americans married young and had an average of three children in a few years. Many believed that creating a child-centered family marked a successful and happy personal life. Childlessness was considered deviant, selfish, and pitiable.[121] In his 1946 work, *The Common Sense Book of Baby and Child Care*, pediatrician Benjamin Spock—one of the most influential and controversial figures to provide advice on child-rearing—argued that parents' love and attention were necessary for children's growth. Spock's advice stressed the importance of material and emotional devotion to children.[122]

The child-centered view of families was apparent in postwar cooking advice. Many recipes assured women that they could establish affectionate relationships with their children by resorting to easy, convenient recipes and products. Children would "always remember 'mother's cakes' as ever so special—perfectly delicious—pretty, too," a *Better Homes and Gardens* editor contended in her 1953 article.[123] She noted that even when cake mix was used, mothers could show their love to their children. More important than simple cake baking was elaborate decoration, which could also be done using frosting mix.

Cookbooks and women's magazines showcased a variety of decorated cakes for children. Some of them were made into different shapes, including a cat, a boat, a doll, and a boot.[124] A 1952 article in *Good Housekeeping* featured, for example, "Bobby's Balloon Cake," made with an angel food cake decorated with white frosting and different colors of gumdrop slices. The "Sweet Sixteen" cake was thickly frosted with light pink cream, and different shades of candy wafers were inserted around the edge of the cake. The shapes of Humpty Dumpty, a butterfly, and flowers were also used for cake ornaments.[125] In the new convenience economy, advertisers promised that even motherly love could be produced from a box.

These decorated cakes and desserts often appeared in vivid color photographic images in cookbooks and magazines. Color photography, whose popular spread was discussed in Chapter 2, presented to its viewers the appropriate shade and lightness of frosting colors, and helped them visualize the finished product. In the late nineteenth century, when cookbooks contained only (often very brief) textual instruction, with no color illustrations, the lightness of shades for certain foods relied largely on one's preference and invention. Women were expected to know how much cochineal or spinach juice should be added to their cakes and candies. Now that frosting mix and cake mix were pre-colored by manufacturers, women could create the "right" color of cake without measuring the dye or even thinking about how to color it.

Colorful images and recipes provided a kind of culinary fiction and fantasy for women. Many of them probably did not bake those intricate, time-consuming cakes or follow the advice offered in cookbooks and magazines but rather only enjoyed looking at images of colorful dishes in magazines and cookbooks. These prescriptive recipes suggested that there were always easier alternatives with the help of short-cut ingredients.[126] Because some of the recipes for elaborate cakes suggested using cake mix and packaged frosting, women could make simpler versions of decorated cakes. In analyzing the success of cake mix and similar products in the mid-twentieth century, Dichter argued that not only did mixes save time, but they also enabled the modern woman to "be creative in new forms." These new products allowed women to bake at home in "an easy fashion," which assured them "success almost every time."[127] Many recipes encouraged women to be "creative" while providing specific directions to follow and suggesting the use of packaged ingredients, which required less imagination as well as less time and money. Moreover, women were expected to use and express their "creativity" primarily to serve the family's needs rather than for the sake of their own enjoyment.[128] A new standard for ideal mothers and wives came with a can and a box.

Not only did food products become highly artificial in postwar cake baking, but the association between taste and sight also became "artificial" or arbitrary. The colors of cake and frosting mix often indicated their flavors, but the pink shade of strawberry-flavored frosting, for example, was not necessarily the color of actual strawberries. Nor did the frosting taste like fresh strawberries. But as processed foods flooded into the market, consumers learned to identify a specific pink shade as the color and flavor of "strawberries." Colorful food advertisements filled virtually almost all spheres of the visual environment, including newspapers, magazines, television, and billboards. The use of artificial food coloring (and flavoring) and the arbitrary associations between color and taste allowed food processors to mass-produce standardized products economically and consistently and to market their products to mass consumers as an essential means for being "creative."

Conclusion

The spread of commercial colored foods and dyes helped afford middle-class women a means to perform vernacular gentility. Food dyes began in the nineteenth century as a replacement for labor-intensive processes previously done in the home. Visually appealing dishes had signified upper-class white women's social and economic capital, as they had the luxury of resources and time for making (or letting others make) intricate, time-consuming foods. The introduction of less-expensive packaged food colorings and powdered gelatin products at the turn of the twentieth century eased the food-coloring process and made decorative cooking accessible to middle-class households. By the postwar era, advertisers were promising much more: personal creativity and motherly love in a box.

Sensory experiences in cooking and eating and visual environments in households changed fundamentally from the early to mid-twentieth century. Cookbooks, magazine articles, and recipe brochures, endorsed by cooking professionals and disseminated by food manufacturers, helped bring commercially processed ingredients into household kitchens. The expansion of processed food ingredients even intensified the connections between ideal femininity and visuality in cooking. The advent of new commercial products and intense corporate marketing transformed not only how women created colorful dishes but also the degree to which women adopted artificiality in domestic cooking: there was now a spectrum of acceptance of artificiality among women. Food processors, advertisers, and cookbook writers touted artificiality in the household as a necessary practice for women to create dishes appealing to the eye and the palate. The artificial was becoming the new standard for what looked natural.

· 5 ·

Making Oranges Orange

Artifice became a constituent part of the color of natural produce. In the late nineteenth century, American consumers encountered agricultural products—including bananas, oranges, and pineapples—being shipped from distant production sites for the first time.[1] Until then, most consumers had relied on foods supplied by local farmers and what they grew themselves. Fresh produce was available only during the growing season. Although upper-class consumers could afford imported fruits and vegetables, their choices were limited due to inadequate transportation systems. Agricultural products from Florida and California had begun to reach northeastern markets by the 1850s. These foods, however, were often damaged and rotten by the time they arrived at the auction sites near the markets. Beginning around 1870, refrigerated railcars and long-distance transportation systems enabled the shipment of perishable produce.[2] Farmers, growers, and packers began to employ various color-controlling technologies to consistently provide fruits and vegetables with a uniform color that many consumers came to recognize as "natural." These technological innovations transformed the American diet and, eventually, the eating habits of the planet.

Since the beginning of agriculture, human beings have been controlling the natural environment by selecting certain crops to accommodate seasonal and regional conditions and by interbreeding different varieties to increase productivity and improve quality. Yet the late nineteenth to the mid-twentieth century marked a critical moment in the history of human manipulation of the natural environment—a moment when the advent of new agricultural machinery and chemical substances enabled farmers and traders to control the color of their produce effectively and uniformly.[3]

The mechanization and expansion of agricultural production resulted in overproduction and a price decline for agricultural produce during the decades after the Civil War. The outbreak of World War I alleviated the farm problem in the United States as farmers became suppliers of agricultural products for European markets. After the war, however, as European demand for American produce decreased, overproduction brought a dramatic price decline, leading to the economic degradation of rural areas.[4] Increasing the marketability of fruits and vegetables and farmers' incomes became critical national issues.[5] The standardization of product quality, including color, became an indispensable factor for farmers and growers to sell their products on the mass market.

The creation of standardized, uniform food colors emerged from a set of practices and beliefs: the government's attempt to regulate, as well as boost, agricultural production and marketing, farmers' and growers' desire to control the environment and create sustained profits, and changing consumer expectations about what was natural and appetizing. Hand in hand with the standardization of food colors came materials to train consumers' eyes to value some colors over others. As new food products arrived in the American market, legislators, agricultural producers, traders, and advertising agents played a critical role in teaching consumers the "right" and "natural" colors of foods, some of which many consumers had never before seen or eaten. Natural abundance in modern consumer culture came with the expansion of capitalism, which in turn disciplined people's eyes to look at a "product of nature" with a specific expectation.

Creating Color Expectations

Bananas had become one of the most popular foods in the United States by the 1910s, recognizable by their yellow color and curved shape. Until the 1890s, yellow was not the fruit's only "natural" color to appear in the American market. When the importation of bananas began early in the nineteenth century, a primary variety traded was the Cuban Red, which had red-purplish skin and was smaller and plumper than the yellow variety that later became more common.[6] As banana imports increased throughout the nineteenth century, at least two varieties reached the United States market from Central and South America, mainly Cuba and Panama: the Dacca banana with red-purplish skin and the Gros Michel variety with yellow skin.[7] Both red and yellow bananas were a luxury for most consumers at the time, selling for ten to twenty-five cents for an individual banana; to put this in perspective, beef sirloin was about ten cents per pound.[8]

Middle- and upper-class consumers, mostly in urban areas, had a chance to encounter both varieties not only at grocery stores but also in various media during the 1870s and 1880s. An 1871 Currier & Ives lithograph, *Fruits of the Tropics*, included both red and yellow bananas, along with other fruits (plate 5).[9] *Mrs. Lincoln's Boston Cook Book*, published in 1884, introduced a recipe for "Tropical Snow," which called for six "red bananas," as well as other "tropical" foods, such as oranges and coconuts. The dessert was layers of orange and banana slices, sprinkled thickly with coconut and powdered sugar on the top.[10] An 1889 advertisement for bananas, noting that there were two kinds of bananas, even claimed that the red variety was "considered the best."[11]

Beginning in the 1890s, as banana imports increased, their retail price declined. A 1904 article published in *Scientific American* even called bananas the "poor man's fruit."[12] The quantity of bananas imported to the United States grew rapidly during the first decades of the twentieth century: over forty million bunches arrived at United States ports in 1910, increasing to nearly fifty million in the next four years.[13] Per capita banana consumption rose from 18.1 pounds in 1915 to 23.4 pounds in 1928.[14] The fruit became a common ingredient in various recipes, mainly desserts such as pudding, ice cream, and pies.[15] By the 1920s, bananas had become a part of American popular culture, often referred to in songs, poems, and novels.[16]

As bananas gradually became a popular food item, yellow became the color that American consumers expected as the sign of good, mature bananas. Because the yellow Gros Michel had thicker skin, it was more suitable for shipping to distant markets than were red varieties.[17] United Fruit and other fruit companies began planting only the Gros Michel in their plantations in Latin America, while discarding other varieties. All bananas imported to the United States came to look the same, with a uniform color, shape, and flavor.[18] Although the red variety continued to appear on the market sporadically, it was more expensive: the wholesale price of yellow bananas was about $1.50 to $2.00 per bunch, whereas red bananas usually cost between $2.00 and $3.00.[19] The fruit's biological characteristics and shipping companies' economic incentives helped determine the color of bananas, and yellow eventually became the color that American consumers took for granted.

Well into the early twentieth century, fruit cooperatives and advertising agents reinforced the popular perception of food colors by teaching consumers how to determine the proper stage of ripeness for eating fruits. The Fruit Dispatch Company, a subsidiary of United Fruit, often included an explanation of how to tell bananas' ripeness based on their skin color, usually with a color illustration, in recipe leaflets and advertisements.[20] A yellow color with a green tip indicated that the pulp was still firm and starchy; the fruit should be left at a comfortable room temperature to become completely ripe or should be cooked. When the skin became all yellow, bananas reached the "yellow ripe" stage, suggesting that most of the starch had turned to sugar and that the fruit had attained a delicious flavor. Bananas at that stage could be readily digested and were still firm enough for cooking. Yellow color with brown flecks was the sign of the "full ripe" stage, at which all starch had converted into sugar and was easily digested. At this stage, the flavor had developed to "its highest delicacy."[21] Images of yellow bananas pervaded advertisements and cookbooks. Even brochures not published by banana traders showed the fruit only with yellow skins.[22]

Fruit shipping companies and cooperatives also provided "color education" for wholesalers and retailers. By the mid-twentieth century, the Standard Fruit and Steamship Company (which was acquired by the Castle & Cooke, the predecessor of the Dole Food Company, in the 1960s) had begun distributing to grocers a color poster that showed different stages of banana ripeness based on skin color. Shipping companies usually transported bananas to retail locations when the fruit was still green and unripe to provide the optimum quality at grocery stores. The color guide poster enabled retailers to determine when to bring bananas to the sales floor. When the skin was still greenish yellow but assumed a "more yellow than green" shade, the fruit was "ready for retail display." This ripening stage of bananas had a longer shelf life than fully ripened fruits; grocers thus had lower product loss, while consumers could cook the fruit or wait until the banana became fully yellow.[23]

Around the same time that bananas became a common fruit, another now-popular fruit—oranges—became an everyday food for many American consumers. Like bananas, citrus consumption was limited to relatively wealthy people in cities until the last decades of the nineteenth century.[24] For many, citrus was a luxury, eaten only on special occasions, such as Thanksgiving and Christmas. Children often found the bright orange fruit in their Christmas stockings as a present. As one of the few fruits available to northeastern consumers during the winter, an orange's bright color symbolized an exotic, temperate place.[25]

By the first decade of the twentieth century, citrus consumption grew substantially, particularly in urban markets. In addition to the development of the transcontinental railways and refrigerated cars, the citrus industry's extensive marketing campaigns encouraged the nationwide consumption of oranges.[26] In 1907, with financial support from the California-based Southern Pacific Railroad, the California Fruit Growers Exchange (CFGE)—the state's largest citrus cooperative and the predecessor of Sunkist Growers, Inc.—launched its first major advertising campaign for oranges, using Iowa as a test market.[27] After the campaign, Iowa orange sales increased by 50 percent compared with a nationwide increase of 20 percent.[28] In its advertisements, the CFGE often characterized oranges as a dietary staple and promoted them as an important part of breakfast and school lunches.[29] The citrus industry's promotion, amplified by advice from nutritionists and home economists, helped create "a national vogue" for citrus fruits.[30]

Until then, neither producers nor advertising agents thought that they could successfully advertise an orange or any farm produce. They believed that an orange was "just an orange," with nothing new or worth mentioning in an advertisement. Nor did they consider it possible to trademark an agricultural product.[31] In 1908, the CFGE's advertising agency came up with a trade name, Sunkist (a play on "kissed by the sun"), for oranges marketed through the cooperative.[32] As John Soluri has argued in his analysis of Chiquita bananas, fruit shipping companies and cooperatives turned an agricultural commodity into a retail product distinguishable by a brand name. By promoting fruits from particular regions and companies, the CFGE sought to identify its brand name with high-quality produce.[33]

The color of oranges served as an important sign of quality and brand identification. California and Florida citrus campaigns used the bright orange color as the representation of freshness, ripeness, and abundance of citrus fruits. These efforts helped construct and naturalize the association between skin color and eating quality of the fruit. In his study on the California citrus industry, Douglas Sackman has shown how the CFGE reshaped the cultural significance of citrus fruits and how consumer demands in turn improved the cultivation of the fruit. He contends that "the production and representation of oranges reconfigured the boundary between nature and culture," facilitating a "nature-culture hybridization." While "shaping culture to create consumer demand," the CFGE re-created the biological nature of oranges.[34] By presenting bright orange as the symbol of natural, ripe, and healthy fruits, colorful citrus advertisements materialized a culturally constructed idea about bright-colored oranges, turning the fruit into an object as well as a product of culture.

Window displays provided urban residents with a colorful image of actual oranges while promoting the purchase of citrus fruits (figure 5.1). Grocery trade journals, such as the *Progressive Grocer*, and grocery business manuals emphasized the importance of window displays to catch the consumer's eye and to promote sales of all kinds of products in the early twentieth century.[35] Advertising agencies and store owners believed that a heap of bright oranges would offer the public an attractive color and the impression that "oranges were abundant and hence probably low in price."[36] In his analysis of department stores and show windows of the mid-twentieth century, Jean Baudrillard has described the abundant display of foods and other goods as the "primal landscape," which presented an "alimentary and vestimentary feast" and "stimulate[d] magical salivation." The scale of window displays of early twentieth-century grocery stores was much smaller than that of department store showcases. But bright oranges displayed in windows similarly served as a sign of "a new-found nature of prodigious fecundity."[37] They provided urban consumers with a visual image of nature as a cornucopia of perfect crops.

Figure 5.1 Grocery Store Window Display. Theodor Horydczak, "California Sunkist Displays. Window Display at Sanitary Grocery Co. II" (ca. 1920–1950). Prints and Photographs Division, Library of Congress.

Brightly colored images pervaded all levels of distribution and sale. Crate labels provided jobbers and wholesalers with colorful images of bountiful harvests, representing the ideal appearance of fruits and vegetables. Wholesalers' and retailers' marketing and price decisions eventually determined growers' income. Growers and packers tried to catch the eyes of these traders at auction sites by attaching colorfully decorated labels to wooden shipping crates of fruits and vegetables (figure 5.2).[38] The use of crate labels began in southern California in the mid-1880s. Packinghouses and marketing cooperatives hired lithograph companies to create colorful illustrations for their labels.[39] Although crate labels were often discarded with the empty crates after an auction, consumers also had an opportunity to see them as some retailers used the crates to display fruits at their stores.[40] Crate labels were used until the mid-1950s, when less expensive cardboard boxes replaced wooden crates for shipping.[41]

Crate labels were an important tool for identifying the grade of agricultural produce as well as the names of producers and packers at an

Figure 5.2 In this picture, buyers are inspecting fruit samples prior to auction. A crate label attached to each box designated the grade and geographical origin of the produce. Auction warehouse at the Pennsylvania Railroad Terminal in New York City (c. 1920s). Courtesy National Archives, photo no. 83-G-30877.

auction warehouse. The label's background color stood for the grade of products: blue for Grade A, red for Grade B, and yellow or green for Grade C.[42] In many cases, packers and lithographers designed crate labels so as to make their produce and names stand out in the image. According to color theory, blue and orange are complementary colors—that is, when the two colors are placed next to each other, they create the strongest contrast. The color of oranges on Grade A labels with a blue background looked more intense to viewers' eyes than oranges of other grades (plate 6). In auction warehouses, where a number of crate boxes would be stacked high, labels on higher-grade produce stood out better than those on other boxes. These images embodied the association between better-colored produce and higher grades.

Grading systems, established by federal and state governments, helped create and standardize what producers, merchants, and consumers expected to be the "natural" and "good" color of foods. Grade standards provided the definition of how agricultural products should look by categorizing fruits and vegetables into grades, such as "fancy," "choice," and "U.S. No. 1." Agricultural cooperative leaders had advocated the importance of grading fruits and vegetables to supply uniform and high-quality produce since the late nineteenth century.[43] But it was not until the 1910s that federal and state governments began establishing grade standards. One of the earliest standards was Maine's quality standard for apples, issued in 1910. By 1917, most of the fruit-producing states had enacted grade standard laws that specified the color, size, and shape of foods, which could be marketed under certain grades.[44] For instance, under California's 1917 Fresh Fruit, Nut, and Vegetable Standardization Act, oranges needed to attain at least a 25 percent yellow or orange color before picking.[45] The US Department of Agriculture (USDA) established the first federal standard in 1917 for grading potatoes, followed by other fruits and vegetables.[46]

The color of fruits and vegetables correlated with retail and wholesale prices as a marker of product quality. Market buyers usually paid forty to fifty cents more per box for better-colored oranges than for fruits with green tinges or light orange shades.[47] Fruit shippers and traders believed that consumers would pay more for brighter fruits. The price of "well colored" Florida oranges, for example, was $2.00 per box in the New York market on November 23, 1909, whereas "green and poor" fruit was sold at $1.25 per box.[48] Higher prices not only reflected the popular perception of acceptable color but also helped promote and naturalize the idea that oranges were a bright orange fruit—which they sometimes were not.

Coping with Color Expectations

Growers and marketers emphasized bright color as the sign of high-quality fruits and vegetables. However, color was not necessarily a reliable indicator of actual ripeness or freshness. Depending on climate conditions, for example, the skin color of certain orange varieties sometimes stayed green even when the inside of the fruit was ripe. As the ripening process of these oranges advanced, the green color of the rind was naturally bleached, allowing the orange pigment to show up on the skin. These changes were enhanced when temperatures dropped in the evening in autumn and winter. In Florida, at the opening of the orange shipping season in late September and October, when the temperature was still relatively high, the exterior color of oranges stayed green while the inside of the fruit ripened. According to a 1923 USDA report on the color of citrus fruits in Alabama (where citrus growers faced a similar color problem to the one in Florida), oranges remained entirely green in skin color when their eating quality fully developed and the fruit's insides ripened. Shortly after the fruit became fully colored on the tree, it became insipid to the taste, indicating that it was overmature and past the marketing stage.[49] California citrus growers also faced a color problem because Valencia oranges, one of the major varieties grown in the state, sometimes returned to a greenish color if left on the tree in early summer.[50] Yet California oranges generally assumed more uniform and brighter color than did Florida fruits due to climate conditions.

Thus, environmental and biological conditions resulted in what many producers and consumers came to consider an "unnatural" color. Yet it was economic, social, and cultural factors that constructed the line between the "natural" and "unnatural." While Florida's peculiar environmental circumstances produced ripe oranges with green skins, growers' and packers' ideas about "good" oranges problematized the green-colored fruit. In certain parts of Southeast Asia and East Asia, oranges ripened without a change in skin color in early autumn as in Florida. One of the most common orange varieties in these regions was (and still is) marketed when green as well as orange, depending on the time of cultivation—the green color of some orange skins indicated varietal and seasonal differences.[51] In the United States, citrus growers and marketers, particularly in Florida, believed that marketable oranges needed to be a bright, uniform orange color regardless of seasons or varieties.

Competition between orange-growing regions was one factor that impelled citrus growers to make oranges a uniform orange color. Throughout the late nineteenth and early twentieth centuries, Florida and California had been the two major orange-producing states, providing more than 80 percent of the oranges in the nation. Florida's share of national citrus production during the 1920s and 1930s accounted for about 38 percent, while California held 54 percent.[52] Florida's marketing channel was relatively limited to the northeastern region due to its geographical proximity: more than 50 percent of Florida oranges were sold in New York, Pennsylvania, and Massachusetts in the mid-1930s.[53] As the nationwide consumption of citrus fruits increased rapidly (citrus consumption more than doubled between 1918 and 1948), the expansion of the market became a critical issue for the Florida citrus industry.[54]

Florida growers and packers did not find the markets from the Midwest to the Pacific region profitable. They believed that consumers in these regions were accustomed to bright California oranges.[55] In several midwestern markets, including Chicago, Detroit, and Cleveland, transportation charges from Florida were slightly less than they were from California. Despite the freight rate advantage, however, Florida oranges accounted for about 30 percent in these cities; nearly 70 percent were from California.[56]

The color of oranges was the major obstacle, or so believed Florida growers. One citrus grower noted in 1926 that Florida orange producers must "devote greater attention to the production of bright and fancy fruit" because California oranges assumed a "much better appearance." He argued that while Florida oranges tasted better, they were sold at a greatly reduced price compared with California oranges because of their color.[57] Likewise, Lynn Parker Kirkland, the chair of the Florida Citrus Commission (a board of directors for the Florida State Department of Citrus), asserted that Florida's "moist, warm climate and loose soils" gave oranges "such fine flavor and fill[ed] them with juice," but the same factors "lessen[ed] their color throughout much of the normal marketing season."[58] Florida oranges could not be "made presentable alongside of the highly colored California fruit," argued F. L. Skelly, the sales manager of the Florida Citrus Exchange (the largest Florida citrus cooperative, founded in 1909). Skelly argued that producing fruits of poor appearance was "absolutely unprofitable to growers" in Florida.[59] For these growers and marketers, bright, uniform color was a necessary feature to market their fruits nationwide.

It was commonly shared in the Florida citrus industry that campaigns by the CFGE were "an upbuilder for the entire citrus industry."[60] An editor of the citrus trade journal *Florida Grower Magazine*, Marvin Walker, noted that "much of the present demand for this fruit [was] developed by [the CFGE's] advertising."[61] The Florida citrus industry benefited from the popular recognition and increasing consumption of citrus fruits. But the CFGE's intensive campaigns worried Florida growers, who were particularly concerned about color. Earl E. Brown, former mayor of the city of DeLand, Florida, contended that California citrus producers "educated the American public to buy oranges solely judging by the appearance of the skin, regardless of palatability, vitamin and juice content, healthfulness, etc."[62] This was not entirely true because the CFGE did promote the health benefit of oranges, and appearance was not the sole focus of its promotion. In fact, the CFGE was among the earliest to use vitamin C as a sales pitch in food advertising, when "vitamin" was only just starting to become a household term in the United States.[63] Brown's statement, as well as opinions shared by a state government agency, a trade journal editor, marketers, and growers in Florida, reflected the state's strong sense of rivalry when it came to California fruits and its concern about the bright color of oranges as an important economic and political issue for the state.

Against California oranges, the Florida citrus industry de-emphasized the appearance of oranges, or emphasized that color was not the only, or even important, indication of fruit quality. Walker introduced a new criterion at the Florida State Horticultural Society meeting in 1936. He contended that a statement that Florida citrus contained more juice would be the "best selling argument" that the Florida citrus industry could make against California fruits.[64] In the same year, the Florida Citrus Commission's advertisement appeared in the *New York Times Magazine*: "Buy Grapefruit and Oranges not by looks . . . but by FEEL." Showing a photograph of a woman holding an orange in each hand, the advertisement noted that Florida oranges contained "a fourth more juice" than fruits from other places; hence they weighed more. To purchase "juicy" and "tree fresh" fruit, consumers should use their hands, not their eyes, the ad suggested.[65]

Walker also insisted on the importance of stressing the word "Florida" in citrus advertisements—an early example of marketing based on geographical indications. He sought to create "Florida" as a brand name and an image of juicy and fresh fruit. Because the word was "easy to remember and to say," argued Walker, the state's name could be an effective tool to promote its fruits.[66] Regional marketing strategies would indicate to consumers that the place name, rather than visual information, was a more viable indicator of the fruit's eating quality.[67]

The Florida citrus industry also used color images to make the case that uniform bright color was not always the sign of delicious fruit. In the early twentieth century, the Florida Citrus Exchange commissioned well-known home economist Christine Frederick, who wrote numerous articles for women's magazines and published *Selling Mrs. Consumer* in 1929, to write a recipe booklet to promote the state's Seald Sweet brand oranges. Frederick asserted that the color of orange skins would "tell nothing"; instead, the brand name Seald Sweet "tells you everything." The booklet included color images not only of brightly colored oranges but also of fruits with gray blemishes (plate 7). It visually showed that all Florida oranges, regardless of their appearance, were high quality.[68] Likewise, a 1925 advertisement for Seald Sweet oranges and grapefruits, printed in the *Ladies' Home Journal*, featured fruits with grayish color and green tinges. The advertisement noted: "Florida oranges, whether they are bright, golden or russet in color, are equally juicy and palatable."[69] Florida citrus advertisers' effort to de-emphasize the appearance of oranges reflected growers' and packers' grave concerns about the intense competition with California and consumer expectations about the connection between bright orange color and the eating quality of the fruit.

Creating "Natural" Colors

The creation of "natural" colors of fruits and vegetables involved the manipulation of natural ripening processes. Their colors changed as they grew from immature to mature states. Beginning in the late nineteenth century, the development of refrigeration technology for transportation and storage helped growers and packers retard the spoilage of fresh produce for long-distance shipment. To transport highly perishable commodities effectively, agricultural growers, packers, and traders also controlled harvesting seasons and plants' biological growth. They usually harvested the produce while it was still green and stored it in coolers. Just before shipping to the market, packers and wholesalers enhanced the products' color changes by promoting ripening processes.[70]

Until the early 1920s, combustion gases from kerosene lamps and gas stoves were a major means for enhancing the ripening processes of fruits and vegetables. In 1923, USDA scientist Frank E. Denny determined the causal factor of the ripening process as ethylene gas, which was produced in the combustion of lamps and stoves. He showed that when a small amount of pure ethylene was released in the citrus fruit storage room, the fruit colored very rapidly.[71] The use of ethylene became common to make oranges orange, apples red, bananas yellow, and tomatoes red during the 1920s and 1930s.[72] Bananas in particular did not turn yellow, or ripen, on the tree. Picking the fruit triggered the release of ethylene from the banana, enhancing the ripening process.[73] Refrigerated transportation allowed green bananas to remain unripe until they reached auction sites or warehouses near the market.[74] Fruit jobbers hung bunches of bananas in a "ripening room" until the fruit turned to greenish yellow before shipping to retail stores (figure 5.3).

Ethylene provided several advantages over the older way of coloring fruits and vegetables with stoves and kerosene lamps. The new method eliminated the necessity for long periods of heating, which often resulted in drying of the fruit. Gas and kerosene fumes tended to blacken the fruit rind and imparted an objectionable odor. And there was always a risk of fire in storage houses and in railroad cars from using lamps and stoves.[75] By treating fruit with ethylene, an entire carload could be ripened uniformly, which eliminated nearly all the labor of sorting out damaged or green fruits.[76]

Ethylene was not a perfect solution, however. If fruits and vegetables were harvested too early, they did not ripen properly or develop full color even when ethylene was applied to them. When tomatoes were not mature enough, they colored poorly even after ethylene was poured over the produce. Immature persimmons did not develop the desired color or flavor, and immature avocados assumed an "unnatural"

Figure 5.3 A banana ripening room in Springfield, Missouri. The bananas were hung with string and left to rest in the room until the fruit turned to a desirable ripening stage. The roller rack was used for moving bananas between railcar and ripening room (c. 1935). Charles E. Magoon Collection on Produce Marketing, Hagley Museum and Library.

brassy color when treated with ethylene.[77] Produce was therefore left on the tree or vine until it reached what growers and packers called the "green-mature" stage: when the product was still green and unfit for eating but mature enough to turn ripe with ethylene. The gas helped to produce full color, increase the sugar content, decrease acidity, and improve the general texture and flavor.[78]

Seeking to create uniform, bright colors as the sign of succulent fruits and vegetables, growers and packers tended to prioritize the appearance of their produce over the actual taste. Several studies conducted in the 1920s and 1930s suggested that ethylene-ripened produce did not develop full flavor. While some scientists argued that ethylene-ripened produce attained the same quality as produce ripened on vines and trees, others insisted that fruits and vegetables, when artificially ripened, generally had a lower sugar content than those ripened on the plant.[79] A 1925 study of tomatoes showed that "green mature" tomatoes, ripened by ethylene, remained solid for a longer period than did vine-ripened fruits.[80] While the firm fruit was easy to transport, it did not give consumers the same flavor or texture as vine-ripened tomatoes. Uniform bright appearance, ease of transport, and longer storage became the primary concerns for agricultural producers and retailers for mass-producing fruits and vegetables and distributing them nationally.

The citrus industry was one of the first agricultural industries to employ ethylene extensively in the 1920s. The enhancement of citrus colors with ethylene was called a sweating, or degreening, process. When the fruit arrived at the packinghouse, boxes of oranges were stacked in a "sweating room," at about 85°F and roughly 85 percent humidity, for forty-one to forty-eight hours.[81] The heat, humidity, and ethylene accelerated the coloring by bleaching out the green and unmasking the yellow and orange pigment.[82] In Florida, about two-thirds of packinghouses used ethylene gas in the 1931–32 season, while most of the remainder still used kerosene.[83] In California, nearly half the oranges were treated with ethylene before their shipment.[84]

Although ethylene offered a relatively satisfactory result, it did not always give oranges full mid-season color. Poor ventilation and high temperature also tended to cause rapid decay of the fruit.[85] In 1933, Rodney B. Harvey, a plant physiologist at the University of Minnesota, and Frank R. Schell, a Florida grove owner, patented a process for enhancing the color of oranges with synthetic dyes as an alternative to ethylene treatment.[86] Harvey and Schell sold their patent to the Food Machinery Corporation (FMC), a manufacturer of agricultural equipment headquartered in San Jose, California.

This was referred to as a color-add, or Harvey, process. Oranges were immersed in a coloring solution for about five minutes, then passed through a pure water bath for rinsing, drying, polishing, grading, and packing.[87] The color-add process decreased treatment time significantly, as the ethylene process took two to three days. Lessening the time of heating fruit reduced decay and helped oranges "stand up longer in the hands of the dealer and consumer." The cost per box was more or less the same: about 3.5 cents per box for the color-add process and 3.3 cents for ethylene sweating.[88] With the same cost, faster treatment time, and more satisfactory results, the color-add process seemed an ideal solution to many orange growers and packers.

The federal government, however, did not view the dyeing process preferably. When FMC president John Crummey informed the Food and Drug Administration (FDA) of the company's intention to make a test shipment of dyed oranges in 1933, FDA assistant commissioner Paul Dunbar replied that the administration would not "look with favor upon the artificial coloring of natural foods." The color-add process would "not enhance the good reputation of Florida fruit," added Dunbar. He also understood, however, that the color-add process could not be regarded as the concealment of immaturity or poor quality because the oranges colored with dyes were ripe inside; hence it would not be possible for the administration to prohibit the practice under the current federal law.[89] Chief of the FDA Walter G. Campbell likewise noted that coloring "fully and naturally matured fruit" would not constitute adulteration.[90] In addition, the dyes used for coloring oranges were food dyes that had been certified by the USDA.

For all the unfavorable replies from the federal agency, the first carload of dyed oranges arrived in New York City from Florida in April 1934. Colored oranges were also sent to other northern cities. The FMC had begun using the color-add process at one plant each in California and in Florida by May 1934.[91] In promoting its equipment for dyeing oranges to citrus packers, the firm emphasized efficiency of the color-add process: a "much more attractive color was provided," and the processing time would be reduced significantly.[92] Some cooperatives advertised dyed oranges with distinctive brand names, promoting them as higher quality than regular fruits. The San Diego Orange Growers Exchange, for instance, sold color-added oranges under the name Epicure.[93] In addition to California and Florida, citrus cooperatives in Texas soon followed suit.[94]

There was a strong belief within the citrus industry as well as among government scientists that color was a crucial factor in marketing oranges and other fruits and vegetables. Charles C. Commander—general manager of the Florida Citrus Exchange (FCE), the state's largest citrus cooperative—argued that it would be impossible to market green oranges unless they could find "markets for green colored though fully matured fruit."[95] Proclaiming the necessity of the dyeing practice in the mid-1930s, Florida Citrus Commission chair Lynn Parker Kirkland asserted: "Since color plays so important a part in the sale of oranges, many crops must be colored artificially before they can be marketed at a profit for the grower."[96]

Government officials echoed industry leaders' view. Paul O. Nyhus, agricultural commissioner of the Bureau of Agricultural Economics, contended in a 1932 *USDA Yearbook* that there was "no definite relation between flavor or maturity and the color of fruit while on the tree." But there was "a very significant relation between the color of the fruit offered for sale and the price that it [would] bring." Citrus fruit producers "always faced the problem of making the color of ripe fruit match its flavor," Nyhus concluded.[97] A USDA scientist asserted that since consumers were "prone to judge the quality of fruits by the appearance," "nicely colored oranges, bananas or peaches which [were] attractive to the eye [would] sell better than an equal or even better quality of the same fruits not so well colored."[98] This color problem was a result not only of oranges' natural variations or biological conditions but also of strong expectations about the color of fruits among growers, packers, and government officials and scientists. In a mass market, not only did bright colors stimulate consumers' appetites, but a *specific* color needed to "match" a food's eating quality.

Dyeing oranges, however, was not necessarily welcomed by the entire citrus industry. Soon after the FMC introduced the color-add process to California, the CFGE and other citrus cooperatives, as well as state agricultural agencies, began criticizing the process as food adulteration and deception of consumers. They asserted that using ethylene was satisfactory for California fruits.[99] The general manager of the CFGE argued that there was a clear distinction between the addition of a food dye to orange skin and the acceleration of color latent within the orange by ethylene.[100] Many growers believed that green-colored oranges were not marketable, even when they were ripe inside. But opponents of citrus dyeing did not consider the practice justifiable for efficient agricultural production and marketing.

Facing opposition from California growers and packers, the FMC turned to Florida as a major marketing site for their citrus-coloring business.[101] Although some Florida growers opposed dyeing oranges, an increasing number of packers began installing citrus-coloring machinery in the mid-1930s.[102] The color-add process had been widely adopted in Florida by the 1940s. Twenty-one million out of thirty million boxes of fresh oranges shipped out of state were colored with synthetic dyes during the 1946–47 season.[103]

The different attitudes toward citrus coloring in Florida and California were partly due to intense competition between the two states as well as among Florida growers. California growers were much more organized than their Florida counterparts. A majority of California growers were affiliated with the CFGE, which represented more than 80 percent of the state's citrus growers by 1930. The CFGE marketed more than three-quarters of all California citrus between 1927 and 1939.[104] Affiliations of Florida growers and packers, on the other hand, were diverse, and a number of them did not belong to any organization at all. They generally relied on independent shippers rather than on large pooling organizations or packinghouses.[105] The FCE never controlled a majority of the Florida orange shipment. In the 1910s, the FCE marketed about 40 percent of the state's citrus; by the 1940s, it handled only about 20 percent of Florida oranges.[106] In the early 1930s, the manager of the FCE lamented that no one organization had been "given by the growers sufficient power to enact proper laws or to enforce strict regulations."[107] Without a strong unifying organization, individual growers' diverse interests sometimes hindered them from cooperating with one another.

Second, environmental conditions and citrus cultivation patterns allowed the CFGE to unify California growers more effectively. Because oranges could be stored on the tree for two to three months due to California's relatively cool nights, the CFGE prorated harvests across growers, picking only a portion of each grower's crop at any time. The proration of oranges ensured that no grower would benefit or suffer from temporary price changes as each grower's fruit was sold throughout the season. In contrast, because of climate conditions, Florida oranges did not store well on the tree and had to be harvested quickly to avoid fruit drop and deterioration. Unlike California crops, fruits in Florida could not be harvested across the season to even growers' price expectations.[108] Florida growers competed not only against the California citrus industry but also against their neighbors within the state.

Third, varietal differences grown in Florida and California intensified the competition between the two states. California produced mainly two varieties that did not compete with each other: winter navels, with a season from October to June; and summer Valencias, with a season from May to October. In Florida, there were at least five varieties that all ripened in the period between October and April. Florida oranges hence competed with one another and with California navels in the winter market, whereas California Valencias generally did not compete directly with any other oranges during early- to mid-summer.[109]

Moreover, the quality of California oranges was uniformly high because of favorable and consistent growing conditions. The quality of Florida produce varied widely depending on production sites. In California, most production (about 97 percent) was concentrated in counties within a ninety-mile radius of Los Angeles, where climate and soil quality were relatively similar. In Florida, orange production sites were spread over wide areas with varying soil, drainage, and weather conditions. Hence, there were great differences in quality, orange type, and vulnerability to frost and wind damage among citrus fruits grown in the state; it was thus difficult for Florida growers to market uniform and high-quality oranges.[110]

In facing intense competition from the California citrus industry and from their counterparts in Florida, less organized Florida growers turned to the more convenient and economical way of enhancing citrus color by using synthetic dyes. Proponents of the color-add process held that the color manipulation of oranges was an "imperative necessity" rather than a "desirability."[111] They asserted that the process would serve as an effective solution to the problems of farmers' low income, overproduction, and ineffective marketing by increasing the marketability of fruits with more uniform coloration.[112] Creating a more "natural" look of food products through artificial means was a way to cope with environmental and economic challenges.

Threshold of Naturalness

While the color-add process became increasingly common in Florida by the 1940s, some agricultural producers, government officials, scientists, and consumers began questioning the safety and legitimacy of employing synthetic dyes for foods, especially fresh produce. Those who opposed dyeing fruits criticized the practice as "artificial," while many of them did not question the employment of ethylene gas for promoting color changes in fruits and vegetables, seeing it as "natural." They generally believed that ethylene treatment was necessary to produce uniform quality and efficiently market agricultural products, although some citrus growers insisted that the gas deteriorated the eating quality of oranges.[113] The distinction between the natural and the artificial was not, however, straightforward. Whether using synthetic dyes or ethylene gas, the enhancement of "natural" food color required human involvement.

In March 1934, one month before the shipment of color-added oranges from Florida to the northern market, the USDA appointed the Committee on Citrus Coloring to investigate the safety of the practice.[114] Most committee members objected to the practice of citrus dyeing while claiming that the use of ethylene was legitimate. Bureau of Plant Industry associate chief Frederick D. Richey argued that ethylene treatment merely unmasked "the characteristic colors already present" in the fruit. It was "entirely similar" to the process that occurred "more slowly in nature," argued Richey.[115] Echoing the view that the use of ethylene was simply the enhancement of a "natural" process, other USDA scientists asserted that the term "coloring" was inappropriate for ethylene treatment, as the word would convey "the erroneous impression of attempting to conceal inferiority." They contended that the use of the gas was "merely a stimulation of natural processes" by "blanching" rather than adding extraneous color.[116]

Nonetheless, the USDA allowed the color-add process in July 1934—with the proviso that those oranges colored with synthetic dyes must be stamped "Color Added" on their skins. In addition, the Florida state government required color-added oranges to meet higher maturity standards than the federal standards for uncolored oranges in order to prevent growers and packers from using the method to conceal immaturity. All fruits shipped from Florida became subject to state inspection before being allowed to leave the state.[117]

The labeling requirement reflected government officials' and scientists' understanding of what was natural and artificial, as well as industry interests in making marketable products. The USDA did not require citrus packers to declare the use of ethylene on labels or orange skins, since the federal government did not see the ethylene treatment as "artificial." Alluding to the coloring of butter, frustrated Florida growers contended that they should have the same right that "the butter people" were afforded.[118] The coloring of butter was a common practice, not an exception, in the dairy industry. State and federal governments permitted the coloring of butter with synthetic dyes without a labeling requirement partly due to a strong dairy lobby. As the color of foods became subject to government regulation, how and to what extent one could exercise political power became a key for the food business to create and market a "natural" color. The "Color Added" stamp was a product of political and business negotiations that helped define the artificiality of color manipulation.

To publicize the safety of the dyeing practice, Florida cooperatives distributed leaflets explaining that the dye used for coloring oranges was in no way harmful to consumers or the quality of the fruit.[119] The Waverly Growers Cooperative printed a two-color placard to be enclosed in each box of dyed oranges:

> The color used on "Color Added" oranges is an entirely harmless food color approved by state or federal certification to contain nothing injurious to health. Color added is a guarantee of quality. Oranges stamped "Color Added" are required by Florida law and rigorous inspection to meet higher standards of maturity and juice content than are required for any other orange by any other regulation, state or federal.[120]

By stressing the higher-quality standard for color-added oranges and the safety of citrus coloring, Florida growers and packers sought to make the "Color Added" stamp a guarantee of maturity.[121]

They soon recognized, however, that many consumers did not want dyed oranges and that the "Color Added" stamp was actually detrimental to the sale of their fruit. A member of the Florida Horticultural Society received letters from housewives who complained about color-added oranges. A woman in Knoxville, Tennessee, sent a letter, attached with a piece of color-add labeled orange peel: "Since you Florida folk have become such gold diggers, I am for California oranges hereafter, when I can find them. What do you think you are doing to your lovely oranges anyway?"[122] Another woman gave up making marmalade after spotting color-add stamps on the skin of "unbelievably bright oranges," fearing that orange peel coated with dyes might be injurious to health.[123]

Some considered the color-add practice nothing but a deception of consumers, because they strongly believed that green oranges, irrespective of inside quality, were immature. The *New York Herald Tribune* published an article in 1940 that consumers should not "shy off from the orange marked 'color added,'" as the color was harmless.[124] One woman sent a letter to the paper, expressing her doubt over the legitimacy of the color-add process: "The color itself may be harmless but it fools the consumer. No orange can be called ripe until it reaches its full orange yellow on the tree. And, during that last period of final maturity, Mother Nature puts into the fruit those vital elements that give the orange its rightful place in the food scheme."[125] Another letter sent from Florida asserted that no "Floridian with two grains of sense or appreciation of sweet tree-ripened fruit would touch a doctored orange or grapefruit. If Northerners could get to know what fine fruit we have, when it is honestly tree-ripened, they would have nothing more to do with 'color-added' oranges."[126] Contrary to growers' and packers' hopes that the term "color added" would become a sign of superiority, consumers saw the stamp adversely or did not know what "color added" actually meant.[127]

Criticism came also from within Florida. Some growers and packers believed that the color-add process was a harmful effect of agricultural mass production and an intrusion into nature. At the 1948 US Senate hearings on the dyeing of oranges, a Florida grower who was one of the earliest to use orange-dyeing equipment in the state declared that he had come to see the practice as the deception of consumers. He protested that Florida growers "should get back to the old way of handling [their] fruit and not subjecting it to so many mechanical manufacturing ways of handling it."[128] A "small fruit grower" from Florida also asserted: "When we interfere with nature, we are making a mistake. If I have to do part of the job that belongs to nature, I think I would make a serious mistake."[129]

For opponents of synthetic colors, dyeing agricultural produce appeared to blur the line between the natural and the artificial, and between "natural" products and processed foods—boundaries that many Americans were not willing to overstep, at least conceptually. Since the early twentieth century, agricultural production had become highly industrialized. As Deborah Fitzgerald observed, "every farm [became] a factory." "Science, technology, and the spirt of rationalism," which had been the principles behind the factory system, represented by Fordism, became pervasive on American farms.[130] Citrus dyeing was just one of many "efficient" industrial practices—including chemical fertilizers, farm machines, and conveyor belt equipment—introduced to farmlands. And while these mechanized processes became more involved in the production, distribution, and marketing of agricultural products, colorful images of fruits and vegetables, often depicted in popular media, symbolized natural abundance. Advertising was teaching consumers what nature would look like from then on.

Conclusion

Creating the "natural" color of foods was a learning process for many groups of people—growers, traders, government officials, scientists, and advertisers, who, in turn, taught consumers to see the world of food as they did. Due to the limitations of transportation technology, environmental factors, and biological conditions of agricultural produce, growers and traders promoted particular varieties and colors of their products, which many consumers came to accept as their "natural" colors. Government grading systems helped the industry define, standardize, and maintain certain shades as the natural colors of food, teaching growers the commercial value of color. The availability of foods on the market, retail prices, and corporate marketing indicated to consumers which color of produce they should select when buying foods. Consumer expectations, steered by corporate and government forces, in turn affected how growers and packers harvested their produce and how wholesalers and retailers marketed the food. Agricultural producers manipulated their products to give them the "right" color, believing that food with "unnatural" colors, like green oranges, would not sell in the national market even if the eating quality of the product was perfectly fine.

As the use of synthetic dyes increased and food technology developed in the first decades of the twentieth century, the definitions of "natural" and "artificial" were increasingly subject to political negotiation and the push and pull of competing corporate interests. The practice and regulation of coloring foods thus posed a question about who got to decide what "natural" meant. Federal and state governments used their powers of regulation to endorse the "right" colors of foods. Marketers and domestic advisers helped define, legitimize, and naturalize how food should look in their advertisements and cookbooks. To what extent "artificiality" should be accepted and what "naturalness" meant depended on producers' economic interests, government officials' understanding of food safety and public health, and consumer expectations about wholesomeness. Growers, advertisers, and legislators created the colors of foods at the nexus of cultural expectations, business interests, regulation, and environmental conditions.

This was a moment when visual cues and expectations about taste became uncoupled. With the elimination of seasonal variations, the introduction of uniform color, and the distribution of foods from more distant production sites, color became dissociated from the taste of food. The increasing connections between agricultural producers and chemical companies in the early twentieth century marked the advent of new technologies and new powers of manipulation that enabled producers to give foods a "natural" color. Agricultural producers employed synthetic dyes to control a physical property of produce, as though the color of fruits and vegetables was a malleable, external characteristic of the food. What came to seem natural was created by "unnatural" practices, which, at the same time, obscured the operation of artifice. Consequently, the environmental impact of producers and consumers was not always obvious.

· 6 ·

Fake Food

Over time, the fake displaced the real to become the new ideal. Thus, the real had to look like the fake. With the rise of the food processing industry between the 1870s and the 1930s, what had initially been a substitute or an imitation came to set the standard for the ideal color of the original products. This chapter explores this paradoxical process by focusing on margarine and canned foods—among the earliest commercially processed foods. Ann Vileisis has shown how the introduction of factory-processed foods, particularly margarine and canned foods, "denatured" the senses. Urban consumers, increasingly detached from production sites, lost their age-old familiarity with the procurement and preparation of foods.[1] Margarine and canned foods provide two different cases of how substitutes eventually determined the natural color of the original products, leading to the transformation of consumers' visual and eating experiences. In the case of margarine, competition and regulation were key determinants behind this process; for canned foods, technological and scientific development and intensive marketing were the more important factors.

Human beings had used the color of foods as a criterion of food quality probably since the era of hunters and gatherers. Knowledge about how food should look helped our ancestors judge the ripeness of produce and avoid foods not suitable for eating, depending on seasonal and regional differences. Beginning in the late nineteenth century, intensive food marketing, innovations in food technology, and government regulations set a standard for color that had previously been based on the rules of nature. Margarine manufacturers and canners sought to replicate the color of butter and fresh fruits, vegetables, and fish, and present their products as "perfect nature." As a result, the color of factory-made "imitation" foods eventually imposed standards on nature and transformed agricultural production and marketing.

Defining Natural Yellow

The manufacturing of substitutes for agricultural products posed immense challenges to food processors—in this case, margarine manufacturers—in addition to the need for technological improvement. Butter producers were among the earliest to recognize the commercial advantage and importance of color management in marketing strategies. Color became even more important for the dairy industry when margarine was introduced as a cheaper substitute for butter in the early 1870s. Both margarine manufacturers and butter producers believed that consumers held a strong expectation about the color of butter being golden yellow and expected its substitute to be yellow as well. They exploited the color of butter to protect and advance their own vested interests. Responding in part to the power of the dairy industry, state and federal governments regulated margarine production in industry-friendly ways and eventually defined the "natural" color of margarine. For their part, margarine makers fought against dairy interests to give their products butter-like shades by employing new manufacturing technology and appropriating the legislative definition of margarine colors.

Selling and eating butter substitutes, made from skimmed milk and melted beef fat, had been common for centuries in Europe to alleviate butter scarcity.[2] But the butter substitute business remained a small operation until the late nineteenth century, when French chemist Hippolyte Mège-Mouriès developed a manufacturing process that contributed to the commercial production of a butter substitute, which he called "artificial butter." He used oleo oil (beef fat extracted from suet) as a major ingredient instead of milk fat to reduce the production cost. By cooking the beef fat at a low temperature (below 103°F) and churning it with milk, he made its flavor similar to that of butter.[3] The final process was to add to the extracted fat "yellow color, which [was] employed for the ordinary butter."[4] Mège-Mouriès attained patents for making margarine in France and Britain in 1869.[5] After butter merchant Antoon Jurgens and his sons began experimenting with margarine production based on Mège-Mouriès's method in the Netherlands in the early 1870s (Jurgens's firm created Unilever in 1930 after a merger with other companies), the commercial production of margarine soon spread to neighboring countries.[6]

The manufacturing of margarine in the United States began in 1873, when Mège-Mouriès was granted an American patent.[7] There were at least eighty margarine manufacturing plants in the country by the mid-1880s.[8] Because the main ingredient of margarine at the time was beef suet (a by-product of meatpacking), large meatpackers, including Armour & Company and Swift & Company, were well positioned to enter margarine production. These meatpackers had accounted for about one-third of national margarine production by 1930. They also sold suet to non-meatpacking margarine manufacturers in the United States and Europe.[9]

Margarine at the time was often different from butter in flavor and was usually too hard and brittle in texture.[10] Yet its yellow color provided consumers, particularly those of lower economic status, with a visual sensation similar to that of butter. Margarine's primary consumers were those who could not afford butter; it was hence called "the poor man's butter." Not only urban laborers but dairy farmers themselves—the very producers of butter—depended on the cheaper substitute because of their economic limitations. For poor dairy farmers, butter was what they sold; margarine was what they ate.[11]

Margarine manufacturers stressed in their marketing rhetoric that their products were superior to butter, which was still made in an "old-fashioned" way on the farm.[12] Margarine was never "touched by hand" throughout the manufacturing process, and every operation was done by machinery in a clean and sanitary facility, claimed Swift in its advertising leaflet.[13] Another manufacturer even asserted that there was nothing more natural than margarine, suggesting that civilization "perfected" the nature: the "entire world was dazed with surprise and delight that nature's limitless supply, 'finished by man's genius,' could be drawn upon inexhaustibly, to supply rich and poor alike with a luxury, at a reduced cost."[14] Compared to "old" butter, margarine represented a product of modern scientific advancement.

For all the marketing campaigns, the amount of margarine consumed in the United States did not exceed butter consumption until 1957 (figure 6.1). By contrast, in major margarine-producing countries in Europe—particularly the Netherlands, Germany, and Denmark—the consumption of margarine increased to more than or about equal to butter consumption by 1900. In Denmark, for example, the per capita consumption of margarine and of butter accounted for about 17 pounds and 15 pounds respectively in 1900; and increased to roughly 33 pounds and 20 pounds by 1914.[15] In the United States, butter producers resisted the introduction of margarine, which they believed would precipitate greater competition and a price decline for dairy produce.[16] In fact, margarine was usually about ten to twenty cents per pound cheaper than butter in the American market at the turn of the twentieth century.[17] The introduction of margarine occurred at a time of profound economic changes in the agrarian economy following the Civil War. Due

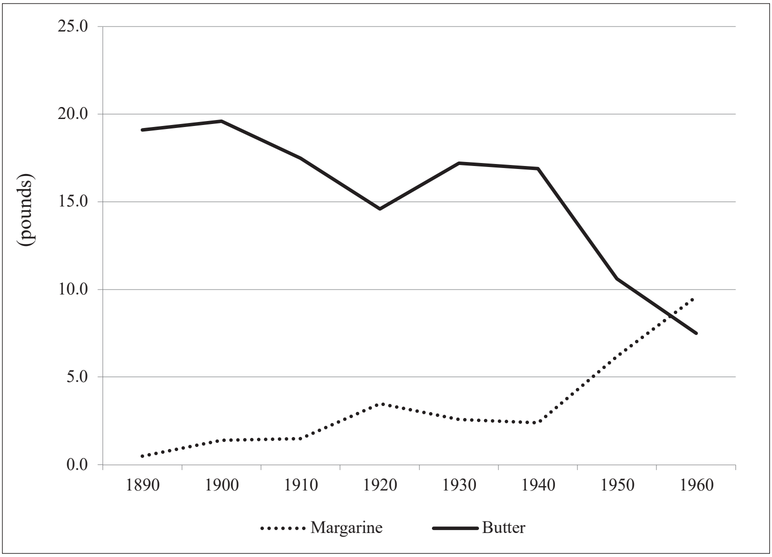

Figure 6.1 Per Capita Consumption of Margarine and Butter in the United States, 1890–1960. Data source: Ruth Dupré, "'If It's Yellow, It Must Be Butter': Margarine Regulation in North America since 1886," *Journal of Economic History* 59, no. 2 (June 1999): 353–371.

to the development of industrial machinery, the transformation of farming systems, and the expansion of the market, dairy farming and other agricultural production expanded rapidly, leading to overproduction and a price decline.[18]

It was margarine's identical color to butter that posed a particular threat to dairy producers. Some retailers fraudulently sold margarine as butter by taking advantage of their similar appearance.[19] In seeking to curb market competition, butter producers across the country lobbied federal and state governments for the regulation of margarine and sent thousands of petitions to Congress.[20] Dairy production had become one of the largest sectors in the agricultural industry by the 1870s. The dairy lobby represented approximately five million dairy farmers and thousands of creamery owners and traders. Many politicians, particularly those from dairy states, including New York, Pennsylvania, Ohio, Wisconsin, and Minnesota, were more sympathetic to the dairy interests than to the newly developing industry giants.[21] These five states had supplied more than 40 percent of national butter sales by 1890.[22]

Prior to the mid-1880s, state legislatures sought to regulate the production and sale of margarine by imposing rules on its labeling or by prohibiting its production and sale.[23] However, the enforcement of state laws, whether requiring labeling or outright prohibiting margarine, was not effective largely due to the difficulty of detecting the product. Margarine and butter were mostly sold in bulk until the early twentieth century. Even if manufacturers labeled their products according to the law, once retailers unpacked the original package, neither state inspectors nor consumers could tell whether the mass of yellow fat was butter or margarine.[24] Dairy interests insisted on the necessity of regulating margarine by a distinctive color that would enable consumers and merchants to readily tell the difference between the products on the market on sight.[25]

A series of legislation at the state and federal levels began restricting the coloration of margarine and consequently helped define its color. State governments used color as a means for regulating—and sometimes prohibiting—the manufacture and marketing of margarine. An increasing number of states enacted so-called "anti-color" laws, which prohibited the manufacture and sale of yellow-colored margarine while allowing uncolored products.[26] Major margarine-producing state New Jersey was the first state to forbid the sale of margarine colored to imitate butter in 1886. By 1898, twenty-six states had regulated margarine under anti-color laws. Some other states went even further: Vermont (1884), New Hampshire (1891), West Virginia (1891), and South Dakota (1891) passed laws that required margarine to be colored pink.[27] Legislators and butter makers, as well as margarine producers, believed that consumers would not buy margarine as a butter substitute unless it was yellow. Because most margarine produced at the time was colored with yellow dyes, dairy producers hoped that anti-color laws would inhibit the sale of margarine. For food businesses, color had usually been a means to make food attractive to modern consumers, whose eyes were trained to desire such colors. The pink law in particular was a canny reverse move requiring an *unattractive* color. Legislators and the dairy interests that lobbied them understood the power of color: they used it to repulse consumers.

Court decisions concerning the anti-color laws authorized state governments to regulate the coloring of margarine. In so doing, the court helped determine how margarine should look on the market. The US Supreme Court upheld the constitutionality of an anti-color law that prohibited the sale of margarine colored to look like butter in 1894. Justices established that margarine, "in its natural condition," was "of 'a light-yellowish color'" and that it was "artificially colored 'in imitation of yellow butter.'" Chief Justice Melville Fuller, who dissented the ruling with two other justices, challenged the view that the "natural color" of margarine was light yellow or white:

> [Margarine] is of the natural color of butter and looks like butter, and is often colored, as butter is, by harmless ingredients, a deeper yellow, to render it more attractive to consumers. The assumption that it is thus colored to make it appear to be a different article, generically, than it is, has no legal basis in this case to rest on.[28]

Regardless of their different opinions about whether margarine "naturally" looked like butter, the justices, including Fuller and other dissenters, stood on the premise that the "natural" color of butter was a deep yellow shade. Fuller's statement also suggests that he accepted the addition of color as a necessary practice to make food attractive as early as 1894. (Since Fuller generally favored deregulation of the economy, it may not be surprising that he dissented.)[29] Creating a standardized natural color for food became not only a crucial part of marketing strategies for the food business but also a practice that government officials, legislators, and even the highest court in the United States recognized as fundamental to food manufacturing and marketing.

While Supreme Court justices ruled the restriction of yellow coloring justifiable, a law that required margarine to be an arbitrary color such as pink was judged unconstitutional. The US Supreme Court ruled New Hampshire's pink law unconstitutional in 1898. Justices declared that pink was not the color of margarine "in its natural state," suggesting the significant role of color in determining the attractiveness, as well as marketability, of food. The court further contended that the act would necessitate adulteration because it required manufacturers to add "a foreign substance to [their] article, which [was] thereby rendered unsalable."[30] The state legislators who passed the pink color act and the Supreme Court justices who rejected it had different understandings of the law with regard to state power and constitutionality. Beyond the jurisprudential dispute, however, both sides understood the power of color—in this case, that pink was an arbitrary, "unnatural" color for margarine that would reduce the product's commercial value. How far producers could go in using artifice to make a food's color prettier was still open to debate, but the decision established an inverse point: law cannot force producers to use color to make a food uglier. The color of food was now becoming the law of the land.

Margarine color regulation became a matter not only of state legislators but also of the federal government by the turn of the twentieth century. As dairy producers increasingly demanded a restriction of margarine based on color at the national level, the federal government enacted the first national margarine legislation in 1886. The act permitted the addition of color to margarine but restricted margarine production and sale by levying a tax of two cents per pound on margarine whether it was colored or uncolored.[31] As the taxing provisions were the central feature of the legislation, the federal margarine regulation came within the jurisdiction of the Bureau of Internal Revenue.

The commissioner of the bureau issued tax stamps to margarine producers, wholesales, and retailers to collect their taxes.

The act turned out to be ineffective, however. It was extremely difficult for the Bureau of Internal Revenue to supervise and control the collection of taxes. Inspections took time and money, more than state inspectors could manage.[32] To make margarine restriction more stringent and effective, dairy interests proposed a higher tax on colored margarine.[33] At a 1902 hearing on margarine legislation, the president of the National Dairy Union, William D. Hoard, claimed that margarine makers could "imitate butter in taste, smell, grain, and consistency," but there should be a line between butter and margarine based on a "characteristic by which the public [could] readily distinguish." While believing that white margarine would not sell, Hoard declared that the omission of color would not make margarine less nutritious or palatable, because there was no nutrition in color.[34]

At the hearing, European cases provided legislators and representatives of the dairy and margarine industries with precedents for restricting the coloring of margarine. Denmark in particular caught their attention. Danish butter production had increased rapidly since the 1860s due to technological development, large-scale production, and the expansion of foreign and domestic markets.[35] Margarine first entered the Danish market in the early 1870s, imported mainly from the Netherlands and Norway until 1884, when domestic production began. Dairy farmers strongly lobbied for the restriction of the new product, leading to 1885 legislation requiring the labeling of margarine, and eventually a ban on coloring margarine to make it look like butter in 1888. The Danish regulation allowed the coloring of margarine by establishing fourteen yellow shades as permissible colors for the product. But these colors were so light that even the darkest one did not match the color of butter.[36] A Danish margarine manufacturer doing business in the United States noted that the margarine colors allowed in Denmark were "very, very light," and the finished product looked like "a kind of straw color."[37] For all this coloring regulation, Danish margarine consumption was far higher than in any other European country or the United States: per capita margarine consumption in Denmark accounted for 15.5 pounds in 1901, whereas in the United States, it was only 1.0 pound.[38] This was partly because a large amount of Danish butter was being exported to foreign markets, particularly Britain, while domestic consumers, including dairy farmers, used margarine.[39] To make margarine marketable, Danish manufacturers supplied yellow dyes in a capsule along with their products. Consumers could thus color the margarine at home by themselves to suit their tastes.[40]

Convinced that prohibiting the coloring of margarine would not necessarily lead to the unfair elimination of the margarine industry, the US Congress passed legislation in 1902, as an amendment to the 1886 act. It enforced a ten-cent tax on "artificially colored" margarine while reducing a tax on uncolored products from two cents to one-fourth of a cent.[41] The act also reduced license fees for wholesalers and retailers who sold only uncolored margarine, from $480 to $200 and from $48 to $6, respectively. The Supreme Court upheld the law's constitutionality in 1904.[42]

The 1902 regulation forced margarine manufacturers and retailers to change their business strategies. Soon after the passage of the federal act, Armour & Company—the leading margarine producer—followed the example of the Danish margarine manufacturers. The firm began shipping uncolored margarine with a color-filled capsule free of charge to evade the ten-cent tax and still offer consumers yellow margarine.[43] The US Treasury announced in 1909 that the federal margarine law did not prohibit the inclusion of coloring solutions in margarine packages. The use of color capsules thus became a common practice among margarine producers.[44]

Margarine manufacturers sent sales agents to local stores and distributed brochures to market white margarine.[45] John F. Jelke Company, one of the earliest margarine manufacturers outside the meatpacking industry, promoted not only its products but also the coloring practice. Its eight-page leaflet with color illustrations featured a woman coloring margarine and explained the process step by step (figure 6.2). The first step was to let the margarine stand in a warm room. When it became soft enough, it was placed in a bowl. Then the color was dropped evenly over the margarine (about eight to ten drops per pound). The next was to "work it over and over" with a spoon or ladle until it became an even yellow color. The leaflet also noted: "Jelke High Grade Margarine is free from artificial color because the U.S. Government imposes a tax of ten cents per pound on all Margarine artificially colored by the manufacturer. These pictures show how to color your Margarine and save ten cents per pound."[46] By explaining why consumers needed to color the product themselves as well as how to color it, the firm indicated that the time and trouble they were taking was not for the sake of the company; rather, it was for consumers themselves to save the extra ten cents, which would otherwise have been added to the retail price.

Margarine production decreased significantly immediately following the passage of the 1902 act. But it soon recovered and rose to more than 140 million pounds by 1910—25 million pounds more than the amount produced in 1902 (figure 6.3).[47] The increase in overall production was primarily due to the growth of uncolored margarine: after the decline between 1903 and 1905, the production of uncolored margarine increased steadily, reaching its peak in 1920. The butter substitute gradually appeared on the dining table of both middle-class and working-class households due to butter shortages during and after World War I. A dairy inspector in Illinois reported in 1903 that uncolored margarine was sold more widely than before in his district. Due to the lower annual license fee for margarine retailers and the gradual increase of margarine consumption, many retailers, including those who had refused to sell the product before, began to take out licenses and sell uncolored margarine.[48]

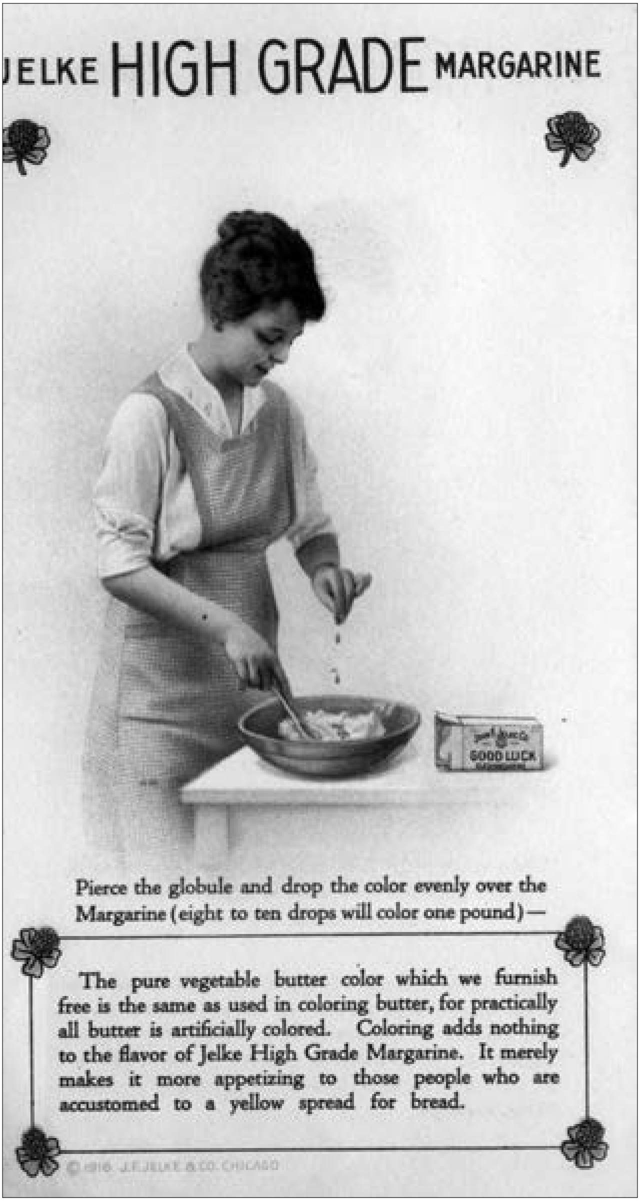

Figure 6.2 This leaflet for Jelke Good Luck Margarine explained how to color margarine by illustrating a woman adding a color solution to the margarine. John F. Jelke Company, *How to Color Jelke High Grade Margarine for Your Own Family Table* (Chicago: self-pub, 1916). Litchfield Collection on the History of Fatty Materials, Published Collections Department, Hagley Museum and Library.

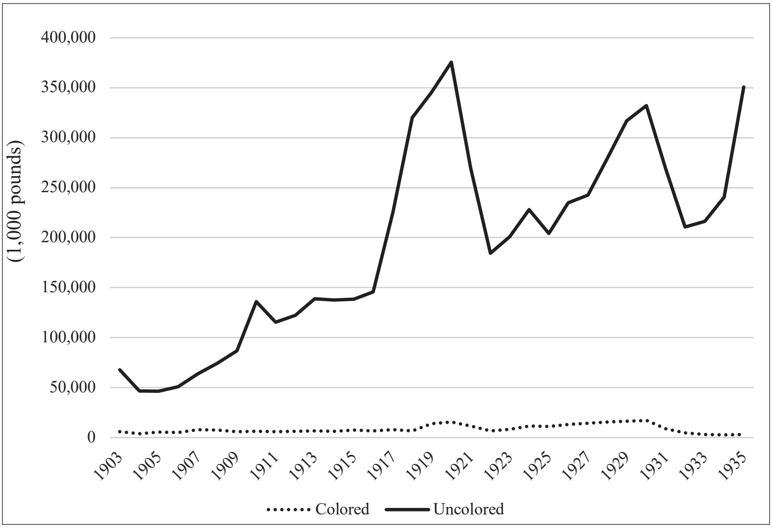

Figure 6.3 The Amount of Colored and Uncolored Margarine Produced in the United States, 1903–1935. Source: *Annual Report of the Commissioner of Internal Revenue* (Washington, DC: Government Printing Office, 1903–1936).

As in the United States and Denmark, margarine legislation elsewhere often contributed not only to regulating margarine production but also to defining the color of margarine. By the early 1900s, many countries had introduced various kinds of restrictions on the manufacturing and sale of margarine, often due to pressure from butter producers. As in the United States, most margarine regulation was intended (at least ostensibly) to prevent the fraudulent sale of margarine as butter and to protect public interests.[49] Regulating color seemed to be an obvious solution to distinguish the two products. France, New Zealand, and Australia, as well as Denmark, banned the coloring of margarine to make it look like butter.[50] In Britain, where most margarine was imported—mainly from the Netherlands and Denmark—legislators and dairy producers proposed, at a hearing on the 1899 Margarine Act, a ban on yellow coloring and a requirement to color margarine red, although neither of these provisions actually became law.[51]

Another measure to regulate margarine color was to require the addition of "latent color" to the product. In 1905, Danish legislatures enacted another coloring regulation by requiring the addition of sesame oil, which imparted a yellowish color to the finished product. When inspectors mixed a small sample of margarine with some solvents, the sesame oil contained in the margarine turned red due to a chemical reaction; thus, it was easy to detect whether the product was margarine.[52] Germany, Belgium, Austria, France, and Sweden also adopted this latent color regulation.[53]

Margarine regulation in many countries situated the product, and defined its color, in relation to butter because it was a substitute. The malleability of margarine, including its color, flavor, texture, and nutritional contents, allowed legislators to use its physiological characteristics, such as color, as a regulatory measure, and also allowed manufacturers to respond to regulations by changing its ingredients, manufacturing methods, and marketing strategies. Neither regulators nor consumers necessarily opposed the addition of dyes or other coloring materials to margarine. Rather, they promoted and even welcomed the manipulation of margarine color to make it look like what they deemed a "natural" color by requiring a certain color in regulation or coloring the product at home. For legislators and butter producers, the "natural" color of margarine was supposed to be different from that of butter; for consumers, it should look like butter. In the upside-down world of modern capitalism, fewer people made their own butter, and more and more of them artificially colored their margarine themselves at home. Bright, shiny food was something to work for.

Refashioning Nature's Yellow

Although dairy farmers criticized the artificial coloring of margarine, they had been coloring butter at least since the fourteenth century.

After the introduction of margarine in the 1870s, they colored butter not only to maintain uniform appearance but also to distinguish it from margarine. They contended that because butter had always been dyed with yellow colors and consumers assumed it was always yellow, the coloring of butter was a necessary practice to make butter "look like butter" at all times of year.[54] Dairy farmers also believed that it was essential to provide bright yellow butter so that it would not be mistaken by consumers for its substitute.[55] Immediately after the 1902 act came into effect, a secretary of the National Dairy Union sent out a notice to dairy associations that the "salvation of the butter business" depended on "keeping up the standard color of butter to distinguish it from" margarine.[56] He suggested that by brightly coloring butter, the standard for color could be advanced to a point that margarine makers could not imitate. For many dairy interests, color was a vital bastion to protect their products and compete against margarine.

There was, however, often a disparity between the ideal butter making that dairy industry leaders promoted and the actual butter making practiced by farmers. Until the early twentieth century, dairy products had been almost wholly processed on the farm. Butter making had commonly been a woman's job. Farm wives milked the cow, separated the cream, and churned as well as colored the butter. Men were mainly in charge of feeding, herding, and sheltering the cattle, and maintaining the pastures and meadows.[57] The quality of butter depended on the skill and resource of individual farmers. The finished product was not always uniform and sometimes poor in quality due to a lack of knowledge, equipment, or financial means.[58] Because butter making was a sideline business for many dairy farmers, they were often reluctant to make costly investments, such as in cooling appliances, which were necessary to prevent cream from souring.[59]

The production of butter at factories (called creameries) began in New York during the early 1860s and later in other states. Dairy farmers brought their milk to the creamery, where it was churned into butter and shipped to the market.[60] The quality of creamery butter was generally more uniform. Many dairy producers and consumers considered it better than butter made on the farm. Yet the operation of early creameries remained small in scale. It was not until the late 1910s that the production of creamery butter exceeded the amount of butter produced on the farm.[61]

Officials of federal and state agencies, leaders of dairy associations, and university scientists tried to educate dairy farmers about the significance of color in the butter business and "scientific" ways of making butter.[62] The US Department of Agriculture (USDA), for example, published a Farmers' Bulletin, *Butter Making on the Farm*, in 1905 to inform farmers of the "well defined laws" of butter-making.[63] Dairy associations regularly published articles in trade journals and farm newspapers to warn farmers not to "overlook the color"—especially during winter.[64]

The lighter color of winter butter was primarily a product of environmental conditions. But it became butter makers' responsibility to "correct" undesirable shades to match consumers' and producers' expectations of the "natural" color of butter. Dairy association managers and government officials often complained that farmers guessed the amount of food dyes put into the churn. Such "carelessness" did not achieve uniformity in the finished product.[65] Believing that color was one of the few factors in butter making over which producers had absolute control, they advised farmers to gradually increase yellow dyes added to butter so that the product would look uniform at all times.[66]

The creation of the "natural" color in butter making also required knowledge about market demands. What consumers considered a "natural" or "good" color of butter varied widely depending on the market. Butter makers and traders generally understood that consumers in the South preferred a deep yellow butter, whereas the eastern and northern markets demanded a lighter shade.[67] Many butter merchants in Chicago claimed that they had no trouble selling butter with a light color. Some even asserted that a highly colored product was not popular among consumers in the city.[68] In butter-making manuals and trade journals, industry leaders often advised dairy farmers and retailers to regularly ask their customers about their preference in order to meet the taste of the market. Otto F. Hunziker, one of the authorities in the American dairy industry, contended in his 1920 butter-making manual that many butter makers often "overestimated" the public demand and tended to color butter with "a deeper shade than necessary or desirable."[69] While Hunziker warned butter makers to be more attentive to consumer demands, he did not question whether the butter-coloring practice was necessary or legitimate; in fact, he even promoted the practice of giving butter a uniform color.

Margarine manufacturers attacked the butter-coloring practice as unfair. They challenged the "privileges" that the dairy industry was allowed, as there was no regulation concerning the coloring of butter.[70] While criticizing the regulatory system that granted the dairy industry immunity from legislation, margarine manufacturers also questioned butter producers' claim that butter makers held a "preempted right" to "Nature's yellow" as a "trade mark."[71] They asserted that no one could claim to own the color of food, and even more so if the color was the creation of "Nature."[72] By twisting butter makers' contention that yellow was the "natural" color of butter, margarine manufacturers insisted on their right to use the yellow color that nature provided.

Butter coloring was also questioned within the dairy industry. Some butter makers and government officials believed that adding dyes to butter was not only unnecessary but also a deception. They asserted that good butter always attained a good-enough color at any time of the year and that consumers were not demanding highly colored butter.[73] One butter maker argued that "sensible people, [who would] pay twenty-five cents for good butter," were well aware that butter was not as yellow in winter as it was in summer and would be satisfied if the butter was otherwise good.[74] Proponents of coloring butter with dyes, who constituted the majority of the dairy industry, criticized the opponents: if the coloring of butter was abolished, there would be a great calamity to the industry, as consumers would not purchase "an objectionable pale color" of butter.[75]

Those who opposed the use of dyes in butter still considered color a significant factor in selling the product. In a 1906 edition of the farm newspaper *Wallace's Farmer*, one dairy farmer introduced a way to retain "desirable" yellow color without using dyes: oats mixed in cattle feeds gave butter a golden tint.[76] In fact, mixing carrots, marigold, and other yellowish ingredients with cow's feed, particularly during winter, had been common practice among dairy farmers to make the color of butter and milk yellower.[77] Like the addition of food dyes to butter, the practice of feeding carrots and yellow maize to cows also involved human manipulation and intentional control of color. For those opponents of the butter-dyeing practice, the line between the natural and the artificial lay not only in the source of butter color but also in when the color was added—when feeding cattle or churning butter.

Like butter coloration, ingredients of coloring sources for margarine were one of the critical factors that regulators and manufacturers employed to judge the "naturalness" of margarine colors. The 1902 federal margarine act imposed a ten-cent tax on "artificially colored" margarine and a two-cent tax on margarine "free from artificial coloration" that caused "it to look like butter of any shade of yellow." But the act did not specify what constituted "artificial coloration." The definition of "artificiality" was left to the jurisdiction of the commissioner of the Bureau of Internal Revenue.[78] The unclear definition of "artificial" colors of margarine posed a problem for regulators. The "natural" color of margarine was not necessarily white. Even without food dyes, it sometimes assumed a yellowish shade, depending on its ingredients.

Margarine manufacturers followed their own understanding of "artificiality" to provide yellow margarine and to evade the ten-cent tax. One solution was to use vegetable oils, such as coconut, palm, and sesame oils, which assumed a yellow color due to carotenoid pigments in the fats.[79] Margarine manufacturers argued that they were not intentionally dyeing their products to look like butter but that these vegetable oils were an essential ingredient of margarine; hence, their margarine was "naturally" colored and not subject to the ten-cent tax imposed on "artificially colored" margarine.[80]

Commissioner of Internal Revenue John W. Yerkes, however, questioned the use of vegetable oils. A few months after Congress passed the 1902 margarine act, Yerkes contended that because "so minute and infinitesimal a quantity of a vegetable oil [was] used" in margarine, the oil would not be regarded as "a bona fide constituent part or element of the product"; rather, it was used "solely for the purpose of producing or imparting a yellow color" to the margarine. Therefore, Yerkes concluded, the margarine that contained vegetable oils would be considered "not free from artificial coloration" and would become subject to the tax of ten cents per pound.[81] The Supreme Court upheld Yerkes's finding in 1909, ruling that the proportion of vegetable oil used in margarine was so small that it substantially served only the function of coloring margarine so as to make it look like butter. Hence, the oil would be considered an "artificial coloration," and the finished product would be subject to the ten-cent tax.[82]

Margarine manufacturers began experimenting with other vegetable oils, including cottonseed, peanut, and soybean oils, which could be used in sufficient volume to constitute legitimate ingredients of the product.[83] Under the 1902 act, margarine was defined as a compound made of animal fat, such as tallow and suet; hence, vegetable-oil products were not subject to the ten-cent taxation, although manufacturers continued to sell these products as margarine (or "oleomargarine"). The commercial application of hydrogenation technology—a chemical process to harden liquid oils by adding hydrogen into fat at high pressure—accelerated the use of vegetable oils for margarine in the 1900s.[84] During the following decades, the production and sale of "uncolored" yellow butter substitutes rapidly increased: vegetable-oil compounds and combinations of vegetable and animal oil products had displaced all-animal-fat margarine by the late 1920s.[85] Officials at the Bureau of Internal Revenue frequently complained that it was impossible to regulate the manufacture of margarine and enforce the law based on the color standard.[86]

The federal government finally closed the tax loophole of "naturally" yellow butter substitutes in 1930. Congress amended the 1902 act so as to change the definition of margarine to include products made not only of animal fat but also of vegetable oils. All compounds "made to look like butter" became liable to margarine taxation. The following year, Congress passed the Brigham Act, submitted by Elbert S. Brigham—a representative from the dairy state of Vermont. The act was to provide, in Brigham's word, a "clarification" of the current margarine law.[87] It imposed a ten-cent tax on yellow margarine regardless of the source of its color. In addition, the act stipulated for the first time the definition of yellowness of butter and margarine, measured by a colorimeter to eliminate uncertainties.[88] By quantifying and standardizing color, legislators sought to establish the color of margarine as an "objective" indicator to regulate the product. The colorimeter, as discussed in Chapter 2, provided color scientists and food manufacturers with a means to measure, quantify, and standardize the color of foods. It now became a tool wielded by butter interests to force regulation and difficulty on margarine interests. Standardization of food color thus served as a political and legal tool in power struggles between competing interests. Following the passage of the Brigham Act, the amount of colored margarine decreased to less than 1 percent of total production (figure 6.3).[89]

Under the 1931 Brigham Act, neither yellow nor white became the "natural" color of margarine. Margarine manufacturers continued to use vegetable oils, rather than beef fat, due to their availability and cheaper price. Because margarine with a yellow tint became subject to the ten-cent taxation, producers artificially bleached yellow shades, imparted by vegetable oils, to make the margarine white.[90] As margarine makers continued to supply color capsules for household use, consumers colored bleached margarine with yellow dyes to serve it as a butter substitute on their tables. For most consumers, the "natural" color of margarine was still bright yellow.

Color became a weapon in the fight between butter and margarine interests and over who controlled more legislators. Butter producers and margarine manufacturers used color as a demarcation between naturalness and artificiality and tried to demonstrate the legitimacy and authenticity of their products. Stressing that butter was always naturally yellow, dairy interests often insisted on the importance of keeping the bright yellow color all year round to distinguish it from what they called "imitation butter." Competition between the dairy and margarine industries and changes in margarine regulation from the late nineteenth to the mid-twentieth centuries helped define and naturalize not only the color of margarine but also the color of butter. They also demonstrated how business interests could use the regulation of color in battles for power and market share against competing interests.

Creating Perfect Nature

While margarine was introduced as a cheaper substitute for butter, canned foods substituted for, and complemented, fresh produce. Canned products helped create and reiterate the image of "perfect nature" with uniform, bright color. The color of natural produce—including fresh fruits, vegetables, and fish—often varied widely due to environmental conditions as well as seasonal, varietal, and geographical differences. Advancements in canning technology and food science allowed canners to produce a standardized appearance of canned foods consistently. Product labels and advertisements with colorful images promoted the color of nature packed and preserved in cans, often suggesting that canned foods were fresher than fresh foods.

Canned fruits and vegetables had generally been an expensive specialty item until the last decades of the nineteenth century. Commercial canners had existed since the early nineteenth century in the United States, but it was not until the 1870s that the development of canning technology, especially the application of steam pressure, enabled canning companies—including Del Monte, Libby's, Heinz, and Campbell's—to mass-produce various canned foods and establish large national businesses.[91] Canners had introduced a wide variety of canned foods to the market by the 1910s: green peas, tomatoes, corn, peaches, pears, apples, apricots, cherries, plums, white grapes, strawberries, pineapples, shellfish, and salmon.[92] Nearly 2,200 canning facilities operated in 44 of the 48 states, as well as in Hawaii and Alaska, by the 1930s.[93]

The distribution and consumption of canned products expanded not only regionally but also across class lines. As the production of canned foods increased and prices declined by the turn of the twentieth century, canned products became widely available for many Americans, including working-class consumers, and became mainstays on grocery store shelves.[94] The per capita consumption of canned fruits and vegetables increased from about 12.5 pounds in 1899 to roughly 38.5 pounds in 1927.[95] The appearance and taste of canned foods were not identical to that of fresh produce, but because fresh agricultural produce was still scarce, especially during winter, canned goods provided lower- as well as upper-class consumers with colorful, reliable arrays of fruits and vegetables.

The quality of canned foods, particularly their appearance, depended on multiple factors, including the selection of varieties, the grade of ingredients, the timing of harvesting and canning, and cooking processes. The selection of proper varieties was critical to produce canned products with good color and flavor. The color of canned salmon, for example, differed widely depending on the variety. In the Puget Sound area in the state of Washington, the saukeye salmon (also called sockeye) retained a brighter, livelier red color than did Alaskan canned fish. The pink salmon was softer than other varieties and turned a light pink or brownish color when processed in a can. The chum salmon, often called dog salmon, was not good for canning, since it was very soft and mushy when cooked and pale in color. The canned chum assumed "a dirty white color" and had "a rank, muddy flavor," according to canned-food broker John A. Lee in his 1914 sales manual.[96] Not all fruit varieties were good for canning purposes, either, even when the fruit had a good color, flavor, and texture suitable for eating raw. Among peaches, for example, the best variety for canning was the Phillips yellow cling. Its texture, color, and flavor endured relatively better after heating and canning than did other varieties.[97]

Canners sometimes prioritized appearance over taste and flavor. Peas of the Alaska variety were "more sightly [*sic*]," in Lee's words, due to their small size and round shape than were other varieties. They were also firmer and would "stand up" better under cooking than the sweet varieties. Other varieties, including the Horsford-Advancer and the Admiral, were oval shaped and larger in size—not "sightly" compared to the Alaska variety. But they "far excel[led]" the Alaska in tenderness and sweetness of flavor. Hotels, caterers, and restaurants usually preferred the Alaska variety to provide better appearance on their dishes because of its color and shape.[98]

Besides the selection of proper varieties, the quality of raw materials needed to be high and consistent. A canning manual advised canners to have a "complete understanding and supervision over the work" of farmers and growers in order to attain high-quality ingredients.[99] It was imperative for canners to make certain that fruits were picked at the proper stage of maturity, or what canners called "canning ripe" or "firm ripe"—that is, not quite ripe enough for table use but of full size and with full flavor.[100]

When the fruit was immature, it lacked color and flavor; when it was overripe, it would soften badly during sterilization in the can. Vegetables, such as string beans, peas, and corn, had to be picked for canning while still tender.[101] Underripe tomatoes oxidized more than fully mature tomatoes, and their color did not develop well—hence the yellowish or reddish-brown color instead of the brighter red.[102] In this regard, the preparation of canned foods required skill and knowledge. If the raw material was not of a suitable grade, an experienced canner would recognize it by the appearance or flavor of the finished product.[103] Canners frequently declared in their advertisements and other promotional materials that because only the best kinds of foods were put into cans, canned foods were "far superior to fresh foods in bulk"; in other words, nature was perfected in cans.[104]

Another reason why canners promoted canned foods as better than natural produce was the geographical proximity between the farm and the canning factory. Canning plants were usually located near the farm, river, or ocean where fruits, vegetables, fish, and other raw ingredients were plentiful, such as in California, Alaska, and regions along the Columbia River.[105] It was technically easier and less expensive to transport canned foods than perishable items without deteriorating their quality. One hour from the field to the factory was ideal for peas, according to the National Canners Association.[106]

In promoting the quality of their products, canners used this geographical proximity as a sign of freshness, since foods could be preserved in cans right after fruits and vegetables were harvested and fish were caught. In a 1917 article featured in the *American Food Journal*, Lawrence V. Burton—a bacteriologist who worked for Libby, McNeill, & Libby, one of the major canning companies—argued that canned foods were fresher than "the fresh articles" because "fresh foods delivered to the home" were sometimes "picked green, [then] shipped a thousand or more miles."[107] Canners pitched time as an important criterion for freshness. The quicker the food was packed after harvest, the fresher the product was. But once the food was put into cans, time did not matter. As Burton noted, "Canned sausage is always fresh. It never spoils."[108]

The proximity of plants to harvesting fields benefited the production of canned pineapples. Canned pineapples became increasingly available in the United States during the last decades of the nineteenth century, initially from British Malaya and the Bahamas and later from Hawaii. The development of pineapple canning allowed consumers in urban areas to enjoy this golden yellow fruit from the tropics; otherwise, the highly perishable fruit would not reach their dining tables. In Hawaii, settlers from the mainland United States had experimented with pineapple canning since the early 1880s without much commercial success. James D. Dole, second cousin of the first governor of Hawaii, Sanford B. Dole, pioneered the establishment of the modern pineapple canning industry in the territory.[109] After receiving a bachelor's degree in agriculture from Harvard University, James Dole moved from Boston to the town of Wahiawa on the Oahu island in 1899 and built the first cannery in 1901. He expanded his cannery to Honolulu Harbor in 1907. The production of canned pineapples increased rapidly in Hawaii: from about 750,000 cases in 1912 to 1,000,000 cases within a year.[110]

Canners believed that canned pineapples were much superior to raw fruits. Because the fruit was delicate and decayed quickly, pineapples sold as raw fruits were harvested while still green and ripened in transit. This "artificially ripened fruit" was white, fibrous, and tough, and not so well flavored as canned pineapples, which were packed where the fruit was grown. When packed at full maturity, canned pineapples retained their bright yellow color, as well as flavor and tenderness, with "the sunshine in the can," as canners often referred to it.[111] Canners commonly immersed pineapples into heavy syrup to sweeten the fruit and brighten its color. On labels and in promotional materials, producers touted the use of syrup and mechanical processing for canning as a way to preserve a product of nature and make it even better.[112]

Canned pineapples gradually became a popular item in many American cookbooks in the 1910s partly due to price decline and extensive advertisements by Dole and other canning companies.[113] A December 1910 issue of the *Boston Cooking School Magazine* featured a "Formal Menu for December," which included a recipe for a dessert made of canned pineapples and slices of oranges.[114] The yellow color of the pineapples, as well as the orange oranges, helped brighten the table even in winter. The price of canned pineapples was mostly equal to other canned fruits and even less expensive than some produce in the mid-1910s. The wholesale price of canned pineapples, featured in a 1915 wholesale catalog, was $1.80 per dozen, whereas canned peaches cost $2.85 per dozen and canned pears, $3.00 per dozen.[115] By 1920, pineapples became the second-most-consumed canned fruit, after canned peaches, in the United States.[116]

Even if raw ingredients for canned foods were high quality, inadequate canning processes could deteriorate the visual and eating quality of the finished products. Canning involved several cooking processes to give the finished product a desirable appearance. It was necessary for canners to cook foods in small batches—and quickly—in order to have them achieve a uniform color. When a large amount of beets, for example, were canned, processed, and sealed at the same time, their color would be irregular, some holding their color, others turning yellow or white.[117] To keep the full color of fruit preserves, the whole fruit had to be cooked quickly.[118] To retain a bright, white color for pears, for example, cooking time could not exceed ten to twelve minutes.[119] After cooking, it was essential to cool preserves as rapidly as possible in order to keep the natural color of the fruit.[120]

One of the most important processes in canning was blanching (it literally means "whitening"): heating food in boiling water for one to fifteen minutes depending on the food. The process eased the removal of skin from foods like peaches (pealing made the food look whiter; hence, blanching). Blanching also helped *preserve*, or enhance, color (rather than making it whiter or paler) by halting enzyme action. Asparagus and peas, for example, attained bright green shades. For the preservation of color, food had to be cooled off with cold water immediately after boiling. Some fruits, like peaches, attained a uniform color, and their discoloration could be prevented. Blanching also made peaches flexible for easy packing in a can. Other advantages of blanching included the removal of an objectionable flavor, improvement or softening of texture, and the cleaning off of dirt.[121]

The use of proper containers was crucial for retaining the desirable color of canned products, such as beets. The acid contained in beets reacted to the tin, causing discoloration of the contents—beets turned yellow and pale rather than bright red. Instead of plain tin cans, enamel-lined cans helped preserve the bright color of beats and other produce, including berries.[122]

When the quality of raw ingredients was not high enough, chemical additives, particularly food dyes, could brighten and maintain the color of canned foods. Low-grade preserves often contained synthetic dyes, which imparted uniform bright colors. Some manufacturers used the juice of other fruits to brighten the appearance of the finished product. When the color of apple jelly assumed pale shades, for example, canners added the juice of raspberries or blackberries, though they would still sell the product as "apple jelly."[123] Maraschino cherries, used primarily for decorative purposes, almost always contained red dyes. To give cherries a bright, uniform color, the fruit was usually bleached with chemical additives, particularly a sulfite of soda solution, before being colored red.[124]

Another canned food that commonly contained dyes was canned peas. At the turn of the twentieth century, canned peas had been chiefly imported from France. The French canned peas were dyed with chemical additives, usually copper salts. Officials and scientists at the USDA, particularly its chief chemist, Harvey W. Wiley, denounced these imported canned goods as adulterated and misbranded because many of them did not declare the use of chemical additives on the label.[125] After the 1906 Pure Food and Drug Act required the labeling of additives used in canned goods, American canners sought to retain the "natural" color of canned peas without using chemical additives by selecting varieties suitable for canning and harvesting them at the right stage of maturity. In marketing domestic products, canners often stressed that brightly colored French products were injurious to health.[126] While the bright, uniform color of canned foods was a sign of superior products, the same feature could generate consumers' and government inspectors' suspicion about safety.

Canners and marketers advised retailers to stress the appearance of their canned goods as an important feature of high quality in selling their products. Rich, bright color was "so essential to the acceptability of the canned product," home economist Eleanor Lee Wright wrote in the trade journal *American Food Journal* in 1919.[127] In selling canned corn, for example, the brightness of the color, as well as the sweet flavor, was a very important factor. Canned-food broker John A. Lee advised retailers to spoon corn up from the center of the can to show the contents to customers at stores. Because heating and other canning processes sometimes discolored the contents near the can's edges, it was usually brighter in the center. For canned salmon, according to Lee, breaking up the flakes and showing the color to customers would be effective to show its "attractive color."[128] Even when retailers opened a sample product and displayed its contents, consumers usually could not see the inside of a particular can they were about to purchase until they opened it at home. Canned products, as well as many other commercially manufactured foods, provided consumers with uniformity and predictability that the contents of any can would look and taste the same.

Bright color in advertisements, trade cards, and labels worked to provide consumers with visual cues about how canned foods would look. Canners were one of the earliest food businesses that employed color prints in their promotional materials. Until the turn of the twentieth century, can labels had usually been descriptive, filled mostly with text information.[129] But with the improvement of printing technology, most canned-food labels by the 1910s included bright images of fruits, vegetables, meat, and fish. Among the major canning companies, Del Monte began its first national promotion campaigns in 1917. It was one of the earliest canning companies to carry out mass advertising.[130] Canners' advertisements often depicted not only the outer appearance of a can but also the contents as served on a plate (plate 3). Luscious halves of perfect peaches in glowing yellowish-orange shades, fresh green asparagus and peas, and shining yellow pineapple slices adorned canned-food advertisements and labels.[131]

Since at least the mid-nineteenth century, seed traders and horticulturalists had used handwritten color images in their trade catalogs and other publications to show the appearance of actual fruits and vegetables.[132] Color illustrations on canned-food labels and in advertisements served a similar purpose as those nineteenth-century catalogs. Unlike photography, these images were not necessarily realistic or identical reproductions of actual fruits and vegetables. Yet by identifying certain foods with distinctive colors (such as tomatoes with bright red, pineapples with vivid yellow, and peaches with brilliant yellowish-orange), canners presented their products as an emblem of naturalness and abundance.

While canners and marketers increasingly standardized canned foods and their imagery with new canning technologies and marketing campaigns, the federal government provided the industry with the legal standardization of color. As the production and consumption of canned foods increased during the first decades of the twentieth century, adulteration and misbranding of canned products became prevalent. To regulate misbranding and clarify the standard for product quality, the federal government established grade standards for canned foods, categorized as Fancy, Choice or Extra Standard, and Standard.

In 1930, Congress passed the McNary-Mapes Amendment, which authorized standards of quality for contents and containers of canned foods. Due to a lack of financial resources, however, standards were initially established only for limited products, including canned peas, tomatoes, and peaches.[133] With the enactment of the 1938 Food, Drug, and Cosmetic Act, the government established standards for most canned products. The act specified, for example, the color of canned tomatoes based on the Munsell color chart. And for canned peas, not more than 4 percent of the peas in a can could be spotted or discolored.[134] Like the regulation of margarine color, the determination of the color of a certain food became the work of government.

Conclusion

There was no longer a clear line between original and fake colors. Margarine manufacturers and canners strove to create products that looked as much as possible like butter and fresh produce, meat, and fish. Widely held expectations of yellow butter drove margarine producers and retailers to alter their manufacturing and marketing practices. The case of canned foods epitomized manufacturers' efforts to make nature perfect by making its appearance uniform and prolonging its shelf life. The reproducibility and uniformity of color became critical factors with which margarine manufacturers and canners could fight against their competitors, compete with natural produce, and even overcome nature.

Manufacturing and marketing strategies in the margarine and canning industries in turn refashioned the ideal color of butter and fresh fruits and vegetables. Dairy industry leaders sought to promote modern butter production and marketing to farmers by creating a new color standard for butter in order to distinguish it from margarine. In the canning industry, manufacturers shared the view that modern technology and science made a product of nature more "natural" and "fresher." The marketing rhetoric and colorful images used in labels and advertisements promoted the consumption of canned foods and also afforded consumers idealized images of nature—available in a can.

As imitations overtook the real, color increasingly became a matter of law. Competing interests took to the courts and to legislatures to get their own artificial methods legalized as natural—and their competitors' marked as fake. But there was no non-artificial original to go back to anymore. Government's involvement in the regulation of margarine and canned foods helped endorse these products as genuine articles of commerce. As shown in the Supreme Court cases on the anti-color laws, a series of margarine acts, and grade standards for canned products, not only did court justices and legislators define how butter, margarine, and canned foods should look, but they also understood the power of color. They accepted the premise that the addition of color was necessary to make food attractive and marketable. The creation of a standardized natural color went beyond the realm of business; government also became entangled in a web of color.

· 7 ·

The Visuality of Freshness

Now that consumers had been taught to want certain colors of food, the material culture of shopping had to evolve to match it. One way to create standardized food colors was the work of farmers and food processors; another was retailers' innovations *inside* the grocery store. During the nineteenth and early twentieth centuries, urban consumers bought food mainly from local grocers, public markets, and peddlers. In local grocery stores, consumers' sensory access to goods was relatively limited; products were often displayed behind the counter or stored in a backroom.[1] A public market, on the other hand, was often a space of sensory chaos. In 1884, a trader described the South Water Market in Chicago as a "maze of barrels and boxes and gory calves, and chicken-coops, redolent with the unmistakable odor of the badly kept country barnyard and huge piles of sacked potatoes, and egg-cases, squashes, barrels of cider, and hogs cold and stiff in death."[2] Shoppers saw and touched produce, smelled combinations of various foods (and non-foods), and heard people talking and horses neighing. In this multisensorial environment, they discerned the freshness of foods through their appearance, smell, and texture.

Consumers' sensory experience had become increasingly homogenized by the middle of the twentieth century. An increasing number of food stores began selling perishable foods—specifically fruits, vegetables, and meat—on a self-service basis. Shoppers walked through aisles, picked up precut and prepackaged meat and produce by themselves, and brought it to a cashier. Since customers rarely had a chance to actually taste, smell, or touch the foods they were about to buy, they needed to rely mostly on visual information in selecting foods.

The invention of clear packaging, particularly cellophane, ostensibly allowed consumers to see the "true" appearance of foods *through* the package. Compared with goods sold in grocery stores at the turn of the twentieth century, cellophane-wrapped products sold in self-service supermarkets a few decades later seemed to provide consumers with better visual information about the goods inside.[3] Yet transparency did not necessarily mean that consumers could better discern food quality. Cellophane packaging showed the insides of the package while shutting off consumers' access to the product through other senses. Consumers could now see the foods, but all their other senses were blinded. Moreover, cellophane packaging, as well as store lighting and refrigerated display cases, enabled manufacturers to control the color of foods, helping to standardize a visual environment in food stores. Uniformly bright red meat, brilliant green spinach, and shining red tomatoes, sealed in transparent film and displayed in sanitized cases, embodied "industrial freshness" in the place where nature and technology intersected.[4]

Creating the "Showcase" of the Grocery Store

The introduction of new grocery store operations, including self-service, altered food shopping patterns drastically during the first decades of the twentieth century, particularly in urban areas. The development of the first self-service store is attributed to Clarence Saunders's Piggly Wiggly store, which opened in Memphis, Tennessee, in 1917. Until then, buying and selling of everyday foods was very different from what many Americans would come to expect later in the twentieth century. Store clerks usually retrieved goods from a shelf behind the counter for each customer. Moreover, although grocery stores sold some perishable foods, their major food trade was canned and other processed products. Most butchers and produce grocers commonly operated specialized businesses in separate stores.[5] Beginning in the 1920s, large grocery stores increasingly absorbed neighboring butcher shops and produce stores into their premises. In these "combined" stores, customers saved time by shopping for various food items at one store rather than at three different places.[6]

Even after combined stores became increasingly common, the self-service mode of shopping was at first used only for packaged foods. In most stores, buying meat was much like shopping in a traditional butcher shop, with a full-service counter staffed by male butchers and sales personnel.[7] Shoppers lined up in front of the service counter and asked for the specific cut and the weight they wanted to purchase. During the transaction, customers had the opportunity to ask butchers which meat was fresh and whether it should be broiled or fried. The butcher retrieved the desired slab, cut the quantity ordered from the slab, and wrapped it. In purchasing produce, customers selected products from the bulk displays of fruits and vegetables, and store clerks working in the produce section weighed and bagged the items; prices were then confirmed by scale at the checkout counter.[8]

The integration of perishable items into supermarkets provided retailers an opportunity to appeal to consumers by demonstrating the quality of the entire store and thereby help build customer loyalty. Consumers purchased perishable products more often than packaged foods. If a grocer offered a good assortment of high-quality fruits, vegetables, and meats, customers would visit the store more often than they would other stores.[9] Most grocery items, such as canned foods, boxed cereals, and bottled goods, were identical wherever they were sold. In terms of these products, the only advantages one store might have over any other were more favorable prices and a greater selection. On the other hand, the available perishable items changed from season to season and sometimes from day to day, and variety was a source of interest to shoppers.[10]

Newly converted meat and produce sections became the "showcase" of the store because of their colorful "natural beauty" and the possibilities for attractive display.[11] Grocery manuals and trade journals repeatedly stressed the importance of fresh produce for supermarket businesses during the 1920s and 1930s: perishable items made their "greatest single appeal to the consumer through the eye."[12] *Progressive Grocer*, a major grocery trade journal, noted in 1935 that no commodities "[lend] themselves more naturally to inviting, appetizing arrangements than do fresh fruits and vegetables."[13] Another article asserted that a "bountiful variety of fresh fruits and vegetables attractively displayed in all of nature's color and freshness" would draw consumers into a store.[14] "Unusual freshness or superior appearance of products" could even justify relatively higher prices than those at other stores.[15]

Grocers believed that the appearance of displays was the most important factor in moving stocks of fruits and vegetables, and that the attractive display of agricultural produce influenced the ambience of the entire store. They thus arranged the produce section in the "best position" in the store—usually near the entrance.[16] The colors of produce and meat were important for grocery store operation not only because they brightened up store interiors and attracted consumers but also because they served as a critical indicator of food quality, which determined whether a customer would accept a particular item.[17]

The introduction of self-service operation for nonperishable foods, such as canned and packaged products, also transformed the visual environment in a store. *Progressive Grocer* editor Carl W. Dipman argued in his 1931 grocery manual that in a self-service store, shoppers wanted "contact with" merchandise and needed to "read the label on the package and the directions for the use of the product" without being interfered with by a store clerk; hence, the grocery store "should be arranged with as much open display as possible." "The properly arranged store" was supposed to have "no barriers"; it let shoppers and merchandise "meet," Dipman contended.[18] Unlike earlier grocery stores, the new store display needed to allow shoppers to see, judge, and select products by themselves.

Self-service operation thus required the architectural modification of grocery stores. Grocers altered the arrangement of store shelves so as to allow "customer circulation." They installed what grocers commonly called a "self-service gondola" in the middle of the store, as well as shelves and display cases attached to the walls. Once customers entered the store, they walked through the aisles between wall shelves and gondolas, then paid at a checkout counter right before the exit (figure 7.1). This new architectural design for self-service stores allowed customers to navigate their buying experience on their own. Contemporary grocery manuals often stressed the importance of allowing customers to shop around the entire store freely: they could *see* all the products on display and would purchase more than what they had on their shopping list. The smooth flow of shoppers also prevented congestion, since many grocery stores at the time had only a limited space.[19]

While allowing customers to see goods better, this new aisle-based organization of stores helped depersonalize food shopping experiences. Shoppers still had an opportunity to interact with butchers and produce clerks, but when choosing their self-service grocery items, they wandered around the store independently. When self-service was a novel system in the 1920s and 1930s, neither customers nor store operators were fully satisfied with the system. Both wanted face-to-

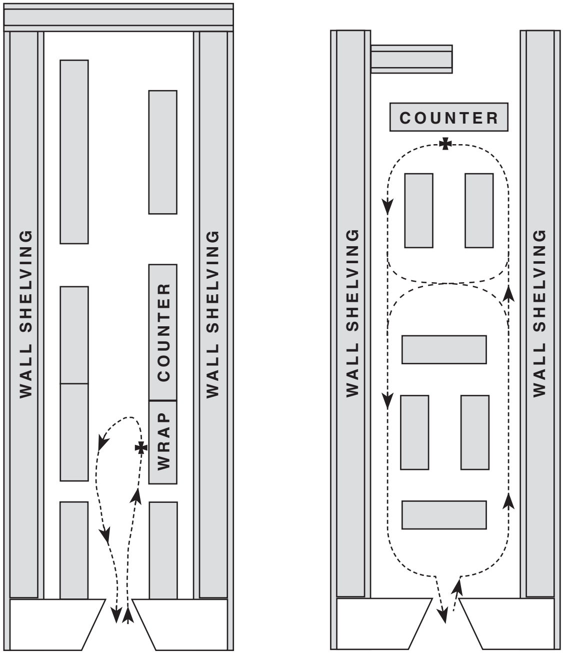

Figure 7.1 Grocery store floor plans for the "Old Way" (left) and the "Modern Way" (right) in *The Modern Grocery Store*, published by Carl W. Dipman in 1931. Dipman explained that long counters and showcases in front of the wall shelves separated customers from most of the goods sold in the old-style store, and about half of the merchandise could not be seen. The modern store, with open display cases arranged into islands, allowed customers to walk freely inside the store, though its operation was not yet fully "self-service." Courtesy *Progressive Grocer.*

face interactions when necessary. In fact, grocers commonly kept service-type operation to some extent even after adopting self-service as the primary merchandising system for nonperishable foods.[20] Yet no matter how gradual the shift from service-type operation to self-service was, it was real. The new architectural design symbolized this change. While the social relations between customers and store clerks diminished, the shopper's contact with merchandise became more intimate.

Meat Color: Challenges for Self-Service

The establishment of self-service merchandising for perishable foods was particularly challenging for grocers in the case of fresh meat largely due to a lack of sufficient technology to maintain the bright color of sliced meat on display.[21] Until the mid-1940s, refrigerated display cases did not keep the temperature of meat or produce low enough to effectively prolong shelf life.[22] Nor were there adequate packaging materials for self-service retailing.

Color became a crucial marketing factor for transforming animal flesh into standardized commodities during the 1860s and 1870s. The advent of the giant meatpacking industry altered American meat consumption patterns dramatically. Due to the expansion of the national market and the development of long-distance transportation, urban consumers increasingly came to purchase cuts of meat that had been dressed in meatpacking plants thousands of miles away. Before then, livestock shippers had transported the whole animal to nearby butchers, who cut the meat in their storage rooms, usually according to order. Meatpackers and retailers needed to convince consumers that pre-dressed meat, shipped from far-away meatpackers, was not spoiled and was as good as cuts freshly butchered in nearby retail stores. The health threat due to spoiled meat was one of the largest concerns for consumers. The color of meat, as well as its odor, was a prime sign of disease and spoilage.[23]

The transformation of meat merchandising practice also made meat color more important than ever before for retailers. An increasing number of retail butchers began displaying cuts of meat in glass display cases in the late nineteenth century. Until then, few wholesalers and retail butchers had displayed meat to customers. A pioneer in initiating meat display was Gustavus Swift, who later established Swift & Company—one of the largest meatpacking firms in the late nineteenth and twentieth centuries. When Swift operated a butcher shop in Clinton, Massachusetts, in the 1870s, he realized that when the products were on display in stores, his customers were likely to buy more meat on impulse.[24] A large assortment of cuts caught their eye. Color was an important element for shoppers to determine the quality of meat. In fact, many cookbooks of the late nineteenth and early twentieth centuries informed readers of ways to select good quality meat based largely on color.[25]

The careful treatment of animals was essential for meatpackers to prevent "unnatural" colors. Meat color resulted from a complex mixture of factors, including the breed, age, and sex of animals; the type of feed; the part of the meat; animals' physical condition; and slaughtering operations.[26] Meat from older animals tended to be darker in color. When the flesh of an animal was overheated before slaughter due to a long drive or excitement, it often assumed, in a meatpacker's words, a dark "fiery appearance" and frequently developed a sour odor after slaughtering. A 1913 meatpacking manual noted that "no animal should be killed after a long drive or rapid run about the pasture," and it was "always better in such cases to permit the animal to rest over night rather than to risk spoiling the meat."[27] Knocking or stunning cattle was the major means of slaughtering animals in the early twentieth century. But these methods tended to prevent free blood flow and caused discoloration of the flesh. Another packing manual, published in 1905, warned packers about the potential loss of profits due to "undue violence," such as striking animals across the back with heavy sticks or prodding them unnecessarily. Great care needed to be taken to promote the flow of blood and prevent the discoloration of meat.[28]

Meatpackers and food retailers described the scarlet red color of meat as "bloom," which consumers generally considered a sign of good, fresh meat. But this "fresh" red color did not actually indicate that the meat was the "freshest" in terms of the time it was exposed to the air. Immediately after beef was cut, the meat assumed a purplish-red color. After the meat was exposed to the air for fifteen to thirty minutes, the cut became the characteristic bright red color of "fresh" meat. Red meat then gradually lost the bloom and assumed brown shades. Brownish meat was not necessarily a sign of spoilage, although the color could suggest the deterioration of the product due to bacterial growth.[29] Consumers were often resistant to purchasing brown-colored meat, associating color changes with deterioration.[30]

A number of factors affected the rate at which the bloom was lost, including temperature, bacteria, and oxygen availability. Light intensity, the type of packaging, and the variety of the meat also determined how fast the product discolored. It was thus extremely difficult for meatpackers and retailers to predict the exact color effect of any particular treatment on a piece of meat.[31] Among these variables, temperature and oxygen were critical factors in maintaining bloom. A lack of oxygen supplied to the cut of meat altered its color from red to brown. High storage temperatures accelerated the color change on the surface of meat.[32] The growth of bacteria, which caused the discoloration of meat, also depended on temperature. Strict controls on both refrigeration and sanitation were thus essential to retard bacteria growth in cut meats and to prolong their bright red color.[33]

For cured meat products, including hams, sausages, and bacon, meatpackers commonly used food additives to standardize and keep the product's "fresh" meat color. Since the nineteenth century, meatpackers had been adding synthetic dyes to sausages and other meat products. They also used sweeteners to maintain the red color of cured meats and add flavor to the finished products.[34] By manipulating physiological and chemical constituents of meat, meatpackers sought to give the products a particular color that consumers would consider "fresh." The addition of dyes and other chemical additives was a stable and reliable means to control the freshness of foods, making meat products chemically fresh.

While food additives could work for prolonging the color of cured meat products, maintaining the color of fresh meat was difficult. With the expansion of combined stores that sold groceries and perishable foods, supermarket managers showed tremendous interest in self-service retailing of meat as well as produce. But only a few stores tried running meat departments on a self-service basis before the 1940s.[35] The H. B. Bohack Company of New York was among the earliest to experiment with self-service meat retailing in 1927. California-based Espandola also tried self-service meat in the 1930s. The store's butchers cut meats and wrapped them in opaque butcher paper in advance. After weighing the package and designating its price, the meat was placed in a refrigerated self-service case. The experiment failed, however. These stores lacked adequate refrigerated display cases and sufficient display space. The wrapping materials then available were not satisfactory for self-service meat, as they did not maintain the color of meat and were not transparent—the feature that most retailers considered essential for self-service. In addition, most consumers had yet to become acquainted with self-service shopping in general.[36] During the 1930s, other food retailers experimented but soon gave up their self-service meat operations.

"The Eye Says Buy"

As grocers increasingly integrated produce and meat sections into their stores during the 1920s and 1930s, they employed a range of techniques to showcase their "fresh" products. Key was to display fruits, vegetables, and meat as symbols of freshness. An arrangement of foods and new lighting equipment allowed them to make the entire store visually attractive.

Color Contrast and Mass Display

What grocers commonly called "color contrast" was one way to create the attractive arrangement of produce. By displaying fruits and vegetables according to "harmonious color scheme," the beautiful colors of fresh produce afforded "appetite-provoking effects," as Dipman contended in his 1931 manual for the grocery business.[37] Grocers' manuals and trade journals often gave grocers advice on how to create color contrast for produce display. According to a 1935 *Progressive Grocer* article, color contrast helped "give produce display appetite appeal":

> Place alternate rows of reds, whites, greens and yellows. Make narrow alternating bands or piles of red radishes, lettuce, carrots, spinach and celery, etc. that will give the appearance of so many colored ribbons. Arrange your fruits the same way, alternating masses of oranges, grapefruit, apples, lemons, tangerines and pears so that the contrasting colors will catch the shopper's eye.[38]

The colorful arrangement of each kind of produce that stood out in the display helped provide the entire department with a fresh and bright appearance. Not only did color contrast make the display colorful and orderly looking, but it also distinguished varieties of produce. Shoppers could easily spot, for example, red radishes, when displayed next to green vegetables.

To make color contrast effective, grocers displayed produce in quantity, or in so-called mass display. Display racks and tables full of colorful fruits and vegetables conveyed the impression of great variety and high quality. The mass display of seasonal items for "peak effects," such as large displays of oranges, peaches, berries, or melons in season, drew consumers' attention to the department as well as to the entire store.[39] One grocer asserted that when each item was shown "in mass arrangement with special consideration for freshness and color contrast," customers could not "resist buying liberally."[40] Radishes were piled with heads outward, next to a high mound of potatoes with round ends exposed. Bunches of green asparagus were displayed in a mass, next to a mound of cauliflower, whose snowy whiteness was accented with bunches of red radishes filling out the corners.[41] A mass display of colorfully arranged produce stood out in a store as a symbol of freshness and natural abundance.

Color contrast was also important for meat display. Grocers often used green garnish and display dividers to add vivid color contrast to meat cases. Meat retailers had commonly used fresh parsley and other green vegetables as garnishes until the late 1930s, when they began using rubber-made green dividers, or "rubber greens."[42] Garnish manufacturers promoted their products by stressing the importance of color contrast and the close connections between eye appeal and sales appeal. In a 1931 advertisement, a parsley-display maker asserted that "SALES are made through the EYE":

> Everything the EYE takes in forms the foundation of the sale. People buy what they SEE—the EYE makes up the mind. Meat displayed in your Refrigerated Display Case needs a sprightly note of Spring Green Color to give it added "EYE-APPEAL."[43]

The firm suggested that the "Spring Green Color" of fresh parsley created visually appealing color contrast and accentuated the freshness of red meat. Even when dividers were not made of fresh parsley, grocers claimed that rubber greens juxtaposed with red and pink meats created "a look of freshness" and a "sparkling appearance."[44] Garnishes "beautifully colored in deep forest green" made the "meat displays sparkle with natural freshness," a rubber green manufacturer advertised in a 1948 *Progressive Grocer*. These firms stressed the importance of visualizing freshness through color: "the eye says buy" if grocers use the firm's product.[45] In addition to the red–green color contrast, the arrangement of various meats—from the whitish pink of veal to the bright cherry red of beef—not only made the entire display look brighter and balanced but also helped consumers tell the differences between various cuts of meat.[46]

Equipment manufacturers introduced new display cases furnished with mirrors in the 1940s, enabling grocers to create color contrast and mass display of perishable items more effectively than before. A tilted long mirror set along the top of the produce display case reflected the fruits and vegetables and the meat products below, giving the "illusion of a much larger stock."[47] The mirror also helped enhance "eye-appealing color contrasts."[48] Mirrors hung over the produce and meat departments at the proper angle reflected light on the products, making them look much brighter and more attractive. The proper placement of a mirror was very important. The angle at which the mirror was to be suspended depended on the width of the department and on the height the mirror was from the floor. The angle of the mirror needed to be adjusted so as to reflect the most light on the produce and to show all the food on display to customers standing a short distance away.[49]

The presentation of freshness in modern food stores required the elimination of objectionable odors and anything unattractive. "Smelly, messy, unsanitary-appearing" products, such as the odor of raw meat and fish, must be destroyed, counseled an article in a 1939 *Progressive Grocer*.[50] A few heads of lettuce with wilted leaves or a stalk of celery with dried ends could spoil the entire produce department.[51] To give a fresh appetizing appeal, all the fruits and vegetables displayed needed to be clean and carefully and frequently trimmed. To heighten the attractiveness of produce and meat displays, grocers segregated discolored items from the regular department and sold them at reduced prices.[52] The line between salable and unsalable items based on the appearance of foods became the criterion of freshness for retailers, who strove to present foods with a standardized "fresh" look to customers.

Plate 1a&b. Lovibond Tintometer (1888). Division of Medicine and Science, National Museum of American History, Behring Center, Smithsonian Institution.

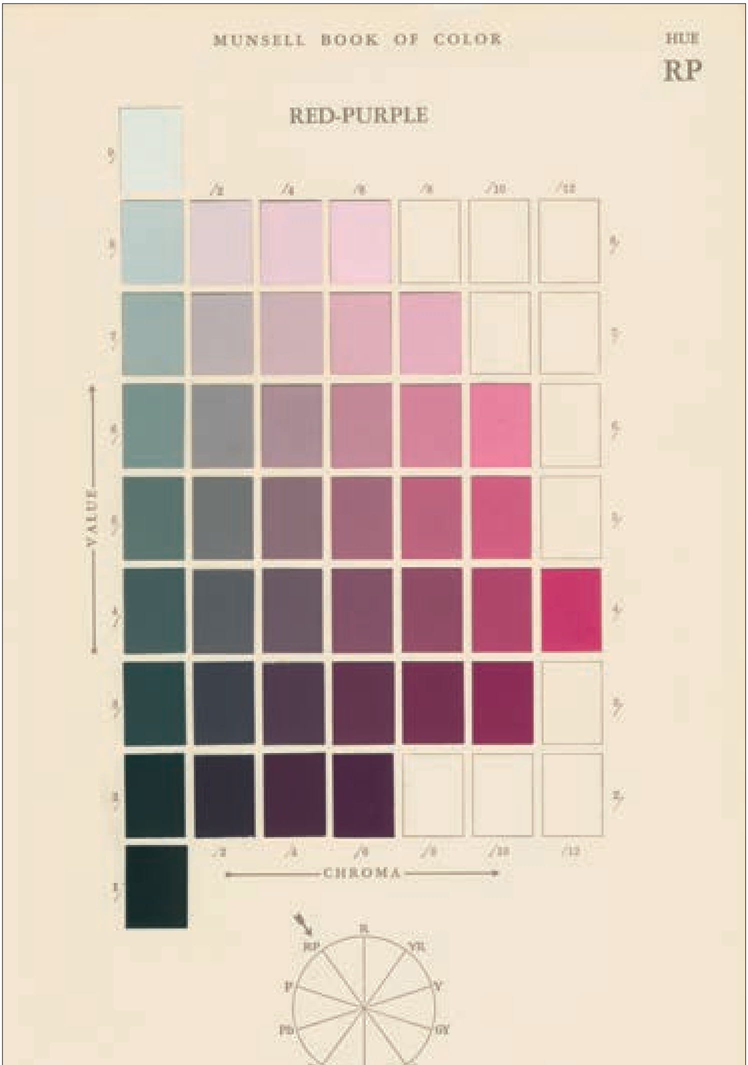

Plate 2. Munsell Color Chart for "Red-Purple." Albert H. Munsell, *Munsell Book of Color* (Baltimore: Munsell Color, 1929). Courtesy X-Rite, Inc.

Plate 3. Del Monte was among the earliest to use color advertisements for its canned products, often presenting colorful images of canned fruits and vegetables along with fresh produce. In this advertisement, Del Monte stressed the freshness of canned peaches due to the proximity between harvesting sites and packing plants. *Good Housekeeping* (April 1918), author's collection.

Plate 4. This advertisement for Jell-O, with colorful illustrations, stressed visual appeal, convenience, and variety. It noted that consumers could make "a perfect Orange dessert" and other fruit-flavored dishes without actual fruits, regardless of the season, as Jell-O contained "the true fruit flavor." The dishes shown here are (from top) Cherry Jell-O; Orange Jell-O; Lemon Jell-O Spanish Salad; Strawberry Jell-O; Chocolate Jell-O; and Raspberry Jell-O. *Good Housekeeping* (November 1911), reproduced from the University of Delaware collection.

Plate 5. There are two red bananas and a yellow banana in the middle. *Fruits of the Tropics* (New York: Currier & Ives, c. 1871). Prints and Photographs Division, Library of Congress.

Plate 6. Orange crate label for Exceptional brand Valencia oranges, grown and packed by the Mupu Citrus Association of Santa Paula, California, in the early twentieth century. The color of the label indicates that oranges were Grade A fruits. Division of Work and Industry, National Museum of American History, Behring Center, Smithsonian Institution.

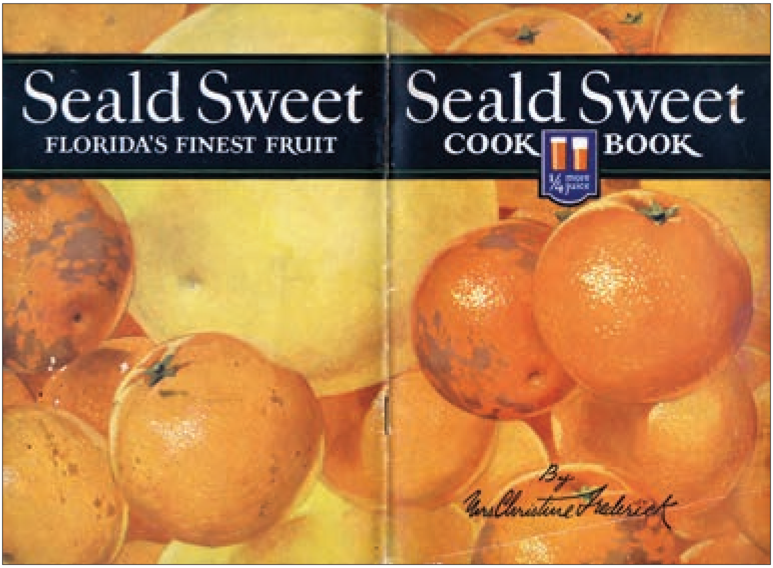

Plate 7. This leaflet for Seald Sweet brand oranges, published by the Florida Citrus Exchange around the 1920s, explained the health benefits of eating oranges and included recipes with color illustrations. Mrs. Christine Frederick, *Seald Sweet Cook Book* (Tampa: Florida Citrus Exchange, n.d.). Courtesy Seald Sweet International.

Plate 8. This advertisement by DuPont stressed the convenience of self-service for shoppers and explained how cellophane allowed the new way of buying meats. Phrases like "Cellophane lets you see exactly what you buy"—emphasizing the importance of visual information when buying foods—often appeared in DuPont's cellophane advertisements during the mid-twentieth century. *Saturday Evening Post* (1949). Courtesy DuPont.

Bright Lights, Big Produce

New lighting equipment revolutionized the American food-retailing scene in 1938. The General Electric Company introduced fluorescent lamps for commercial use under the brand name Mazda after the supreme god of Zoroastrianism, Ahura Mazda, associated with light and wisdom. According to General Electric's physicist Matthew Luckiesh, the development of better lighting was critical not only to increase sales but also to enhance "an activity of human beings."[53] For him, better visual environments were essential parts of modern civilization based on scientific knowledge and technology. As Mazda—the god and the brand name—symbolized, light and wisdom went hand in hand. Luckiesh's lighting development and his emphasis on the "improvement of seeing" epitomized the construction of a vision-centered food retailing environment.

The new fluorescent lamps enabled grocers not only to control the color of produce and meats but also to present freshness to consumers as the main visual characteristic of perishable items. Until the late 1930s, many supermarkets had installed ordinary oversize lamps, usually incandescent tungsten bulbs. These lights generated heat and accelerated the darkening of meat and the wilting of fresh produce. Lighting manufacturers, particularly General Electric, the Westinghouse Electric and Manufacturing Company, and Sylvania Electric Products, devoted considerable resources to developing better lighting equipment for grocery stores as well as other businesses. In promoting their lighting equipment to grocers, manufacturers asserted that food lighting served as an important "salesman," since lighting enhanced the value of display by making the entire store brighter and food items stand out.[54] "SEEING is the biggest thing in the Selling," General Electric claimed in its 1945 fluorescent light advertisement.[55] The control of sensory perception became a crucial part of capitalist enterprise.

Fluorescent lamps were generally more expensive than incandescent tungsten bulbs. But fluorescent lamps offered several advantages, especially for meat and produce dealers: less food deterioration, better visibility, and brightness. Because fluorescent lamps did not produce as much heat as incandescent bulbs, they were less likely to damage perishable products. The white color of fluorescent lights gave meat an attractive appearance. A grocer in Seattle reported to the trade journal *Meat Merchandising* that when the fluorescent light was turned off, the fat in the meat appeared "a dull yellow"; when it was on, the fat became "a creamy white," and the meat took on a "fresh, appetizing color." His meat sales increased 30 percent after the installation of fluorescent lights in his store in 1940.[56] Compared with incandescent lamps, the fluorescent light was more efficient, as it produced more than double the amount of light from the same amount of current and lasted about three times as long as incandescent bulbs.[57]

Grocers used fluorescent lights not only on store ceilings but also inside display cases. Bright lighting for meat display brought out "the full richness of the coloring and the sparkle of freshness."[58] The Seeger Refrigerator Company noted in its 1941 advertisement that "the new 'Fluorescent' light floods the [meat display] case with a brilliant glow without loss of color to food displayed."[59] In addition, fluorescent lights emitted a small amount of ultraviolet radiation, which helped retard the discoloration of meat by preventing bacteria growth on a surface of cut meat. According to one study, when the refrigerator was kept relatively cold (38°F–40°F), with humidity at 85 to 90 percent, the ultraviolet radiation doubled the time that packaged meat remained in "attractive, salable condition," as compared with meat without fluorescent lighting.[60]

Fluorescent lights were available in a wider range of colors than were incandescent lights. The selection of the correct light color was crucial for selling meat and fresh produce. Ordinary fluorescent light for room illumination contained "too much blue and too much green."[61] The fluorescent tube marked "white," for example, made meat look gray, even before the meat color actually changed. The "daylight" tube (which looked bluish in color when lit) could be used for the grocery department but was not suitable for the meat display. According to *Meat Merchandising*, the only fluorescent tube that grocers should use for meat display was the "soft white" color, which had a pinkish and slight yellowish cast. Some of these soft white tubes were developed particularly for meat lighting to slow the color changes of meat and make the product look more attractive.[62] General Electric recommended its "deluxe cool white" light for meat display. Like soft white, it contained a pinkish shade and emphasized warm colors, including the pink and red colors of meat products.[63] Even special colors had been developed for food display by the 1940s.[64]

When retailers used a pinkish fluorescent tube for meat display, it tended to make the fat look pink. But by "toning" the white color lighting with a certain amount of red color, the mixture of white and reddish lighting provided meat a better look. One food store placed a number of overhead red neon identification signs above meat display cases. These illuminating signs not only told the shopper where the meat products could be found but also distributed red light among the white lighting from other in-store lights; consequently, the red color of meat stood out and the fat remained white. Another way to add a small amount of pink to meat lighting was to paint red stripes on the porcelain reflector or on the light tube itself.[65]

Grocers also tinted regular fluorescent bulbs with green and red or purchased pre-colored light bulbs to magnify the characteristic color of a display—such as the green of vegetables and the red of meat.[66] In a 1941 advertisement, General Electric emphasized "appetizing displays" created by its fluorescent lights tinted with colors. Its light green glass tubes made fruit and vegetable displays look "fresh and cool." Fluorescent lights with a light tan color could "provide a warmer, more appetizing tone" for meats.[67] Reddish lighting was especially useful for meats that were already beginning to turn a grayish-red in daylight.[68] A decade later, color consultant Howard Ketcham echoed grocers' emphasis on the importance of colored lighting in his 1958 book, *Color Planning for Business and Industry.* Color-corrected lights would make meats "look their true prime best" with "invitingly fresh and appetizing" color. Fruits and vegetables took on "the garden-fresh appearance," as if "they were growing in sunlit gardens," noted Ketcham.[69] Controlled lighting allowed grocers to enhance the freshness appeal of fruits, vegetables, and meats not simply by brightening up the entire store but also by creating the "natural" color of these products.

The color of store walls affected the reflection of lighting and its color, as well as the viewer's color perception. The "dead white" color of a wall at a wholesale meat store made the carcass look grayish-red, because looking at a white surface produced a gray afterimage. After studying the colors of fresh steaks under different lights in the 1930s, color consultant Faber Birren advised the store to change the wall color to turquoise blue, which would make the meat "appear redder and more inviting."[70] By employing a functional color approach, Birren helped grocers create visual environments for making foods look fresh and appetizing. Grocers, as well as color consultants like Birren and Ketcham, helped standardize and normalize the "right" color of foods.

The Enhancement of Freshness

The creation and presentation of fresh colors required management not only of store interiors but of the food itself. While the bright and clean ambience of a store accentuated the fresh appearance of perishable products, bright lighting did not, for example, make oranges with blemishes look perfectly orange or turn overripe brown bananas back to yellow. Post-harvest handling, refrigeration, and packaging materials helped retailers maintain the freshness of foods by enhancing the brightness of their colors and retarding their deterioration.

Wax Coating

Beginning in the 1920s, the expansion of the market and the growth of the grocery business required growers and packers to supply fruits and vegetables with uniform color. Post-harvest treatment, particularly wax coating, became a common practice for agricultural producers before shipping their products to food retailers across the country.[71] Some fruits and vegetables, such as citrus, were naturally coated with waxy substances, which prevented water loss. But the effectiveness of the fruit's natural coating was diminished by the soaking, washing, and brushing of fruit in packinghouses. Growers and packers began using synthetic materials, usually petroleum based, in the 1930s to coat fruits and vegetables, including citrus, apples, pears, carrots, and eggplants.[72] A *Progressive Grocer* article noted in 1936 that "nature-ripe fruits and vegetables [would] soon be available to city dwellers" due to the "discovery" that "coating them with a thin armor of wax [would] keep them fresh." The author reported that the shelf life of wax-coated apples was three times longer than that of untreated apples; oranges and grapefruit stayed "fresh" for six months instead of six weeks. Tomatoes could be picked ripe instead of green and remain fresh twice as long by coating the skins.[73]

The purpose of commercial wax coatings was to extend storage life by reducing the fruits' respiration and moisture loss. The coating also improved the appearance of fruits and vegetables by adding shine to their skins and retarding blemishes caused by product deterioration. For example, wax coatings applied to green apples delayed the development of a yellow color, softening, and mealiness.[74] Waxing materials decreased the loss of sugar and water in carrots, as well as shriveling, shrinkage, and water loss in cucumbers, most root crops, squash, pumpkins, sweet corn, eggplant, peppers, and tomatoes.[75] The effect of the coating treatments depended on storage temperature, thickness and type of coating, maturity at harvest, variety, and the condition of the fruit or vegetable.[76] Immature apples, for example, tended to generate off flavors after coating.[77] Thorough and consistent control over harvested produce was necessary for growers and packers to supply products with bright, uniform colors and prolong their shelf life.

Refrigeration

Once agricultural products arrived in retail stores, proper humidity and temperature control of produce displays were critical for maintaining the quality of fruits and vegetables and keeping their fresh appearance. When adequate refrigerated cases were not widely available in the early twentieth century, water spray and ice were the best means for grocers to keep perishables cool and fresh. Spraying water over the buds of fruits and vegetables helped prevent or retard the wilting and shriveling of produce, improving the "color and sales appeal."[78] Fruits and vegetables constantly release moisture into the air as part of the ripening process. Loss of water deteriorates their color and general physical condition. Proper humidity helped create a look of "freshness" and "crispness" by preserving the water content of the produce.[79] Crushed ice, spread under fruits and vegetables in display cases, provided both a low temperature and the proper moisture to keep "the full value of their attractive colors." Tomatoes, green onions, leaf lettuce, cucumbers, and peppers, displayed on ice, looked "garden fresh, vitamin rich, and delicious to eat."[80] Moreover, water drops on the skin of produce and crushed ice underneath provided customers with visual cues that the fruits and vegetables displayed were kept fresh. Even after better refrigerated cases became widely available, grocers continued to use water spray and ice in produce sections.

The development of refrigerated display cases gave the impetus to successful merchandising of perishable foods, especially meat. Commercial refrigerators became available in the 1910s. These refrigerators were equipped with large tanks of cracked ice and salt to keep foods cold. Because these early display cases took up considerable store space and were priced high, they were not suited to small grocery stores.[81] In the mid-1920s, the Frigidaire Company developed refrigerated coils as a substitute for the cracked-ice and salt tanks, freeing up the space that had been taken up by the tanks, ice, and salt.[82] In the late 1930s, the Great Atlantic & Pacific Tea Company (A&P)—the leading American grocery chain store—pioneered the self-service refrigerated meat case by converting a fish and delicatessen case into a meat display case. Equipment manufacturers modified A&P's improvised case and began manufacturing refrigerated display cases designed for self-service meat by the 1940s.[83] These manufacturers pitched the visual appeal and freshness of meat that their refrigerators provided. "[Consumers] see what they want and buy what they see!"—one of the leading display case manufacturers, Hussmann, advertised.[84] These manufacturers stressed visibility as a key to successful meat merchandising.

When A&P opened its first self-service meat department in four of its stores in Massachusetts, Rhode Island, and Connecticut in June 1941, the news "spread like wildfire" among grocers in the Northeast.[85] It was initially a combination of service-type and self-service merchandising. In each store, butchers cut, weighed, packaged, and priced meats in a back room in anticipation of the day's sales and displayed the packaged meat in refrigerated cases. A clerk was responsible for attending the "self-service" case to supervise the products and consult with consumers who were not used to buying self-service meat.[86] The new operation was relatively successful, increasing meat sales in the experimental stores by about 30 percent.[87]

While A&P's first self-service meat department was relatively successful compared with earlier ones, the leading chain store still faced the problems of meat discoloration and labor cost. Before the postwar period, refrigerated cases were not effective enough in cooling foods for complete self-service operation, although they helped grocers further prolong the shelf life of produce and meat. Two layers of packaged meats were ideal for refrigeration in self-service open display cases because the temperature of 35°F could be maintained. On busy days, however, grocers piled the meats in three or four layers. Unless the meats moved quickly, the height of the packaged meats raised the temperature to 45°F to 50°F in the top two layers, resulting in discoloration and shrinkage. Store clerks constantly watched over display cases and removed discolored meat. To prevent the deterioration of meat color, clerks needed to rotate the packages; the self-service meat department hence required constant supervision.[88] "Self-service" ironically demanded full-service from the store's staff.

Transparent Film

Besides adequate refrigerated cases, grocers needed a packaging material that preserved color and was physically strong enough to protect the meat.[89] To prolong meat's red color, the package needed to provide controlled water vapor and oxygen passage; be odor-proof, flavor-proof, and grease-proof; and provide inertness to wet products. It also needed to be relatively inexpensive. While excessive moisture loss should be avoided, the surface of the meat had to be kept relatively dry to impede mold growth.[90] In addition, meat retailers believed that the transparency of packaging materials was "mandatory" in self-service meat display, as the buyer could make a choice without the "intervention" of in-store butchers.[91] Transparent films manufactured prior to the mid-1940s were not equipped with all the qualities necessary for wrapping meat for self-service.

Swiss textile engineer Jacques Brandenberger invented the first transparent film in 1908. He created cellulose film derived from wood pulp (cellulose) and named it cellophane, from the words "cellulose" and "*diaphane*" (meaning "transparent"). In 1917, Brandenberger assigned his patents to La Cellophane Société Anonyme, a new French company formed to commercially promote his invention. By 1922, out of four hundred tons of cellophane manufactured in France, nearly 40 percent was sold in the United States market. One of the earliest customers for cellophane was Whitman's candy company, which used the film to overwrap chocolate boxes. Whitman's imported cellophane from France until 1923, when La Cellophane licensed to E. I. du Pont de Nemours & Company (DuPont) the exclusive rights to manufacture and sell cellophane in the United States.[92]

Cellophane was the earliest transparent packaging material used for foods. Initially, its sales and use were limited, with it being primarily used as an outer wrapper for boxes and non-food products. While cellophane was waterproof, it was not moisture-proof; consequently, the film was not useful for direct packaging of food products that needed to be protected from water vapor. Furthermore, cellophane was expensive compared to other flexible packaging materials, such as waxed paper, parchment paper, and glassine, which had been used for foods extensively. Since these materials were mostly opaque, DuPont promoted cellophane's transparency as the major selling point. However, many food producers and retailers whose profit margins were relatively low were reluctant to shift from papers and other less expensive wrappers to the newly developed film, believing that what they had been using was good enough.[93]

In 1927, DuPont chemists successfully developed moisture-proof cellophane. Food manufacturers began using the film for packaging various products, including baked goods, cheese, sliced bacon, hams, sausages, and other cured meat products.[94] To promote cellophane to food manufacturers, DuPont managers insisted on the importance of visual information for selling foods. They argued in the firm's 1928 brochure that "every detail of color, size, shape and texture [was] clearly apparent" through cellophane. Appealing to the visual sense was particularly important because food's "delicious appearance" could "tickle the palate and tempt the customer to buy" the product.[95]

The moisture-proof cellophane was not necessarily an ideal solution, however. It was brittle and nondurable at low temperatures and thus not well suited for self-service meat display cases.[96] Nor did the film solve the problem of meat discoloration due to inadequate moisture control inside the package. Discoloration occurred on the bottom of meat, where it rested on the cellophane (grocers usually wrapped meat directly in cellophane without a tray).[97] In fact, when A&P first started its self-service operations in 1941, the store used cellophane to provide visibility to shoppers and inserted a sheet of waxed paper between the meat and the film to prevent discoloration.[98]

Many chemical and packaging manufacturers, in keen competition with one another, saw the commercial potential of transparent film during the 1930s and 1940s. The Sylvania Industrial Corporation began manufacturing cellophane under a Belgian patent in 1930. (DuPont's cellophane was based on a French patent.) In 1936, the Goodyear Tire and Rubber Company introduced a rubber-based film called Pliofilm. Other chemical companies also developed transparent films for food packaging, including the Dow Chemical Company's Saran, the Dewey and Almy Chemical Company's Cry-O-Rap, and the Celanese Corporation's Lumarith cellulose acetate film.[99]

DuPont held a relatively advantageous position in the transparent packaging market. Soon after Sylvania introduced its cellophane, DuPont sued successfully for patent infringement. In 1933, the two companies signed a contract that ensured DuPont an 80 percent share of the cellophane market in the United States.[100] Goodyear Tire's Pliofilm was highly transparent and resistant to tearing; it had the ability to control the loss of moisture and still permit the transfer of enough oxygen to the meat to retain its bright color. Due to its higher price, however, sales of Pliofilm remained smaller than that of DuPont's cellophane: Pliofilm sales made up about 2 percent of total cellophane sales in 1939 and increased only to 4.4 percent by 1949.[101] These various films provided protection and transparency for the packaging of a wide range of food products, yet none of them were adequate as self-serve meat wrappers.

Packaging Freshness

Self-service merchandising for perishable foods began to grow in the early 1940s, although neither adequate refrigeration technology nor adequate packaging materials was yet available. The labor shortages spawned by World War II helped augment self-service, or semi-self-service, retailing. Almost all butchers at the time were men, and many butchers and meat department retail clerks joined the armed forces. Others turned to higher-paying war plant jobs. Many grocers believed that self-service merchandising would be an effective solution for the labor shortage in the grocery business.[102] It was not until the postwar years that the majority of meat departments became self-service. But many store managers introduced some form of self-service for meat and produce departments during the war.[103]

After World War II, breakthroughs in refrigeration technology helped expand self-service meat merchandising. Wartime material shortages and factories being converted to war production had curtailed the manufacture of refrigerated cases, but equipment makers resumed making self-service meat cases after the war and actively promoted their products.[104] Friedrich Refrigerators, Inc., was one of the earliest to promote its equipment in the postwar years: "Your meat looks better and sells better in Friedrich Floating Air Refrigerators." Stressing the importance of visibility and color contrast for meat display, the advertisement offered a color image of various cuts of meat displayed with green garnishes in the firm's refrigerated case.[105] In the late 1940s, DuPont scientists developed Freon as the primary refrigerant, which absorbed and released heat as it went through compression and evaporation processes (Freon is a gas at room temperature and a liquid when cooled). Freon could keep open-top refrigerated cases cold enough (under 40°F) to preserve the color of meat more effectively and longer than before.[106] With open-top display, customers could look down at meat packages lined up neatly. They could view the meat from a distance or choose a package that looked good and inspect it up close.

The development of a new transparent film also promoted the establishment of complete self-service. In 1946, DuPont finally introduced cellophane that was moisture-proof and had a high oxygen-transmission rate, effective for wrapping self-service meat.[107] One side of the film was coated with water-resistant nitrocellulose. When the uncoated side (or "wettable" side) was kept in contact with the moist fresh meat, it absorbed the moisture from the meat surface. The outer, coated side prevented the escape of moisture. Both sides of the sheet permitted transmission of a moderate amount of oxygen sufficient to prevent bright red meat from turning brown and to preserve the bloom of the cuts.[108] The new cellophane offered meat department operators other advantages, such as ease of handling, transparency, adaptability to various sizes of meat cuts, and low cost. Its strength and resistance to tears also made it possible for shoppers to handle meat wrapped in cellophane without harming the product.[109]

DuPont managers believed that the expansion of self-service meat, as well as other food products, would be a way to increase their cellophane business. While promoting the advantage of using cellophane in their advertisements, DuPont repeatedly advocated the benefit of self-service merchandising to the public during the 1930s and 1940s (plate 8). To convince store operators to adopt self-service merchandising, the firm also published a number of market studies and pamphlets for grocers and food businesses, such as *Merchandising Trends in Fresh Fruits and Vegetables* and *Self-Service Meats*.[110] DuPont executives stressed to its employees that they should be aware of their mission of expanding self-service as well as cellophane.[111] Self-service was good for business not just for grocers but for the growing armada of manufacturers who sold the technology that made self-service shopping possible.

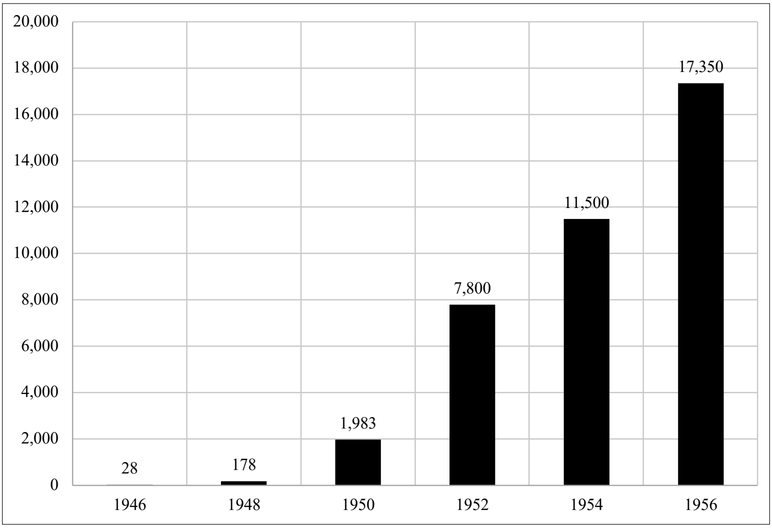

Figure 7.2 The Number of Grocery Stores with Self-Service Meat Departments, 1946–1956. Data sources: Sam Teitelman, "Self-Service Meat Retailing in 1950," *Journal of Marketing* 15, no. 3 (January 1951): 309; *Facts in Grocery Distribution* (New York: Progressive Grocer, 1960).

The number of self-service meat departments increased rapidly by the mid-1950s. In 1946, there were only twenty-eight supermarkets offering self-service in their meat department; by 1956, approximately seventeen thousand stores offered total self-service for packaged fresh meats—more than 50 percent of all supermarkets in the United States (figure 7.2). By the end of the decade, self-service had become the typical way to shop for meat in American supermarkets.[112]

Innovations in refrigeration and wrapping materials also allowed food retailers to prepackage agricultural produce for self-service. Supermarket operators had begun experimenting with the prepackaging of fruits and vegetables during the war years.[113] Among the first to enter this field was A&P, which set up test stores in the Columbus, Ohio, area in 1944 and conducted research on methods for prolonging the shelf life of perishable products. Produce departments never became totally dominated by prepackaging or self-service, but by the early 1950s, nearly 45 percent of the produce departments in American supermarkets were operating on a self-service basis.[114]

Most of the packaging operation was the work of retailers rather than growers or packers. Once boxes of bulk produce came into the packaging room in supermarkets, grocers sorted, trimmed, cleaned, and packaged the products on-site. They usually used moisture-proof cellophane and other transparent films. Large items and those of irregular shape were wrapped in a sheet of cellophane; smaller items were slipped into cellophane bags; and items that needed special protection were placed in trays, then wrapped in cellophane. After packaging, store clerks weighed each item, marked the price, and placed it in a carton, which was then sent to the retailing floor, where the items were placed in refrigerated self-service cases.[115] Some produce, including washed spinach and tossed salad, was not packaged in retail stores because extensive equipment was necessary; the packaging of these items could best be done through a large-scale operation at the grower or packer level.[116]

One of the greatest challenges for produce prepackaging during the 1940s and 1950s was maintaining the quality of produce within the package. Some stores received complaints from their customers that they were disappointed by packaged produce because its quality was not consistent. Consumers also noted that some packaged items did not provide sufficient visibility.[117] Grocery manuals and trade journals advised retailers to package only top-quality fruits and vegetables to guarantee the quality of packaged produce, warning that consumers who found items of undesirable quality in a package would lose trust in the store.[118] As vision became the primary sense for discerning product quality through transparent film, it became increasingly difficult to judge the texture and smell of produce in stores. A lack of visibility, as some customers complained, became a problem; they could otherwise have known food quality through other sensory features.

Grocers generally considered selling packaged fruits and vegetables more advantageous than selling them in bulk: less waste, increased profits, and faster service.[119] Careless handling by consumers and store clerks often damaged fruits and vegetables. Customers, for instance, tended to toss lettuce around the display case, and the leaves became loose, fell off, and became discolored. When a head of lettuce was in a package, it could withstand handling by consumers and retailers.[120] At a supermarket in Belleville, Illinois, losses of lettuce fell to under 2 percent as compared with 11 to 12 percent losses before the store started prepackaging heads individually.[121]

A drop in spoilage losses, as well as better appearance, meant higher profits and sales. Prepackaged vegetables generally outsold those displayed in bulk, even when bulk produce was less expensive.[122] In one supermarket in Wichita Falls, Texas, produce sales rose from 12 percent of total store sales to 20 percent within a few months after switching to self-service retailing of prepackaged produce in 1946.[123] According to a 1954 survey, a store in Minnesota increased the produce department's share of total store sales an average of 2.5 percent after converting to complete self-service of packaged produce.[124]

Convenience for consumers was another advantage of packaged self-serve produce.[125] Packaged fruits and vegetables were easier to carry and store. There was no need for customers to wait for a clerk to weigh and price the merchandise. They had ample time to make selections and comparisons from a large variety of produce attractively displayed in open refrigerated cases.[126] In addition, it was no longer necessary to shop for fruits and vegetables early in the day, soon after they arrived at the store. Packaging and refrigeration in the store guaranteed that everything stayed "just as fresh, crisp, and healthful" later in the day as it was in the morning.[127] When only a portion of the whole vegetable or fruit was used, consumers could store the remaining part in the package and put it back in the refrigerator. Many market studies reported that consumers generally preferred prepackaged self-serve produce to bulk retailing. According to one study, nearly 90 percent of women interviewed preferred to buy tomatoes in transparent wrapping rather than unwrapped.[128]

As self-service produce and meat departments became the norm for many supermarkets in the late 1940s and 1950s, the new retailing system transformed how consumers understood the freshness of foods. The bright produce and meat displays provided customers with visual information about the freshness of the product while eliminating clerk-customer interactions.[129] The architectural change in self-service stores that allowed shoppers to wander the aisles independently had already been underway since the 1920s. The self-service retailing of meat and produce now curtailed customers' reliance on experts in these products. In a meat department, butchers and "wrapping girls" who weighed and wrapped meat usually worked in a back room, unseen.[130] Produce clerks also became involved mainly in prepackaging produce in a specially designed room commonly at the rear of the store.[131] The labor of the supermarket had become nearly invisible to shoppers; instead, what lay before them was nature's brilliant bounty, colored by the most modern science and technology, arranged and packaged for their convenience.

Conclusion

The modern supermarket is the result of innovations in grocery store architecture and science, driven by the need to sell "freshness" to the modern consumer. Color, visual order, and cleanliness became crucial factors for retailers in presenting the freshness of foods in self-service stores. Instead of personal interactions with butchers, lonely shoppers navigated their way up and down aisles looking at cellophane packaging and prepriced cuts of meat. The labor of producing all this packaged beauty became invisible. Meat became magic.

This visual perception of freshness became increasingly separated from the temporal definition. Customers looking at shiny tomatoes and bright red meat made assumptions about their quality based largely on how they looked rather than on how much time had passed since the tomatoes were harvested and the meat was cut. With systematic efficiency and constant control over the mass display of uniformly bright foods, grocers constructed a particular aesthetic of freshness that represented brightness, sanitation, and abundance. The emphasis on vision, as well as the elimination of disagreeable odor, became essential for successful store operation.

The modern grocery store became a cold place—and not just because of new refrigeration systems. The technological development of packaging and store equipment enabled grocers to establish a new retailing system, transforming not only the way they sold and presented foods to customers but also the visual environment in the store. Transparent packages provided consumers with better visibility while allowing retailers to control and maintain a standardized "fresh" look of perishable foods. Bright lights and mirrors in new glass display cases created illusions of fresh abundance. Refrigerated display cases also enabled grocers to prolong the freshness of produce and meat. Freshness was no longer a natural state of foods but a marker of marketability that producers and retailers carefully controlled in a sanitized, standardized environment. As the natural beauty and abundance that perishable foods embodied became the sign of freshness, consumers came to rely more on their eyes in selecting foods than store clerks' assistance. This, in turn, intensified the commodity fetishism of food, as visual appeals of food supplanted a social relationship between customers and clerks, replacing it only with a relationship between people and goods.

· 8 ·

Reimagining the Natural

In the postwar era, American culture—not least its food—had an outsize role to play on the world stage. The dizzying array of food products, household goods, advertisements, Hollywood films, and popular music came to symbolize the triumph of American capitalism in the mid-twentieth century, as Richard Nixon—the then US vice president—alleged at the Kitchen Debate in Moscow in 1959.[1] The emergence of the new consumer culture, marching alongside the unprecedented economic growth of the post–World War II period, fundamentally transformed how and what people consumed—and how they imagined themselves as consumers.

Not all voices were unanimous in heralding the new age of consequence-free convenience. A number of cultural critics, academics, and journalists, including John Kenneth Galbraith, Vance Packard, and Betty Friedan, challenged the ideal of American affluence and insisted on the adverse effects of prosperity on society and individuals since the 1950s.[2] The expansion of highly industrialized food production and processing seemed to encapsulate a "social malady": homogeneous food products laden with chemicals, giant supermarkets filled with colorful packages and endless shelves of foods wrapped in plastic, and a food system that prioritized efficiency and productivity at the risk of consumer health and the environment.[3]

Beginning in the 1940s, agricultural production and food processing came to rely on synthetic chemicals more than ever before, leading to the "Golden Age for American food chemistry," as Harvey Levenstein noted in his 1993 study on US food history.[4] The economical production of synthetic fertilizer became possible just before World War II. Farmers began using an unprecedented amount of chemicals to increase their production. Livestock farmers started vaccinating animals with antibiotics. Food manufacturers began using a wide variety of chemical additives to prolong shelf life, make texture consistent, and give foods an attractive appearance. Many industry reports and trade journals in the 1940s and 1950s insisted on the economic necessity of these chemicals for the agricultural and food processing industries.[5]

The decades of the 1950s, 1960s, and 1970s were an era when various groups of people envisioned alternatives to industrial food production and consumption. Consumer activists and young adults who embraced the counterculture movement revolted against the oligopolistic food industry and advocated the consumption of what they believed were "natural" foods. They pursued what Warren Belasco has called "responsible capitalism," in which business would operate without exploiting consumers or workers.[6] Legislators explored new ways of regulating the use of food additives (sometimes in cooperation with industry). Dye manufacturers and food processors, facing growing skepticism about the expanding use of chemical additives, began to shift their color management strategies and experiment with natural food dyes. This search for alternatives by consumer movements, government, and industry generated a reformulation of ideas about the "natural."

Those who opposed the use of synthetic food dyes included a wide range of groups: organic food advocates, environmentalists, journalists, scientists, students, and housewives. Their movements were diverse and sometimes diffuse, with few close connections to one another. Nor did all of them necessarily share the same agenda. For example, those who devoted themselves to organic foods were not necessarily engaged in the counterculture movement. Yet they all shared concerns about the consequences of the industrialization of food production and expansive use of chemical additives on human health and the natural environment. Consumer groups became one of the important channels advocating for stringent food safety policies at the White House.[7]

Color Wars

A wide variety of precooked and prepackaged products flooded into the American kitchen beginning in the 1940s, ranging from cake mixes and frozen concentrated orange juice to processed cheese and TV dinners. Slices of bright yellow canned pineapples, colorful Jell-O desserts and salads finished with red maraschino cherries, and plump green canned peas embellished pages of cookbooks and women's magazines. The consumption of frozen foods increased rapidly after World War II.[8] Although frozen foods had been available in the 1920s, it was not until the mid-twentieth century that frozen foods entered the mass market, due to their earlier high price and lack of sufficient refrigeration technology in both food stores and households.[9] Commercially processed foods accounted for nearly 40 percent of the foods consumed at home by 1955.[10]

Summarizing the new food consumption patterns in postwar America, a 1955 grocery trade journal described these prepared foods as "built-in maid and chef service," providing housewives with convenience.[11] Food advertisers and domestic advisers, including cookbook writers and magazine editors, framed ideas about convenience as the hallmark of creative cooking and a modern life. They stressed that convenient packaged goods did not indicate housewives' laziness but would instead aid them in presenting their creative skill and provide more nutritious and various meals for their family without failure. They touted these products as symbols of liberation and freedom: an end to time-consuming chores, a new era of easy cooking, and seemingly limitless access to foods—including out-of-season produce.[12]

Processed foods were products of chemical synthetization, invented in laboratories; manufactured in factories; and made up primarily of artificial ingredients, including color additives, artificial flavors, preservatives, and dehydrated eggs. A food scientist at the University of California, Davis, asserted at a 1957 congressional hearing that "the use of chemical additives offer[ed] great possibilities" because they could enhance consumer acceptance of foods, including their new colors, flavors, and textures.[13] Synthetic food dyes in particular were critical ingredients needed to "add life and zest to our daily diets," in a dye manufacturer's words.[14] They allowed food manufacturers to create a bright new world of standardized food colors.

With the dramatic increase of artificial ingredients, some of the substances caused serious health problems—much larger scale than what Harvey W. Wiley saw in the 1900s, as discussed in Chapter 3. In the fall of 1950, a number of children developed abdominal pains and diarrhea after eating orange-colored Halloween candy manufactured by the Sweet Candy Company of Salt Lake City, Utah.[15] Workers in a candy factory also reported an "itching rash" on their hands and neck.[16] In December 1955, nearly two hundred people, mostly children, became ill after eating red-colored popcorn.[17] Scientists in the Food and Drug Administration (FDA) concluded that the cause of illness in the two instances was synthetic dyes contained in the candy and popcorn: FD&C Orange No. 1 and FD&C Red No. 32, respectively. These were synthetic dyes certified for food use under the 1938 Food, Drug, and Cosmetic Act.[18] Orange No. 1 was one of the most widely used dyes, contained in such products as soft drinks, candies, baked goods, and meat products. Red No. 32 was a dye used primarily for coloring oranges in Florida and Texas.[19]

Alongside eye-catching packaging and ubiquitous advertisements stressing convenience, skepticism about unknown ingredients, like synthetic dyes and other chemicals, began to appear in various media in the mid-twentieth century. A series of articles in the *New York Times* in the early 1950s reported doubts over the safety of previously approved dyes.[20] Rachel Carson's 1962 book *Silent Spring* asserted the deleterious effects of chemical fertilizers, particularly DDT, on the environment and the human body.[21] J. I. Rodale, who applauded *Silent Spring* as a masterpiece, advocated the health benefits of organic foods through his magazine *Organic Gardening and Farming*.[22] Nutritionist Adelle Davis denounced processed foods: "Certainly our overprocessed, overrefined American diet diluted with soft drinks, candy bars, and 'quick-energy' cereals has little or no relationship to wholesomeness."[23] The advancement of food technology and science was ultimately inseparable from elevated health risks and environmental degradation.

Mainstream authorities, including scientists, food manufacturers, and chemical suppliers, dismissed consumer activists, writers, and environmental advocates as "freaks" and "crackpots." Corporate managers and scientists became frustrated by "the sensational and misleading information," in the words of biochemist Bernard L. Oser, who at the time worked at research firm Food and Drug Research Laboratories and urged food safety.[24] Nor was there yet any significant surge of popular interest in natural or organic foods. In fact, Rodale's business struggled, and his journal *Organic Gardening and Farming* did not gain a broad audience until 1969.[25]

At around the turn of the 1970s, a series of environmental accidents, including the Santa Barbara oil spill in 1969; mounting news stories about DDT; and health problems caused by chemicals in foods, cosmetics, and drugs, provoked public awareness and government regulation. In 1971, Rodale made the cover of the *New York Times Magazine*, which featured the "current popularity" of organic foods.[26] In 1972, the federal government banned the use of DDT for agriculture. And in the ten years between 1962 and 1972, readership of Rodale's *Organic Gardening and Farming* more than doubled.[27] The natural food business began to slowly develop—particularly in California and Colorado, which attracted a new generation of potential entrepreneurs and customers engaged in the counterculture movement. In 1971, for example, Alice Waters—a graduate of the University of California, Berkeley—opened the restaurant Chez Panisse in Berkeley and offered locally grown ingredients on her menu. Her "California cuisine" helped alter the image of organic foods from dull and tasteless to fashionable, pleasurable, and appetizing.[28] Although the organic food market still remained small, there were growing movements—particularly among students and professionals involved in the counterculture movement—advocating an alternative to the mainstream food system.

These movements employed the color of food as a representation of their political agenda—beans, brown rice, and brown bread became symbols of a "countercuisine."[29] The public image of white breads, specifically those mass-produced and prepackaged in plastic, changed dramatically from the early to mid-twentieth century. Both white bread and plastic symbolized scientific progress and modernity in the first decades of the twentieth century. Those who promoted diet reform, including Sylvester Graham, had insisted on the nutritional value of whole wheat brown bread since the 1830s.[30] Yet professional bakers, millers, and nutritionists asserted that pure white bread was nutritionally superior. In the early twentieth century, eating white bread, and whiteness in general, also symbolized physical strength and control over others, including the Americanization of immigrants.[31]

With the rise of distrust against corporate manipulation, chemical additives, and uniformity in the late 1950s and 1960s, the visual impact of white bread spurred increasingly negative reactions. According to 1956 research conducted by Ernest Dichter, a prominent market researcher in the mid-twentieth-century United States, the whiteness of bread connoted not only blandness but also a lack of sensory appeal. Dichter reported that his respondents often stressed the different sensory experiences between eating packaged white bread and homemade bread, particularly softness and flavor.[32] When the bread was "too white," or what one interviewee called "pasty white," they associated the white color with a lack of nutrition, even when the bread was enriched with artificial nutrients. One interviewee stated, "It's so white, like all the good was milled out of it. I think [bakers] must use a lot of dried or substitute stuff—you know, dried milk and things like that."[33] In fact, bakers removed all colored ingredients, bleached the remaining flour, and added preservatives and stabilizers to prevent discoloring and decay.[34] The lack of sensory appeal and nutrition that the whiteness evoked hindered most of Dichter's respondents from serving white bread to their guests at their dinner table.[35] *Vogue* magazine editor Diana Vreeland once proclaimed in the 1960s: "People who eat white bread have no dreams."[36]

White bread became "an icon of all that was wrong with America," as Aaron Bobrow-Strain argued in his 2012 history of white bread.[37] As plastic came to signify the culture of mass consumption, artificiality, and waste by the late twentieth century, white bread became an apt exemplar of "plastic food."[38] Contrary to popular belief, brown bread's color alone was not necessarily a sufficient indicator of nutritional value. Bread manufacturers sometimes used food dyes to make bread look darker and hence more nutritious than it actually was. A 1976 *Consumer Reports* study reported that neither white nor dark bread was nutritionally superior.[39] Nonetheless, apart from its actual nutritional value, brown became the color of natural, authentic, and modish to the new food cognoscenti, whereas white represented blandness, manipulation, and conformity.[40]

A New Food-Coloring Regime

The federal government began reviewing food safety policies in the 1950s. Congress appointed a Select Committee to Investigate the Use of Chemicals in Food and Cosmetics in June 1950. The so-called Delaney Committee (named after its chairperson, New York representative James J. Delaney) conducted a number of hearings from 1950 to 1953 on the possible carcinogenicity of pesticide residues and food additives. The Delaney Committee and subsequent congressional committees proposed several amendments to the 1938 Food, Drug, and Cosmetic Act to regulate chemical substances.[41] Congress enacted a series of legislation concerning the use of chemicals in food production and processing, including the Pesticide Chemicals Amendment (1954), the Food Additives Amendment (1958), and the Hazardous Substance Labeling Act (1960).

The Delaney Committee hearings, food poisoning incidents, and broad publicity in the media prompted FDA scientists to reevaluate certified colors. The federal government banned eleven synthetic dyes for food use between 1955 and 1960.[42] It ordered, for example, the decertification of four dyes, FD&C Yellow Nos. 1, 2, 3, and 4, in 1957.[43] The ban on Yellow Nos. 3 and 4 in particular became a pressing issue for dairy producers and margarine manufacturers. The dyes had been important ingredients for giving rich yellow color to butter, cheese, and margarine.[44] A number of state and municipal governments, including Wisconsin, Massachusetts, and the city of New Orleans, also proposed a ban on synthetic dyes used for processed meat products, including sausage and ham, in the 1950s.[45]

Orange No. 1 and Red No. 32—the dyes that had caused the candy and popcorn incidents in the early 1950s—also became subjects of scientific investigation. Research showed that both dyes had deleterious effects on laboratory animals, including weight loss and sometimes death.[46] One study reported that Red No. 32, when used for coloring oranges, penetrated the skin, although orange growers had been insisting that the dye never went deeper than the surface of the rind.[47] It also became clear that another dye used for coloring oranges, FD&C Orange No. 2, was poisonous.[48] Secretary of Health, Education, and Welfare Marion B. Folsom ordered the removal of the three dyes from the certified color list in November 1955.[49]

The decertification of the three dyes angered dye manufacturers, food processers, and orange growers. The Certified Color Industry Committee (CCIC), consisting of major dye companies, filed a petition in federal court in February 1956.[50] Following the CCIC, the Florida Citrus Exchange, together with citrus cooperatives in Florida and Texas as well as Frank R. Schell, co-inventor of the orange-coloring process, filed another petition.[51] Orange No. 1 in particular was economically important for dye makers and food manufacturers: more than 155,000 pounds had been produced in 1955, with an approximate value of $582,000 ($5.5 million in 2018 dollars); almost all of this product went to food use.[52]

Dye manufacturers were less concerned about Red No. 32 and Orange No. 2 because of their smaller market value and production than Orange No. 1. But the prohibition of the two dyes threatened the Florida citrus industry. Not only did the ban question the legitimacy and safety of the citrus-coloring practice, but it meant the elimination of the color-add process. There was no alternative to Red No. 32 or Orange No. 2 for coloring oranges.[53]

By the 1950s, orange coloring had been widespread in Florida. At one of the largest packinghouses in the state, more than 95 percent of oranges were colored during the 1952–53 season.[54] The president of the citrus cooperative Florida Citrus Exchange contended that "eye appeal" was Florida growers' "biggest selling prerogative": "After all, they color-add potatoes, vitamin pills, and candy; why not citrus?"[55] Schell similarly asserted that the orange-coloring practice was "one of the indispensable stabilizing factors" on which the entire American citrus industry depended, not only "for continued prosperity, but for its existence as an industry."[56] Orange growers stood on the premise that oranges would not sell if they were not orange in color. They found agricultural produce not much different from processed products like vitamin pills and candy; hence, coloring oranges should be allowed. Their contention demonstrates how the ability to marshal political power was a key determinant in creating the color of orange skins.

Some FDA officials likewise believed that there was strong consumer resistance to purchasing oranges that were ripe but whose skins remained green; hence, the coloring practice was an "economic necessity."[57] Due to protests from Florida orange growers and packers, Congress passed a bill in July 1956 permitting growers to color their oranges with Red No. 32 until March 1959, while alternative colorings were being tested.[58] Proponents of the bill defended the orange-coloring practice by contending that if the use of the color was in such small quantities that it could be consumed without risk of injury or harm, the dye could be considered "harmless."[59]

Citrus growers, in cooperation with chemical firms, had been experimenting with a new dye, Citrus Red No. 2, as an alternative to the dyes they had been using. Pharmacological studies showed that Citrus Red No. 2 was possibly carcinogenic but would be safe in small amounts.[60] Congress afforded temporary approval for the dye in 1959 under the condition that it could be used only for orange skins.[61] Not only did citrus growers receive endorsement from the federal government for the dye's safety, but they also enjoyed economic benefits from the dye. Citrus Red No. 2 had "greater tinctorial power" than Red No. 32: it required only one-fifth the amount of its counterpart to give equal coloration to the fruit.[62]

Government officials did not necessarily regard the food-coloring practice itself as adulteration; rather, they believed that the use of dyes was critical for manufacturing and marketing food products successfully. Color was "a major aspect of quality; it makes food look good," argued USDA scientist John R. Matchett in 1959. He contended, "so deeply ingrained in us is our association of color with quality in foods that we color many of them artificially to correspond with our views of what they should be."[63] Like orange growers and food processors, government officials and scientists strove to find a solution for health problems due to synthetic dyes without abandoning food coloring as a standard practice.

Government scientists and industry leaders did not agree on the definition of "harmless," however. Dye manufacturers insisted that dyes were harmless if the actual amounts used for foods were not deleterious to human health, even if the dye showed adverse effects on test animals in greater quantities.[64] On the other hand, Secretary of Health, Education, and Welfare Arthur S. Flemming, who succeeded Folsom in 1958, envisioned a more stringent understanding of "harmless": dyes would not be considered harmless unless there was proof of no health effects, regardless of the amount used.[65] The 1958 Supreme Court decision on the use of Red No. 32 for coloring oranges upheld Flemming's definition. Supreme Court justices argued that the term "harmless" meant that a color could not be used if it would cause harm at any level, even if it was not harmful at the level actually used in products for market.[66]

House representatives deemed this definition of "harmless" to be problematic. They were concerned that the strict requirement would force food and dye manufacturers out of business, as there would be fewer synthetic colors available on the market.[67] As a result, a new definition of "harmless"—conceived by dye manufacturers and food processors and supporting their interests—entered United States law in 1960, when Congress passed the Color Additives Amendment.[68] Under the new law, color additives were "harmless" as far as they were "safe and suitable" for the intended use within the limit of amount approved. There was one exception: incorporating a provision suggested by the Delaney Committee, the act prohibited the use of color additives that had the possibility of inducing cancer in any amount.[69]

The 1960 amendment required the FDA to investigate the safety of all dyes on the market, including dyes that had been previously certified under the 1938 act. Color additives (both so-called natural and synthetic dyes) were "provisionally listed" for an interim period of two and a half years pending completion of the scientific investigations necessary to make a safety determination.[70] Once the FDA found a color additive safe for consumption, it was placed on a "permanent list."[71] If the dye turned out to be not harmless, the FDA would ban its use for food.

The 1960 amendment divided food dyes into two categories. Synthetic dyes were categorized as "food color additives subject to certification." The FDA required manufacturers to submit a sample from every batch of dyes produced, even if they were on the permanent list. Synthetic dyes could include impure substances, depending on manufacturing conditions and processes. If a certain batch of the dye did not meet the FDA's purity standard, the batch would not be authorized for sale. Another category was "food color additives exempt from certification"—primarily so-called natural dyes. These dyes were still subject to the initial investigation by the FDA to be approved on the permanent list before going to the market. But dye manufacturers did not need to submit a sample for further investigation. Some natural dyes, including annatto extract and paprika, were not subject to any restrictions; for others, such as some types of carotenoids, there was a restriction on the maximum amount manufacturers could use in food.[72]

It was not only for safety reasons but also for economic reasons that food dyes were removed from the certified list. Under the 1938 act, it had been the FDA's responsibility to conduct a test to prove them poisonous. There were so many additives used in foods that it became impossible for the agency to conduct research on each dye. The 1960 amendment provided instead that dye manufacturers were responsible for proving the dye's harmlessness and required them to submit the results of their safety testing to the FDA before the dye could enter the market.[73] Safety testing required substantial financial investment. Dye manufacturers tended to petition permanent listing only for those colors that were the most widely used and had few substitutes.[74] The key was to strike a balance between profitability, efficiency, and convenience on the one hand, and safety on the other.

The total amount of synthetic dyes produced dropped dramatically after the FDA banned nine dyes on the provisional list in 1965: from nearly 9 million pounds in 1964 to about 3.7 million pounds in 1967 (including dyes used for foods, drugs, and cosmetics) (figure 8.1). Although the amount began to increase again in 1968, it still remained at about the level of the early 1950s.[75] The number of approved synthetic dyes on the permanent list had dwindled to six by 1980 (there were nineteen in 1950).[76] The agency ordered, for example, the decertification of channel black and Red No. 4 in September 1976. Channel black was a dye that tinted various candies and snacks, such as black jelly beans and licorice as well as cosmetics.[77] Red No. 4 was a dye that the FDA had previously removed from the certified list in 1964 due to its potential health risks. But facing strong opposition from the canning industry, the agency relented just one year later and allowed the dye to be used only for coloring maraschino cherries.[78] Now both dyes were being eliminated from the market.

Consumer activists increasingly raised their voices against the use of synthetic dyes and other food additives during the 1960s and 1970s. Ralph Nader embodied the consumer activism of the era, when economic prosperity, the expansion of the food and chemical industries, and public policies transformed people's lives drastically. As a lawyer, writer, and consumer activist, he publicized consumer culture's deleterious impacts embedded in political and economic systems—most notably safety issues in the automobile and food industries. He played a critical role in lobbying legislatures to enact a series of consumer

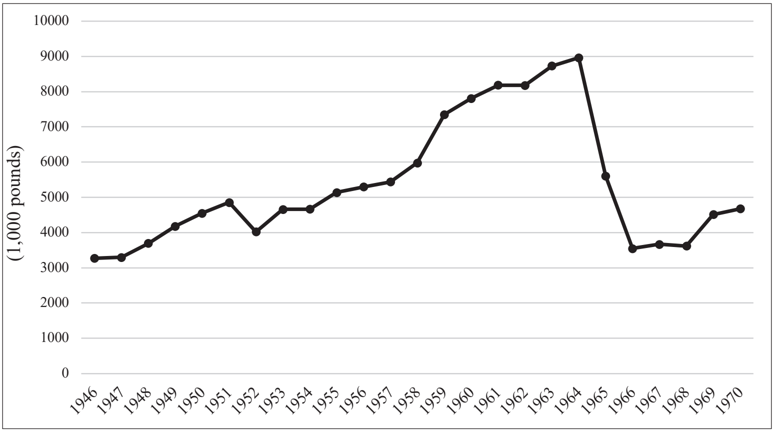

Figure 8.1 The Amount of Dyes Certified in the United States, 1946–1970. The figure included dyes certified for foods, drugs, and cosmetics. Sources: *Annual Reports of the Federal Security Agency* (Washington, DC: Government Printing Office, 1946–1952); *Annual Reports of the U.S. Department of Health, Education, and Welfare* (Washington, DC: Government Printing Office, 1953–1970).

protection laws, including the National Transportation and Motor Vehicle Safety Act (1966), the Wholesale Meat Act (1967), and the Wholesale Poultry Act (1967). By organizing consumer groups staffed by law student volunteers, scientists, and lawyers, and by employing his rhetorical skill, Nader was one of the earliest to turn his social critique to a consumer movement, which continues to this day.[79]

One of the enduring agenda items for consumer groups was the elimination of synthetic food dyes from the market. Nader requested the FDA to conduct further investigation on dyes.[80] His study group published *The Chemical Feast* in 1970, criticizing food processors for seeking to meet consumers' needs through "a versatile misuse of modern chemistry, packaging, and merchandising techniques."[81] Biologist Michael F. Jacobson, who had volunteered for Nader, cofounded the consumer group Center for Science in the Public Interest with two other scientists. Jacobson conducted scientific research on the safety of all food dyes and other commonly used additives.[82] In his 1972 book, *Eater's Digest*, Jacobson disclosed the prevalent use of synthetic dyes in a wide range of food products.[83] In newspapers, television shows, and magazines, both Nader and Jacobson publicized the hazardous health effects of food dyes.

Alerted by Nader's and Jacobson's publications and public protests, consumers sent out "thousands" of letters to the FDA.[84] A woman from Cleveland, Ohio, wrote to the agency in May 1971: "I heard that red food coloring was unsafe. How do I know if it's safe to eat cherry or strawberry Jello [*sic*]? It's important that I know."[85] Similar inquiries poured into the FDA. Along with their letters, some people enclosed newspaper articles featuring Nader and asked for further information about food dyes.[86] FDA officials stressed the safety of food colors on the market, noting that the dyes had passed the government's scientific investigation.[87] Yet uncertainties about the safety of food colors were widely prevalent among the public.

Skepticism about chemical food additives also grew rapidly in Europe during the 1960s and 1970s. Yet the FDA had generally required stricter certification of color additives than had been required in some European countries. In 1954, there were nineteen synthetic dyes certified in the United States, compared to twenty-two authorized in West Germany, twenty-six in Sweden, and twenty-eight in Switzerland.[88] In Britain, even after the enactment of a new food-coloring regulation in 1973, the number of permitted synthetic dyes surpassed that of the United States: sixteen additives in Britain versus twelve in the United States.[89]

In Europe, the member states of the then European Economic Community (EEC) adopted the E-number classification system for color additives in 1962. EEC legislation assigned food additives a unique number, consisted of three or four digits with the prefix "E," such as E123 for amaranth (FD&C Red No. 2 in the United States) and E102 for tartrazine (FD&C Yellow No. 5).[90] When a food product contained additives, manufacturers were required to declare the E-number of the additive on the label. Which E-number additives were permitted for food use depended on local authorities in each country. Legislators established the E-number system to ensure the safety of food additives and to make the use of additives transparent to consumers. However, food products with E-numbers indicated the inclusion of chemical substances that many consumers were not familiar with. For many consumers, E-numbers came to connote "E for Evils" rather than the assurance of safety.[91]

A Red Scare

Red No. 2 became one of the most controversial food dyes during the 1960s and 1970s. There were many other synthetic dyes that the federal government banned for food use during this time. One such example, little-noticed by news media despite its commercial importance, was the widely used food dye FD&C Red No. 1, decertified by the FDA a few months after the passage of the 1960 Color Additives Amendment.[92] Red No. 2, on the other hand, generated a sustained storm of attention. Due to strong opposition from consumer activists and broad media coverage, it became a symbol of hazardous ingredients, large food corporations' indifference to consumer health, incompetency of the FDA to implement effective public health policies, and the close connections between industry and government. Ralph Nader, through his policy group Health Research Group (HRG), ran extensive campaigns against synthetic food dyes. The HRG's first project was a petition to the FDA requesting a ban on Red No. 2. The campaign publicized the frequent use of potentially poisonous additives in numerous food products.[93]

Government officials and food manufacturers had deemed Red No. 2 one of the safest synthetic colors used in foods for nearly seventy years. It was one of the first food dyes the federal government certified in 1907.[94] Among the synthetic dyes used for foods, Red No. 2 accounted for nearly 35 percent of the total amount in 1967.[95] The dye provided food manufacturers with a number of economic and technical advantages. It was inexpensive and stable. It had a bluish-red color, whereas other red food dyes were bluish-pink, yellowy-red, or orange-red.[96] Due to its characteristic color, food manufactures could use Red No. 2 for a wide range of products, including soft drinks, gelatin desserts, candies, baked goods, cake mixes, breakfast cereals, ice cream, vinegar, and processed meats, such as sausage and ham.[97] Not only did the dye impart foods with red and pink colors, but it helped make white fish whiter.[98]

The safety of Red No. 2 was first cast into doubt in the 1950s. A laboratory test showed that a small number of female rats fed the dye developed more breast tumors than the control group. In response, the FDA ordered a follow-up study with eight hundred rats, with the ultimate finding that the dye had "no significant influence on the formation of tumors."[99] Contrary to the FDA's conclusion, however, a group of scientists at a 1956 international conference in Rome declared that the dye was a suspected carcinogen.[100]

Alerted by the potential delisting of Red No. 2, the CCIC filed a petition for the permanent certification of the dye in September 1965, claiming that the dye was perfectly safe for food use.[101] It was clearly an important source of revenue for many dye companies.[102] Some of the major manufacturers of Red No. 2 relied on it for up to 25 percent of their sales.[103] Because the dye could be used for a variety of foods, food manufacturers believed that it was a necessary ingredient for their products. Due to strong demand for the dye from food businesses, the production of Red No. 2 doubled between 1960 and 1970.[104]

The health risks of Red No. 2 drew wide popular attention after Soviet researchers reported test results of the dye in 1970. One of their studies concluded that it was poisonous to the reproductive organs of laboratory rats. The other studies reported the dye as a carcinogen.[105] FDA officials questioned the validity of the Soviet tests as "poor" and rejected their results.[106] They instead requested the agency's scientist, Jacqueline Verrett, to reexamine the dye in the spring of 1971.[107]

Verrett found the dye to be not harmless, but the agency did not accept her results as conclusive.[108] Another FDA scientist, Thomas Collins, conducted a further study, which showed that Red No. 2 caused rat fetuses to die. Several months later, a group of scientists declared to the agency that the data on the dye was "not encouraging" and recommended that it be banned in food.[109]

Receiving a number of adverse reports on the dye from within and outside the agency, the FDA announced the restricted use of Red No. 2 in September 1971.[110] Food processors and dye manufacturers soon protested the decision. Among them was the dye company Warner-Jenkinson, a subsidiary of the 7-Up Company and a major producer of Red No. 2. The company's main concern was that a ban on Red No. 2 would affect the use of other food dyes as well and threaten the entire food dye industry. The vice president for corporate research at General Foods, A. S. Clausi, told a *New York Times* reporter: "We're down to three usable red colors now and if they ban Red No. 2 we're dangerously close to having no reds at all. . . . From the standpoint of flexibility, it's bad for the industry."[111] Due to its commercial importance, Red No. 2 came to represent the future of the food-coloring business for food and dye manufacturers.

Consumer advocates were not happy about the FDA's decision: they wanted Red No. 2 not just limited in its uses but banned outright. The HRG urged a nationwide boycott of all foods and cosmetics colored with Red No. 2.[112] The group also asked the FDA to decertify the dye entirely. Other consumer activists criticized the FDA for favoring the food industry and insisted on the necessity of banning the red dye.[113] *Consumer Reports* magazine published a report on the dye in 1972, arguing that it should be banned until a complete study could be made.[114]

To conduct further studies on Red No. 2, the FDA appointed an ad hoc committee composed of five outside consulting scientists, including the head of the Food Protection Committee—a nonprofit, nongovernmental organization with strong ties to industry. The committee asked

Collins to redo his fetal toxicity tests using a new experimental method. After reviewing three new studies, the committee members concluded in 1973 that the test results did not indicate the toxicity of the dye. Based on these studies, the FDA intended to approve the permanent listing of Red No. 2, maintaining that the data concerning the dye's potential hazards was not definitive and could not justify prohibiting its use.[115]

With the FDA's proposal for permanent listing, General Foods resumed using Red No. 2. Nabisco, on the other hand, had permanently eliminated the dye from its products. General Mills announced that the firm would wait to resume using the dye until all controversy was resolved. In the midst of the increasing concern and confusion over the safety of the dye among consumers and food manufacturers, its production declined from about 1.5 million pounds in 1970 to about 900,000 pounds in 1975. Nonetheless, the annual output of Red No. 2 still accounted for more than $4 million in direct sales, and it was used in at least $10 billion worth of food products.[116]

A number of consumer advocates raised their voices to prevent the certification following the FDA's announcement about its plan to approve Red No. 2.[117] The HRG reviewed one of the reproductive studies done by the FDA using a different scientific method of calculating safety. The HRG's scientists contended that the dye was safe for pregnant women only at extremely low levels.[118] Some of the FDA's own scientists disagreed with the agency's decision. FDA scientist Jacqueline Verrett, who had worked on the dye, asserted that there had been "ample evidence to ban the dye." Food manufacturers believed that "a plate of food [had] to look like a Picasso painting to sell, even if in the end what look[ed] so colorful and good end[ed] up killing you," argued Verrett.[119] She documented the health risks of Red No. 2 and other chemical additives in her co-authored book *Eating May Be Hazardous to Your Health* in 1974.[120] In the following year, WBAI, a noncommercial New York City–based radio station, broadcasted a program with the same title, featuring an interview with Verrett; with Michael Jacobson, then codirector of the Center for Science and the Public Interest; and with other scientists and lawyers attesting to the danger of chemical additives.[121]

Consumer groups were increasingly annoyed with the FDA, which kept postponing its final decision on Red No. 2.[122] According to the HRG's lawyer, instead of temporarily taking it off the market, the FDA allowed Americans to consume about 2.6 million pounds of Red No. 2 without any effective decision. Another consumer group likewise argued that an "organized blitz" from the food industry caused the FDA to delay restricting the dye.[123] The General Accounting Office, Congress's auditing and investigative agency, issued a report in October 1975 charging that the delays had presented "an unnecessary risk to the public health" and requesting that the FDA act promptly to either permanently approve or ban the dye.[124] Criticism from consumer groups and government agencies, as well as mounting media coverage, publicized not only the potential health risk of Red No. 2 but also the doubt over the role of the FDA in protecting public health.

Alexander M. Schmidt, the commissioner of food and drugs, finally announced that the federal government would ban the use of Red No. 2 in January 1976—more than two decades after the dye's health risk was first reported.[125] Prior to Schmidt's announcement, the FDA had reported the results of its long-term study, which involved feeding rats Red No. 2 for two and a half years, showing that one-third of the female rats fed large doses of the dye developed leukemia or cancer of the kidneys, liver, or muscle. Cancer was not detected in the FDA's earlier studies in the 1950s because the duration of the research was only twenty-four months.[126]

Even with the new test results, however, FDA scientists concluded that the data was not conclusive enough. Schmidt stressed that the FDA found "no evidence of a public health hazard" in the dye because a consumer would have to drink 7,500 12-ounce cans of soda containing the dye every day to reach the hazardous level.[127] Some scientists outside the agency questioned the adequacy of the long-term test due to the mismanagement of the research. Researchers mixed up rats in the control group with those in other groups during the experiment. A *New York Times* reporter quoted one FDA scientist as saying that it was "the lousiest experiment" he had ever seen in his life.[128] Although the FDA banned Red No. 2, there was still uncertainty about the dye's effects on human health.

The increasing controversy over Red No. 2 in the United States received broad public attention in other countries even before the dye was actually banned.[129] But because scientists used different methods of experimental techniques in conducting their tests and analyzing the data, government policies over food dyes differed from country to country.[130] The Soviet Union, which had originally spurred the FDA to test Red No. 2, banned the dye based on its own 1971 experiments. West Germany limited its use to certain foods until 1972, when the country banned its use entirely.[131] France and Italy restricted its use only to caviar and caviar substitutes.[132] Canadian authorities, on the other hand, decided that the dye's test data was not conclusive enough to justify a ban in the country and allowed it for food use.[133] The British government likewise concluded that the dye was acceptable for continued use in food on the grounds that the current data was not conclusive and further long-term studies were necessary.[134] Other nations, including Sweden, Denmark, Australia, and Japan, also allowed the use of Red No. 2 in foods.[135]

The ban on Red No. 2 drastically altered color management practice in the food industry. Food products colored with the dye became subject to a recall. The FDA ordered the recall of more than 6,500 cases of candy mints in June 1976.[136] Another company recalled more than 110,000 pounds of sugar-coated candies.[137] Some food processors stopped making products in red.[138] Mars, for example, eliminated red M&M's entirely in 1976. According to the company, although it had not used Red No. 2, the firm abandoned the red food coloring due to consumers' "confusion and concern" over the dye, which could generate an adverse impression about the red color in general.[139] The company introduced orange M&M's instead, along with green, yellow, light brown, and dark brown. Red M&M's disappeared from the market for nearly a decade until the company reintroduced them in 1985.[140] General Foods, which had used Red No. 2 in some flavors of Jell-O, Kool-Aid, and pet foods, switched to other red dyes. Other food companies, including Armour, General Mills, and Nabisco, followed suit.[141]

The ban led dye makers and food manufacturers to explore an alternative red color. FD&C Red No. 40 (also known as Allura Red) became the primary, and virtually the only, alternative dye used for imparting red colors to foods.[142] Red No. 40 was not necessarily an ideal replacement, however. It was more expensive than Red No. 2: the cost of Red No. 40 was around $8.50 per pound in the mid-1970s, whereas Red No. 2 was $5.50 per pound. The shade of Red No. 40 was not very pure or deep red.[143] Food processors complained that grape juices looked "muddy" and many foods looked "a bit duller" when colored with it.[144] The safety of the dye was not entirely clear, even though the FDA had certified its use in foods in April 1971—around the time when the agency first suggested the restriction on the use of Red No. 2.[145] Some countries prohibited its use. The Canadian government, which allowed Red No. 2, ruled in 1974 that Red No. 40 could not be used as food coloring because evidence submitted by a dye manufacturer was inadequate.[146] Nonetheless, without any other alternative dyes, Red No. 40 had become the largest-selling color in the United States by the late 1980s, with annual sales of about 2.5 million pounds.[147]

Consumer groups challenged the FDA to prohibit the use of synthetic dyes on the provisional list.[148] The HRG filed a petition with the FDA in January 1977 demanding that all such remaining synthetic dyes be banned from the food supply immediately. The group reported that some of the dyes used to color orange skins, soft drinks, ice cream, hot dogs, and baked products would cause cancer or serious allergic reactions.[149] Yet synthetic dyes still persisted in the food market. By the late 1970s, the United States had become by far the largest consumer of synthetic dyes: the American consumption of synthetic food dyes amounted to 2,300 tons in 1977, followed by the entire western European region, where 1,050 tons were consumed.[150]

Envisioning the "Natural"

As the list of approved synthetic dyes began to shrink, dye manufacturers and food processors responded to what they called a "color crisis" by reinventing color management strategies.[151] Dye manufacturers began to experiment with the commercial use of natural dyes derived mainly from plants.[152] It was not until the 2000s that food manufacturers began using natural dyes in a substantial amount.[153] Yet the gradual emergence of interest in natural food dyes among dye and food manufacturers from the 1950s became a critical turning point for the food industry in shifting their food-coloring practice.

One of the most often used natural dyes until the mid-twentieth century was annatto extract. Dairy producers and margarine manufacturers had been using the dye for coloring butter, cheese, and margarine since the nineteenth century. Dyes derived from beets imparted bright red and bluish-red colors to cured meat products, soft drinks, and ice cream. Other natural dyes widely used for food were carotenoids, which provided a bright yellow to orange-red color. The carotenoids were a group of color pigments that existed in a wide variety of plants, including paprika (capsanthin), carrots (β-carotene), and tomatoes (lycopene).[154] Food manufacturers used carotenoids for various products, including butter, margarine, cheese, soft drinks, baked goods, and frozen egg yolks.[155]

The commercial use of natural dyes was generally a challenging task for dye makers and food processors. The color-additives regulation made it difficult for dye manufacturers to pursue innovations in natural dyes. The industry was required to go through expensive toxicological studies, which could cost between $750,000 and $1 million, before submitting a dye for FDA approval. Even if a firm developed a new dye and acquired FDA approval, there was significant uncertainty about the market, since food manufacturers still preferred synthetic dyes to natural ones in the 1960s and 1970s. Moreover, once the agency permitted its use, other manufacturers would be able to use the dye without any cost for testing or regulatory procedure. Consequently, there was little incentive among dye manufacturers to invest so much of their own money into the experiment and development of new natural colors.[156]

In the food industry, manufacturers faced economic and technical problems. Relatively high costs hampered the commercialization of natural dyes. Most of them were less stable than synthetic dyes: their colors tended to change easily when exposed to heat, light, and acidity. Hence, it was difficult for food processors, as well as dye makers, to transport, store, and use these colors. Moreover, natural dyes could not reproduce the same color intensity as synthetic ones.[157] For example, the increasing concerns over the health risk of Red No. 2 spurred dye and food manufacturers' interest in anthocyanins, a group of bluish-red natural dyes. But anthocyanins were difficult to use. They tended to fade or change color due to the acidity of the food and oxidation. They also reacted to a chemical substance called ascorbic acid, or vitamin C, which was used widely for various foods as an antioxidant to retard spoilage and preserve color. Many fruits and vegetables of bluish and purplish color, including grapes, blueberries, and cranberries, contained anthocyanins, but grapes were the only source from which manufacturers could extract the pigment in sufficient amounts for commercial use before 1980.[158]

To circumvent the regulation, food processors could use fruit and vegetable juices as "ingredients," instead of as color additives, to impart desired colors to food products. The line between "additives" and "ingredients" depended on the degree of processing. Commercially available natural dyes were not a pure extract of fruits and vegetables but a product of manufacturing processes, such as spray drying and mixing with other substances so as to make the dye relatively uniform and stable. Once a fruit juice was processed, it was subject to the FDA regulation. Because the acquisition of coloring permission from the FDA was expensive, it was cheaper and less complicated in terms of procedure to simply use fruit juices, even if the juice did not give foods a color as vivid and uniform as commercial natural dyes.[159]

Dye manufacturers sought to overcome technical difficulties by chemically manufacturing natural dyes. β-carotene was one of the first "natural dyes" to be synthesized commercially. The FDA did not distinguish a plant-derived dye from a chemically synthesized substance if the chemical structure was identical.[160] Three groups of scientists separately reported the first syntheses of β-carotene in 1950, using different methods: the individual groups were led by Swiss chemist and Nobel Laureate Paul Karrer; German chemist Hans Herloff Inhoffen, at Braunschweig University of Technology; and MIT professor Nicholas A. Milas. (Karrer and Inhoffen later worked together on carotene in the same team.) The synthetic production of β-carotene involved chemical reactions between different chemical substances, such as ketones, and the re-formation of molecule structure.[161]

The Swiss pharmaceutical firm F. Hoffmann-La Roche & Company succeeded in the production of β-carotene on a commercial scale in 1954.[162] Two years later, the FDA added β-carotene to the certified list as a color additive exempt from certification, without any requirement for a maximum use rate.[163] Roche developed the commercial synthesis of other carotenoid-group pigments called β-Apo-8′-carotenal and canthaxanthin during the 1960s. The FDA permitted their use in foods in 1963 and 1969, respectively. β-Apo-8′-carotenal imparted a similar color as β-carotene, but the color was more intense. It was particularly useful for coloring fat- and oil-containing products to impart deeper orange-red colors than β-carotene.[164]

Synthetization of natural dyes provided solutions for a number of the problems dye and food manufacturers faced, including cost, stability, and color intensity. The synthesized carotenoids were not subject to the acidity of the food. They were also relatively stable; hence, they had a longer shelf life. Another advantage was the relatively small amount required for coloring foods, which made them more economical. Only 3 to 3.5 mg of β-carotene was sufficient to provide the desired color in a pound of margarine. The cost benefit was also apparent for commercial bakers, who used the dye for cookies, sponge cakes, and other baked goods to add yellowish and brownish colors. Depending on the product and the depth of color desired, it cost only from 0.02 to 0.16 cents for a pound of batter, which was a nearly 50 percent reduction from previously used coloring ingredients, such as spice mixes. β-carotene was more expensive than synthetic dyes, such as Egg Shade (a blend of synthetic dyes). But the cost increase was small enough for bakers to switch from the synthetic dye to synthesized β-carotene.[165]

So strong was the industry's belief in the virtues of chemical science that dye and food manufacturers actually played down the naturalness of food dyes like β-carotene in the 1960s and 1970s. When Roche introduced β-Apo-8′-carotenal dye in 1964, the trade journal *Food Engineering* touted that it was "probably the most potent food color known" because "just a few milligrams per pound was sufficient to provide the desired color range."[166] Roche stressed the color intensity and stability of the dye. In a 1964 advertisement, the firm described it as a "synthetically produced food color," although it was not a so-called synthetic dye.[167] Roche instead emphasized that the dye was intense, safe, government approved, and economical due to its tinctorial strength. "You need only 2 to 6 milligrams per pound or pint to obtain rich appealing shades," the advertisement noted.[168] In a similar vein, in a 1960 advertisement for a paprika-derived food dye, one of the leading dye manufacturers in Chicago, the William J. Stange Company, contended that the product was manufactured with "maximum control of color and flavor" and "standardized to insure uniform results in every batch of product."[169] There was no hint of it being a natural dye, let alone that its natural quality might in any way be a virtue. Because the natural food dye market was still very small and the manufacturing technology was not yet fully developed, "natural dyes" meant unstable, more expensive, and inconsistent. "Natural" had not yet become a selling point.

The naturalness newly created by dye manufacturers and food companies was far from a "natural" state of food. So-called natural dyes were a product of highly mechanized manufacturing and standardization—these commercial "natural" dyes were vastly different from the spinach or carrot juice that nineteenth-century housewives used for their cooking. It was economically efficient to produce uniform food products using automated machinery and standardized ingredients, including food dyes, in streamlined operations. Using fresh spinach or beet juice as food coloring was more expensive and more time-consuming than simply adding commercially manufactured food colors. Compared with making dyes from scratch using fruits and vegetables, standardized commercial dyes did not require special skill or knowledge. Operators could color foods by simply measuring the necessary quantity of color additives and pouring them into other ingredients, and the result was always the same. Standardized foods also provided a guarantee of consistent quality for consumers who expected that boxes of a breakfast cereal would look and taste the same wherever and whenever they were purchased.

Contrary to what many people believed, naturalness did not necessarily guarantee safety. For example, people could have serious allergic reactions to the widely used natural dye cochineal.[170] Yet food-coloring regulations lacked specifications for composition of natural colors, with little or no toxicological testing to support their safe use in foods. The

FDA approved the use of such natural dyes without sufficient supporting data. It was only in 2009 that Congress enacted a regulation requiring the declaration of cochineal extract on food labels.[171]

It was difficult to draw a line between the natural and the artificial, not only because naturalness was a product of human manipulation but also because consumers accepted certain artificiality in foods. Consumer groups, including Nader's HRG, urged the federal government to delist potentially hazardous synthetic dyes. But they did not demand the elimination of food-coloring practice in general. Artificiality was acceptable when color additives seemed harmless and the product provided convenience. Both protesters and manufacturers generally considered the use of natural dyes permissible—even when the dye was not derived from the food colored. As shown in the previous chapters, dairy farmers had mixed marigold and other orange pigments with cow's feed to make butter bright yellow since the nineteenth century. The federal government legalized the use of dried algae for chicken feed to enhance the yellow color of chicken skin and egg yolk in 1961.[172] Surely, no chicken had ever before eaten dried algae on its own, yet this utterly artificial "natural" innovation barely raised a public eyebrow. Consumers did, after all, want yellow chicken skin; they just did not want to think they would die from eating it. The expected colors of foods had become an external characteristic that producers could control—and that consumers now relied on.

Conclusion

The management of color became challenging for the food business during the 1960s and 1970s due to new types of political participation and criticism from increasingly activist-minded consumers. As the use of chemical substances, including food dyes, rapidly increased, a new generation of chefs, journalists, consumer activists, and natural food advocates sought alternatives to packaged foods mass-produced by giant corporations. They denounced the monotonous appearance of factory-made white bread in plastic and brightly colored processed foods as a symbol of mass consumption, conformity, and hegemonic corporate power. The social and cultural climate of the era—which included the counterculture movement, consumer activism, and a new interest in alternative diets—provoked government officials and scientists to create new food safety policies.

By the time the pendulum—pushed with great effort by activist consumers—began to swing back toward more "natural" alternatives, the industry also began embarking on natural sources and practices in lieu of their own synthetic inventions. With the emergence of social and cultural criticism denouncing consumer capitalism as wasteful and unhealthy, standardized food products colored with synthetic dyes began to be a liability for food manufacturers. As the number of government-approved colors decreased after the enactment of the 1960 Color Additives Amendment, food processors began to shift their color management strategies by experimenting with the commercial development of natural dyes.

Dye and food manufacturers, consumer activists, and countercultural advocates sought naturalness in a new form. This did not mean a reversion to the past but rather a reimagination of the natural in the context of highly mechanized manufacturing processes and advances in modern science. While denouncing synthetic dyes and advocating the use of natural dyes, consumer activists continued to accept the case for food coloring as far as coloring materials were "natural" and "safe." By chemically synthesizing "natural" dyes, dye manufacturers offered food processors a more efficient and economical means to color foods than plant-derived colors. Using various fruit and vegetable juices was another "natural" way to color foods, even when the color was not derived from the food colored with it.

The notion of safety, as well as naturalness, was contingent on particular sets of interests and political decisions. The raging controversy over Red No. 2 demonstrates the social construction and political negotiation that underlie food safety issues and regulation. While the United States prohibited Red No. 2, other countries, including Britain, Canada, and Japan, continued to allow its use for food products. The interpretation of test results on the dye differed widely even within the FDA. The definition of "safety" and "adulteration" depended on scientific data, industry demands, state officials' views on safety, available knowledge at the time, and consumers' perceptions about natural foods. Social and political conditions are inseparable from the interpretation of the data and government's translation of the results into the regulation of business practices.

The natural dye market remained negligible even by the 1970s. Yet consumers' increasing distrust of chemical additives, the scientific and technological innovations in natural food dyes, and conceptual changes in the naturalness of foods during the period created a foundation for the subsequent rise of the natural food dye market, as well as the natural food business. Conventional food manufacturers quickly picked up the trend and began stressing "natural," "wholesome," and "additive-free" in their advertising rhetoric. This in turn helped drive the substantial increase in the use of natural dyes, transforming manufacturing and marketing strategies in the food industry. More and more consumers would now buy "natural" products from corporations just as large—and in many cases the very same ones—as those that had sold them the most dubious, toxic, and artificially colored factory foods that laboratory scientists could imagine. "Nature" has replaced nature, but capitalism marches on.

· 9 ·

Eye Appeal Is Buy Appeal

In a color-saturated world, we usually do not think twice about the color of foods. But even the colors we think of as natural are historically constructed products. Unless we are among the few who can grow all their own food themselves, we cannot escape from uniformly colored, bright foods—engineered by farmers, food processors, and retailers—in almost any aisle of the grocery store. Agricultural growers and packers create the color of fruits and vegetables by controlling ripening processes and harvesting seasons. Refrigerated display cases, store lighting, and transparent packages are all essential for retailers to retain and present the appetizing "fresh" color of produce and meat. Food processors add enormous amounts of dye to snacks, candies, and other packaged products. Color has become a food component that producers create by adding and subtracting coloring ingredients as readily as one might add salt, pepper, and sugar, as though color is an external, rather than an intrinsic, feature of foods.

The color of food is not merely a physiological characteristic but a contested terrain where nature and technology intersect; business interests, government regulation, and consumer expectations compete; and taste and sight are intertwined. Color is only one aspect of food products, but it has the power to determine the marketability of foods, drive food processors to change their manufacturing operations, and make people hungry (or disgusted). We live in a world where eye appeal is buy appeal. A history of how these two appeals became connected provides new insight into the rise of consumer capitalism, the transformation of visuality, and shifting ideas about naturalness.

This book has shown how business enterprises, governments, and to a lesser extent consumers and consumer activists co-created the color of foods by answering three questions: How and why did business try to manage the visual appeal of food? How did color management strategies in the food industry change over time? What were the consequences of color management for society and culture? The initiative to control the color of foods involved the emergence of a whole ecosystem of business networks among farmers, food processors, dye makers, appliance companies, and giant chemical conglomerates. By weaving together these diverse businesses and agents, this book has demonstrated how color helped form and transform people's relationships with food, nature, and society, and how color provides a new way of *seeing* the past and present.

The creation of "natural" color was a process of standardization that began in the last decades of the nineteenth century. With the rise of mass production and mass-marketing strategies and the development of food-coloring technologies, uniformity and consistency became a key component of agricultural producers' and food processors' efforts to create and market what they imagined to be the "natural" look of foods. Oranges became always orange, regardless of season or production site; butter came to look uniformly yellow all year round; and the red shades of cherry-flavored soft drinks and strawberry cake icing came to look alike. Even homemade cakes could look identical when made with cake mixes and packaged frosting. Since the mid-twentieth century, masses of standardized, clean, and bright produce became a common feature of modern supermarkets as a way to present "freshness" to customers. By the 1960s, however, the rise of the counterculture movement, environmentalism, and consumer activism posed a challenge to the food business. Due to the unprecedented use of chemical additives in foods and the potential health risk of food dyes, standardization and manufactured consistency would no longer go unchallenged.

The creation of standardized food colors entailed the introduction of new political and economic powers. The federal and state governments in the United States employed regulatory powers to define how food should look on the market by enacting anti-adulteration laws, establishing food grading systems, and setting color standards for certain products, such as margarine. Farmers and food processors emphasized, and sometimes de-emphasized (as in the case of Florida oranges), the importance of color in selecting foods in the interest of commercial success. Their colorful advertisements, recipe leaflets, and popular magazines provided consumers with powerful visual references, presenting ideas about the natural color of foods. With dramatic changes in politics, economy, and technology, food producers' and traders' competing interests became one of the primary factors that reformulated and standardized the color of foods.

Standardized colors provided consumers with quality assurance, reliability, and convenience. Until the late nineteenth century, visual experiences in purchasing and eating foods differed widely depending on region and season as well as on one's social and economic status. With the development of color-controlling technologies and long-distance transportation systems, a wider variety of both agricultural and processed products began reaching a broader population by the early to mid-twentieth century. While many consumers attained an unprecedented variety of foods, their sensory characteristics became standardized and predictable. A bag of apples, a box of breakfast cereal, and a tub of margarine invariably offered consumers a uniform color along with a consistent flavor.

Standardization also made "nature" more accessible to a broader range of people. The commoditization of the senses through scientific engineering and corporate marketing helped democratize the consumption of various products, exposing people to new visual and taste experiences. The introduction of synthetic dyes enabled manufacturers to create a "natural" color for foods economically and broadened the market for brightly colored products. Canned foods provided both lower- and upper-class consumers with an alternative to "fresh" foods throughout the year. The introduction of yellow-colored margarine provided working-class families with a substitute for butter, although they did not enjoy the same taste or texture.

This democratization of visual experiences, however, engendered inequalities in health risks. Cheaper food products, including penny candies and low-grade canned foods, were more likely to contain cheap, sometimes poisonous, coloring substances. Consumers who could not afford expensive and reliable foods were more exposed to the risk of health hazards.

The management of color by the food business dramatically altered consumers' sensory experiences not just in eating but also in buying foods. Grocery operators, in cooperation with appliance companies and chemical firms, constructed a new kind of visual environment to convey standardized ideas about the naturalness and freshness of foods. Compared to local grocery stores of the nineteenth century, modern self-service stores, first introduced in the late 1910s, thrust consumers into a color-saturated and sanitized environment. As self-service operation became common in produce and meat departments by the late 1950s, mounds of brightly colored fruits and vegetables and piles of red meat in transparent film—displayed in refrigerated cases and kept under constant control by retailers—presented to consumers a look of freshness.

Consumers came to rely more on their eyes in selecting foods than on assistance from specialists in grocery stores, such as butchers, fishmongers, and produce sellers. The food shopping experience became a lonely path of wandering up and down aisles rather than one of social interactions. The role of experts in meat, fish, and produce literally became marginalized as these workers were increasingly relegated to a back room; the natural beauty and abundance that perishable foods embodied became the centerpiece of the store.

Beyond the Eyes

Standardized colors in the food industry were a distinctive historical construction. Food had not always been uniform in color, shape, or size. The establishment of government grade standards, the creation of large-scale food distribution and retailing systems, and the expansion of the market helped determine and limit the kinds of foods available on the market in the early to mid-twentieth century. Corporate forces trained people's minds to make vision supreme—tomatoes, oranges, chicken, and many other everyday foods were appetizing to the eye but no longer as tasty to the tongue as they had been throughout history. Once consumers were used to less tasty—even tasteless—foods, many mistook the new blandness for the natural taste of the food.

Along with the growing skepticism about the use of chemical additives during the 1960s and 1970s, the search for "real" taste led to the gradual yet steady expansion of the natural and organic food market beginning in the 1980s. The emergence of natural and organic food stores, including Whole Foods Market, Bread & Circus, and Wild Oats Markets (Whole Foods Market eventually acquired the other two, before being acquired itself by Amazon in 2017), helped popularize and extend the market nationwide. As "natural" became a buzzword in food marketing rhetoric, naturalness ceased to be solely a realm of the organic and natural food business, which had generally been associated with counterculture advocates. Large conventional food companies slowly began to co-opt ideas about naturalness as a way to market their products—including highly processed and industrially manufactured foods—as natural by adding some "natural" ingredients to other less natural ones or through distinctly unnatural processes.

More recently, being "natural" came to mean healthy, ethical, and profitable. It became a viable business partly because consumers accept certain kinds of artificiality. Consumer activists have been criticizing the use of synthetic dyes in foods since the 1960s, but they have not necessarily demanded that manufacturers remove processed foods from the market or stop coloring them; rather, they insist that food processors should use only natural dyes. In the mid-2010s, major food companies, including Kraft, General Mills, and Nestlé, began adding "natural" dyes derived from plants to their products instead of synthetic colors. Agricultural producers also turned to an old method of feeding fish and animals (most commonly salmon, chickens, and cows) colored substances, including food dyes, to give meat, eggs, and butter a rich, attractive color. Using natural dyes does not undo the industrial processing by which these food products were manufactured. As the addition of dyes to food became a common practice not only for food manufacturers but also for consumers, the manipulation of color was permissible as far as dyes and other means to control color did not seem poisonous. The new "natural" foods offered for sale today are a far cry from the foods eaten before the industrialization of food got underway in the late nineteenth century.

Despite the rise of health consciousness and the fierce resistance to synthetic dyes in some quarters, not all consumers value the "natural" option. General Mills announced that it would resume using synthetic dyes for one of its popular breakfast cereals, Trix, in September 2017—a year after the removal of synthetic colors from its products. The cereals made with natural dyes did not look as vivid and colorful as the original product. According to General Mills, "many Trix fans" demanded the company put the original colorful product back in their pantry. Prior to the new product launch, General Mills noted on social media:

"Finding your mornings are duller? We've got something special coming with a little color!"[1] There are now two Trix products on the market: Classic Trix, with synthetic dyes and flavors, as well as new Trix, with natural colors. While some consumers may go for Trix colored with natural dyes, bright colors are clearly still an important element—even a norm—for consumers who prefer eye appeal to concerns about suspect ingredients.

Although chemically laden, uniformly colored foods remain prevalent on the market today, some consumers and agricultural producers are challenging corporate-trained eyes. A new generation of entrepreneurs launched the "ugly food" business in the mid-2010s, selling fruits and vegetables with blemishes and deformed shapes, such as off-color apples, crooked cucumbers, and oversize peppers.[2] This new interest in "imperfect" foods indicates food-conscious consumers' increasing desire for more intensely—and more naturally—tasty foods, rather than those that merely *look* tasty. The meaning of culinary aesthetics is undergoing a change, from a bright, uniform look to variations—a change that indicates a counter-education of the eye, perhaps even a move to lessen the visual hegemony. Where once the eye reigned supreme, it is competing with the tongue and nose once again.

An alternative way of food marketing and shopping is gaining momentum, largely in urban areas. As in the era before the rise of self-service supermarkets, an increasing number of co-ops, city governments, and other local associations in the twenty-first century are organizing farmers' markets to provide consumers with more opportunities to interact with farmers and growers. Information about where food comes from, who makes it, and how it is made is now an important asset for food products. Even large supermarkets put up signs with growers' and farmers' names (sometimes with their pictures). Yet the increasing interest in taste and the provenance of foods does not necessarily mean that the color of food does not matter. It still continues to be a crucial factor in marketing and eating foods. While bright, uniform color may no longer appeal to organic-food purchasers, who are still a minority in the population, "unattractive" color serves as a sign of "natural" and "good" food.

The visuality in modern consumer capitalism elevated sight above the other senses for over a century. Taste is making a comeback in the twenty-first century, even as the power of the visual appetite remains strong, but the agrarian tongue may be no match for the capitalism-trained eye. Even as tastier, less bright foods proliferate on the market, they do so alongside their shiny competitors without actually displacing them. Whether this sensory distortion can ever be undone remains to be seen.

Business and the Senses

The management of sight in the food industry constitutes a crucial part of the broader story of the mobilization of the senses in business strategies in capitalist development. Product designers, manufacturers, and marketers in a wide range of industries—including automobiles, cosmetics, fashion, and toiletries—sought to appeal to the senses from at least the nineteenth century. They began developing products with numerous variations in color, smell, taste, sound, and texture to stimulate consumers' sensory desires. Vision turned out to be the easiest sense to standardize, quantify, and reproduce in the food business.

Multisensory appeal, or what management scholars call sensory marketing, is now a growing trend for many businesses. Rainforest Cafe—a theme restaurant that operates in eleven states in the United States as well as international locations, including London, Paris, and Tokyo—provides diners with the simulated sensory experience of visiting a rain forest, with its unique sound, smell, and lighting, as well as the taste and flavor of its dishes. Luxury hotels use their distinctive scents in their lobbies and guest rooms. Airlines welcome their passengers on board with their corporate-theme color, lighting, smell, and music. Sensory appeal provides a means for marketers not only to entice consumers and whet their buying appetite but also to associate particular sensory features with their corporate images. The senses work as a brand, just like a logo and a trademark.

Over time, business has created an entirely new sensory world. As corporate management of sensory perception has become more powerful and effective, its impact has become more diffuse and pervasive in society. Like the color of foods, other sensory experiences, such as the smell of "the fresh air" created by air fresheners and the sound of "ocean waves" used as relaxation music, have become standardized and detached from their temporal and spatial contexts. In this way, artificial worlds have become real worlds. People create the "nature" of their own imaginations, or at least that of corporate marketers.

Abbreviations

Notes

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Abbreviations

Publications

FSHS	*Proceedings of Florida State Horticultural Society*
JIEC	*Journal of Industrial and Engineering Chemistry*

Government Agencies

AAA	Agricultural Adjustment Administration
DHEW	US Department of Health, Education, and Welfare
FDA	Food and Drug Administration
FSDA	Florida State Department of Agriculture
USDA	US Department of Agriculture

Archives and Archival Collections

AAA-NMP	Nickolas Muray Papers, 1910–1978, Archives of American Art, Smithsonian Institution, Washington, DC
CU-CCP	Charles Frederick Chandler Papers, 1847–1937, Rare Book and Manuscript Library, Columbia University, New York
FCA	Florida Citrus Archives, Sarah D. and L. Kirk McKay, Jr. Archives Center, Roux Library, Florida Southern College, Lakeland, FL
HBS-Arc.	Harvard Business School Archives, Baker Library Special Collections, Harvard Business School, Boston
HBS-HAP	Henry B. Arthur Papers, Baker Library Special Collections, Harvard Business School, Boston

HML	Hagley Museum and Library, Wilmington, DE
HML-CLC	Carter Litchfield Collection on the History of Fatty Materials (Accession 2413), Hagley Museum and Library, Wilmington, DE
HML-DPAD	E. I. du Pont de Nemours & Company (DuPont), Advertising Department records (Accession 1803), Hagley Museum and Library, Wilmington, DE
HML-DPFD	DuPont, Film Department records (Accession 2168), Hagley Museum and Library, Wilmington, DE
HML-EDP	Ernest Dichter papers (Accession 2407), Hagley Museum and Library, Wilmington, DE
NAB-USHR	Records of the United States House of Representatives, Record Group 233, National Archives Building, Washington, DC
NACP-BAIC	Records of the Bureau of Agricultural and Industrial Chemistry, Record Group 97, National Archives, College Park, MD
NACP-CLSF	Color Lab Special File, Records of the Bureau of Agricultural and Industrial Chemistry, Record Group 97, National Archives, College Park, MD
NACP-FDA	Records of the Food and Drug Administration, Record Group 88, National Archives, College Park, MD
NACP-OSA	Records of the Office of the Secretary of Agriculture, Record Group 16, National Archives, College Park, MD
NACP-SF73	Special File 73, Records of the Food and Drug Administration, Record Group 88, National Archives, College Park, MD
NAL-BDI	USDA Bureau of Dairy Industry Records, National Agricultural Library, Beltsville, MD
NAL-CNP	Charles E. North Papers, National Agricultural Library, Beltsville, MD
NMAH-PCC	Product Cookbooks Collection, 1874–2007, Archives Center, National Museum of American History, Smithsonian Institution, Washington, DC
NMAH-WCBA	Warshaw Collection of Business Americana, Archives Center, National Museum of American History, Smithsonian Institution, Washington, DC
NYPL-FBP	Faber Birren papers, Manuscripts and Archives Division, The New York Public Library, New York

RL-JWT	J. Walter Thompson Company Collection, David M. Rubenstein Rare Book & Manuscript Library, Duke University, Durham, NC
RL-LBP	Loy Baxter Papers, David M. Rubenstein Rare Book & Manuscript Library, Duke University, Durham, NC
RL-NPC	Nicole Di Bona Peterson Collection of Advertising Cookbooks, David M. Rubenstein Rare Book & Manuscript Library, Duke University, Durham, NC
RL-RLC	Roy Lightner Collection of Antique Advertisements, David M. Rubenstein Rare Book & Manuscript Library, Duke University, Durham, NC
SL-CCC	Culinary Catalog Collection, 1965–2000, Schlesinger Library, Radcliffe Institute, Harvard University, Cambridge, MA
UCD-CLF	California League of Food Processors Records, Special Collections, University of California, Davis
UF-CC	Chase Collection, Special and Area Studies Collections, George A. Smathers Libraries, University of Florida, Gainesville, FL
UKNA	UK National Archives, Kew, London
WRHS	Western Reserve Historical Society, Cleveland, OH

Notes

1. Capitalism of the Senses

1. See Nadia Berenstein, "Making a Global Sensation: Vanilla Flavor, Synthetic Chemistry, and the Meanings of Purity," *History of Science* 54, no. 4 (December 2016): 399–424; Eugénie Briot, *La Fabrique des parfums: Naissance d'une industrie de luxe* (Paris: Éditions Vendémiaire, 2015); Eugénie Briot, "From Industry to Luxury: French Perfume in the Nineteenth Century," *Business History Review* 85, no. 2 (Summer 2011): 273–294; Galina Shyndriayeva, "Matters of Scent: Aesthetic Expertise, Industrial Research and Luxury Production in the Twentieth-Century European and American Perfume Industry" (PhD diss., King's College London, 2017).
2. Pamela Walker Laird, *Advertising Progress: American Business and the Rise of Consumer Marketing* (Baltimore: Johns Hopkins University Press, 1998); William Leach, *Land of Desire: Merchants, Power, and the Rise of a New American Culture* (New York: Pantheon Books, 1993); Jackson Lears, *Fables of Abundance: A Cultural History of Advertising in America* (New York: Basic Books, 1994); Roland Marchand, *Advertising the American Dream: Making Way for Modernity, 1920–1940* (Berkeley: University of California Press, 1985); Susan Strasser, *Satisfaction Guaranteed: The Making of the American Mass Market* (Washington, DC: Smithsonian Institution, 1989).
3. David Howes, "Multi-sensory Marketing in Cross-Cultural Perspective (Part I): From Synergy to Synaesthesia," *Percepnet*, January 2007, http://www.percepnet.com/cien01_07.htm.

4. Steven Shapin, "The Sciences of Subjectivity," *Social Studies of Science* 42, no. 2 (April 2012): 170–184.
5. Alfred D. Chandler Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, MA: Harvard University Press, 1977).
6. Vicki Howard, *From Main Street to Mall: The Rise and Fall of the American Department Store* (Philadelphia: University of Pennsylvania Press, 2015); Leach, *Land of Desire*; Michael B. Miller, *Bon Marché: Bourgeois Culture and the Department Store, 1869–1920* (Princeton, NJ: Princeton University Press, 1981).
7. See, for example, David Hochfelder, *The Telegraph in America, 1832–1920* (Baltimore: Johns Hopkins University Press, 2012); Thomas P. Hughes, *Networks of Power: Electrification in Western Society, 1880–1930* (Baltimore: Johns Hopkins University Press, 1983); David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880–1940* (Cambridge, MA: MIT Press, 1990); Richard White, *Railroaded: The Transcontinentals and the Making of Modern America* (New York: W. W. Norton, 2011).
8. For a history of visuality, see John Berger, *Ways of Seeing* (London: Penguin Books, 1972); Hal Foster, ed., *Vision and Visuality* (Seattle: Bay Press, 1988); Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1990); Martin Jay, *Downcast Eyes: The Denigration of Vision in Twentieth-Century French Thought* (Berkeley: University of California Press, 1994); David Michael Levin, ed., *Modernity and the Hegemony of Vision* (Berkeley: University of California Press, 1993).
9. Levin, introduction to *Modernity and the Hegemony of Vision*, 6–7.
10. Horace T. Herrick, "Food Colors Increase Attractiveness in Harmless Fashion," *Food Industries* 1, no. 14 (November 1929): 659. See also "Color in Food," *Food Industries* 1, no. 15 (December 1929): 721.
11. Herrick, "Food Colors," 659.
12. For the discussion about the natural environment as "hybridity," see William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W. W. Norton, 1991); William Cronon, ed., *Uncommon Ground: Toward Reinventing Nature* (New York: W. W. Norton, 1995); Donna Haraway, "The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others," in *Cultural Studies*, ed. Lawrence Grossberg, Cary Nelson, and Paula Treichler (New York: Routledge, 1992): 295–337; Donna Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991); Susan R. Schrepfer and Philip Scranton, eds., *Industrializing Organisms: Introducing Evolutionary History* (New York: Routledge, 2004); Paul S. Sutter, "The World with Us: The State of American Environmental History," *Journal of American History* 100, no. 1 (June 2013): 94–119; Richard White, "From Wilderness to Hybrid Land-

scapes: The Cultural Turn in Environmental History," *Historian* 66, no. 3 (Fall 2004): 557–564; Donald Worster, "Transformations of the Earth: Toward an Agroecological Perspective in History," *Journal of America History* 76, no. 4 (March 1990): 1087–1106.

13. See, for example, Cronon, *Nature's Metropolis*; Geoffrey Jones, *Profits and Sustainability: A History of Green Entrepreneurship* (Oxford: Oxford University Press, 2017); James Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven, CT: Yale University Press, 1998).
14. Lears, *Fables of Abundance*.
15. Raymond Williams, "Ideas of Nature," in *Problems in Materialism and Culture* (London: Verso, 1980), 103–122.
16. Susanne Freidberg, *Fresh: A Perishable History* (Cambridge, MA: Belknap Press of Harvard University Press, 2009), 2–3.
17. See David B. Danbom, *The Resisted Revolution: Urban America and the Industrialization of Agriculture, 1900–1930* (Ames: Iowa State University Press, 1979); Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven, CT: Yale University Press, 2003).
18. Leo Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America* (New York: Oxford University Press, 1964).
19. Chandler, *Visible Hand*; Geoffrey Jones and Nicholas J. Morgan, eds., *Adding Value: Brands and Marketing in Food and Drink* (New York: Routledge, 1994); Richard S. Tedlow, *New and Improved: The Story of Mass Marketing in America* (Boston: Harvard Business School Press, 1996); Richard S. Tedlow and Geoffrey Jones, eds., *The Rise and Fall of Mass Marketing* (New York: Routledge, 1993).
20. Lauren Bandy, "Food and Beverage Colours: Consumers Demand a Natural Rainbow," Euromonitor International Report, September 20, 2013; Frost & Sullivan, "European Colours for Food Applications Markets" (2002); Frost & Sullivan, "U.S. Food Additives and Preservatives Market" (2000), all from Harvard Business School database.
21. See Priscilla J. Brewer, *From Fireplace to Cookstove: Technology and the Domestic Ideal in America* (Syracuse, NY: Syracuse University Press, 2000); 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).
22. Harvey Levenstein, *Revolution at the Table: The Transformation of the American Diet* (Berkeley: University of California Press, 2003); Waverley Root and Richard de Rochemont, *Eating in America: A History* (New York: Ecco, 1981).
23. David Suisman, *Selling Sounds: The Commercial Revolution in American Music* (Cambridge, MA: Harvard University Press, 2009).

24. Regina Lee Blaszczyk, *The Color Revolution* (Cambridge, MA: MIT Press, 2012); Regina Lee Blaszczyk and Uwe Spiekermann, *Bright Modernity: Color, Commerce, and Consumer Culture* (London: Palgrave Macmillan, 2017).
25. Geoffrey Jones, *Beauty Imagined: A History of the Global Beauty Industry* (New York: Oxford University Press, 2010).
26. Oscar E. Anderson Jr., *The Health of the Nation: Harvey W. Wiley and the Fight for Pure Food* (Chicago: University of Chicago Press, 1958); Lorine Swainston Goodwin, *The Pure Food, Drink, and Drug Crusaders, 1879–1914* (Jefferson, NC: McFarland, 1999). For a historiographical overview of the relationship between government and industry in the United States, see Thomas K. McCraw, "Regulation in America: A Review Article," *Business History Review* 49, no. 2 (Summer 1975): 159–183.
27. Gabriel Kolko, *The Triumph of Conservatism: A Reinterpretation of American History, 1900–1916* (New York: Free Press, 1963).
28. See Clayton A. Coppin and Jack High, *The Politics of Purity: Harvey Washington Wiley and the Origins of Federal Food Policy* (Ann Arbor: University of Michigan Press, 1999). Coppin and High analyze the role of Wiley as a collaborator with firms, which benefited from his enforcement of the pure food law, rather than as a champion of purity and public welfare.
29. In the early and mid-twentieth centuries, contemporary studies reported that touch and smell, in addition to vision, were important for consumers' food purchasing decisions. See Ernest Dichter, "An Exploratory Psychological Study of Consumer Reactions to Cellophane and Wax Paper Wrapped Bread," December 1947, box 2, HML-EDP; Carl W. Dipman, ed., *The Modern Grocery Store* (New York: Progressive Grocer, 1931).
30. Nadia Berenstein, "Flavor Added: Synthetic Flavors, the Industrialization of Food, and the Sciences of Flavor in America (PhD diss., University of Pennsylvania, 2017); Constance Classen, David Howes, and Anthony Synnott, "Artificial Flavours," in *The Taste Culture Reader: Experiencing Food and Drink*, ed. Carolyn Korsmeyer (New York: Berg, 2005), 337–342.
31. See Charles Spence, "Auditory Contributions to Flavour Perception and Feeding Behaviour," *Physiology and Behavior* 107, no. 4 (November 2012): 505–515; Charles Spence, "Eating with Our Ears: Assessing the Importance of the Sounds of Consumption on Our Perception and Enjoyment of Multisensory Flavour Experiences," *Flavour* 4, no. 3 (March 2015): 1–14"; Massimiliano Zampini and Charles Spence, "Assessing the Role of Visual and Auditory Cues in Multisensory Perception of Flavor," in *The Neural Bases of Multisensory Processes*, ed. Micah M. Murray and Mark T. Wallace (Boca Raton, FL: CRC, 2012), 739–758. See also Laurence Fillion and David Kilcast, "Consumer Perception of Crispness and Crunchiness in Fruits and Vegetables," *Food*

Quality and Preference 13, no. 1 (January 2002): 23–29; Zata M. Vickers, "Pleasantness of Food Sounds," *Journal of Food Science* 48, no. 3 (May 1983): 783–786; Alexandra Sifferlin, "Why We Like Food That Makes Noise," *Time*, March 26, 2015.

32. See Berenstein, "Flavor Added"; Shapin, "The Sciences of Subjectivity"; Sarah E. Tracy, "Delicious Molecules: Big Food Science, the Chemosenses, and Umami," *Senses and Society* 13, no. 1 (March 2018): 89–107; Ana María Ulloa, "The Aesthetic Life of Artificial Flavors," *Senses and Society* 13, no. 1 (March 2018): 60–74. See also Bob Holmes, *Flavor: The Science of Our Most Neglected Sense* (New York: W. W. Norton, 2017); Ole G. Mouritsen and Klavs Styrbæk, trans. Mariela Johansen, *Mouthfeel: How Texture Makes Taste* (New York: Columbia University Press, 2017); Charles Spence and Betina Piqueras-Fiszman, *The Perfect Meal: The Multisensory Science of Food and Dining* (Hoboken, NJ: Wiley-Blackwell, 2014); Richard Stevenson, *The Psychology of Flavour* (Oxford: Oxford University Press; 2009).
33. See Catherine A. Culver and Ronald E. Wrolstad, eds., *Color Quality of Fresh and Processed Foods* (Washington, DC: American Chemical Society, 2008); Gordon Mackinney and Angela C. Little, *Color of Foods* (Westport, CT: AVI, 1962); Rose Marie Pangborn, "Influence of Color on the Discrimination of Sweetness," *American Journal of Psychology* 73, no. 2 (June 1960): 229–238; R. A. Quevedo, J. M. Aguilera, and F. Pedreschi, "Color of Salmon Fillets by Computer Vision and Sensory Panel," *Food Bioprocess Technology* 3, no. 5 (October 2010): 637–643; Charles Spence, "On the Psychological Impact of Food Colour," *Flavour* 4, no. 21 (April 2015): 1–16; Charles Spence et al., "Does Food Color Influence Taste and Flavor Perception in Humans?" *Chemosensory Perception* 3, no. 1 (March 2010): 68–84.
34. Roland Barthes, *Mythologies,* trans. Annette Lavers (New York: Hill and Wang, 1978), 11. See also Mary Douglas, "Food as a System of Communications," in *In the Active Voice* (Boston: Routledge & Kegan Paul, 1982), 82–124, particularly the section "Food as Art Form."
35. Pierre Bourdieu, *Distinction: A Social Critique of the Judgment of Taste*, trans. Richard Nice (Cambridge, MA: Harvard University Press, 1984).
36. See David Howes, *Sensual Relations: Engaging the Senses in Culture and Social Theory* (Ann Arbor: University of Michigan Press, 2003); David Howes, ed., *Empire of the Senses: The Sensual Culture Reader* (New York: Berg, 2005); David Howes and Constance Classen, *Ways of Sensing: Understanding the Senses in Society* (New York: Routledge, 2014); Emily Ann Thompson, *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900–1933* (Cambridge, MA: MIT Press, 2002). For the use of the senses in marketing strategies discussed by business management and marketing scholars, see Bertil Hultén, *Sensory Marketing: Theoretical and Empirical*

Grounds (New York: Routledge, 2015); Bertil Hultén, Niklas Broweus, and Marcus van Dijk, *Sensory Marketing* (New York: Palgrave Macmillan, 2009); Aradhna Krishna, ed., *Sensory Marketing: Research on the Sensuality of Products* (New York: Routledge, 2010); Martin Lindstrom, *Brand Sense: Sensory Secrets behind the Stuff We Buy* (New York: Free Press, 2005).

37. For ideas about naturalness in relation to food, see Warren J. Belasco, *Appetite for Change: How the Counterculture Took on the Food Industry*, 2nd ed. (Ithaca, NY: Cornell University Press, 2007), 94. For further discussion on the natural and the artificial, see, for example, Rafael Capurro, "On Artificiality," Istituto Metodologico, Economico, Statistico (IMES), Università di Urbino, IMES-LCA WP-15 (November 1995); Herbert A. Simon, *The Sciences of the Artificial*, 3rd ed. (Cambridge, MA: MIT Press, 1996).
38. For the consumption and reproducibility of the senses in the past, see Mark M. Smith, *Sensing the Past: Seeing, Hearing, Smelling, Tasting, and Touching in History* (Berkeley: University of California Press, 2007), 121.

2. Food and Modern Visual Culture

1. See Michel Eugène Chevreul, *The Laws of Contrast of Colour*, trans. J. Spanton (London: Routledge, Warne, and Routledge, 1861); Isaac Newton, *Opticks: or, A Treatise of the Reflections, Refractions, Inflections and Colours of Light* (London: William Innys, 1730); Johann Wolfgang von Goethe, *Theory of Colours,* trans. Charles Lock Eastlake (New York: Dover, 2006). Goethe's *Theory of Colours* was first published in German in 1810 and translated into English in 1840.
2. See Regina Lee Blaszczyk, *The Color Revolution* (Cambridge, MA: MIT Press, 2012); Regina Lee Blaszczyk, "True Blue: DuPont and the Color Revolution," *Chemical Heritage* 25, no. 3 (Fall 2007): 20–25; Sally Clarke, "Managing Design: The Art and Colour Section at General Motors," *Journal of Design History* 12, no. 1 (1999): 65–79; Stephen Eskilson, "Color and Consumption," *Design Issues* 18, no. 2 (Spring 2002): 17–29.
3. For a history of dyes, see Philip Ball, *Bright Earth: Art and the Invention of Color* (Chicago: University of Chicago Press, 2001); Simon Garfield, *Mauve: How One Man Invented a Color That Changed the World* (New York: W. W. Norton, 2000); Amy Butler Greenfield, *A Perfect Red: Empire, Espionage, and the Quest for the Color of Desire* (New York: HarperCollins, 2005); Esther Leslie, *Synthetic Worlds: Nature, Art and the Chemical Industry* (London: Reaktion Books, 2005).
4. Warren I. Susman, *Culture as History: The Transformation of American Society in the Twentieth Century* (Washington, DC: Smithsonian Institution, 2003), xxv.
5. Jackson Lears, *Fables of Abundance: A Cultural History of Advertising in America* (New York: Basic Books, 1994), 268–269. Color lithograph, or chromolithog-

raphy, was first used in the United States in the 1840s. See also Pamela Walker Laird, *Advertising Progress: American Business and the Rise of Consumer Marketing* (Baltimore: Johns Hopkins University Press, 1998), 58–87; Jay T. Last, *The Color Explosion: Nineteenth-Century American Lithography* (Santa Ana, CA: Hillcrest, 2005); Peter C. Marzio, *The Democratic Art: Pictures for a 19th-Century America, 1840–1900* (Boston: D. R. Godine, 1979); Lori E. Rotskoff, "Decorating the Dining-Room: Still-Life Chromolithographs and Domestic Ideology in Nineteenth-Century America," *Journal of American Studies* 31, no. 1 (April 1997): 19–42.

6. Laird, *Advertising Progress*, 77, 85–86; Susan Strasser, *Satisfaction Guaranteed: The Making of the American Mass Market* (Washington, DC: Smithsonian Institution, 1989), 164–165.
7. Sally Stein, "The Rhetoric of the Colorful and the Colorless: American Photography and Material Culture between the Wars" (PhD diss., Yale University, 1991): 141.
8. Roland Marchand, *Advertising the American Dream: Making Way for Modernity, 1920–1940* (Berkeley: University of California Press, 1985), 120.
9. Alfred P. Sloan, *My Years with General Motors* (Garden City, NY: Doubleday, 1964), 236.
10. The Ford Company introduced its first car available in color, the Model A, in 1927.
11. "The New Age of Color," *Saturday Evening Post*, January 21, 1928, 22. See also "Color in Industry," *Fortune*, February 1930, 85–94.
12. Regina Lee Blaszczyk and Uwe Spiekermann, *Bright Modernity: Color, Commerce, and Consumer Culture* (London: Palgrave Macmillan, 2017); William Leach, *Land of Desire: Merchants, Power, and the Rise of a New American Culture* (New York: Pantheon Books, 1993).
13. Quoted in Thomas K. McCraw and Richard S. Tedlow, "Henry Ford, Alfred Sloan, and the Three Phases of Marketing," in *Creating Modern Capitalism: How Entrepreneurs, Companies, and Countries Triumphed in Three Industrial Revolutions*, ed. Thomas K. McCraw (Cambridge, MA: Harvard University Press, 1995), 273.
14. Eskilson, "Color and Consumption," 17–29; Neil Harris, *Cultural Excursions: Marketing Appetites and Cultural Tastes in Modern America* (Chicago: University of Chicago Press, 1990); Karal Ann Marling, *As Seen on TV: The Visual Culture of Everyday Life in the 1950s* (Cambridge, MA: Harvard University Press, 1994); Joshua Yumibe, *Moving Color: Early Film, Mass Culture, Modernism* (New Brunswick, NJ: Rutgers University Press, 2012).
15. For example, the increasing level of product standardization and innovations in railroad engineering enhanced the efficiency, safety, and comfort of railroad

transportation. Steven W. Usselman, *Regulating Railroad Innovation: Business, Technology, and Politics in America, 1840–1920* (New York: Cambridge University Press, 2002). See also Ken Alder, *The Measure of All Things: The Seven-Year Odyssey and Hidden Error That Transformed the World* (New York: Free Press, 2002); David F. Noble, *America by Design: Science, Technology, and the Rise of Corporate Capitalism* (New York: Oxford University Press, 1977); Douglas J. Puffert, *Tracks across Continents, Paths through History: The Economic Dynamics of Standardization in Railway Gauge* (Chicago: University of Chicago Press, 2009).

16. See Warren Belasco, *Food: The Key Concepts* (New York: Berg, 2008).
17. Walter C. Hughes, "Care of Confectionery," *American Food Journal* 12, no. 6 (June 1917): 329. See also Stroud Jordan, "Chemistry and Confectionery," *JIEC* 16, no. 4 (August 1924): 336–339.
18. Arthur A. Poss, "Any VEGETABLE That Looks Nice," *Meat Merchandising* 2, no. 9 (September 1926): 9.
19. See Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (Berkeley: University of California Press, 1990); James C. Whorton, *Inner Hygiene: Constipation and the Pursuit of Health in Modern Society* (New York: Oxford University Press, 2000)
20. Matthew Luckiesh and Frank K. Moss, *The New Science of Lighting* (Cleveland: Nela Park Engineering Department, General Electric, 1934), 3–4, 29. For a history of scientific studies on color and lighting, see Blaszczyk, *The Color Revolution*, 20–44; Garfield, *Mauve*, 190–214.
21. Matthew Luckiesh, *Light and Color in Advertising and Merchandising* (New York: D. Van Nostrand, 1923), 2.
22. Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (New York: Pantheon Books, 1970); Michel Foucault, *Discipline and Punish: The Birth of the Prison* (New York: Pantheon Books, 1977). For vision and modernity, see Martin Jay, *Downcast Eyes: The Denigration of Vision in Twentieth-Century French Thought* (Berkeley: University of California Press, 1994); Martin Jay and Sumathi Ramaswamy, eds., *Empires of Vision: A Reader* (Durham, NC: Duke University Press, 2014); David Michael Levin, ed., *Modernity and the Hegemony of Vision* (Berkeley: University of California Press, 1993).
23. Uwe Spiekermann, "Redefining Food: The Standardization of Products and Production in Europe and the United States, 1880–1914," *History and Technology* 27, no. 1 (March 2011): 11–36.
24. Ibid., 13–14.
25. Hildegarde Heymann, "A Personal History of Sensory Science," *Food, Culture and Society* 22, no. 2 (March 2019): 203–223; Herbert Stone and Joel L. Sidel,

Sensory Evaluation Practices, 3rd ed. (New York: Elsevier Applied Science, 2004), 7–8.

26. J. W. Lovibond, "The Tintometer—a New Instrument for the Analysis, Synthesis, Matching, and Measurement of Colour," *Journal of the Society of Dyers and Colourists* 3, no. 12 (December 1887): 186–193; J. W. Lovibond, "On a New Method of Colour Analysis by Means of the Tintometer," *Journal of the Society of Chemical Industry* 9, no. 1 (January 1890): 10–15; J. W. Lovibond, "Relation of Colour to Value in Malt," *Journal of the Society of Chemical Industry* 16, no. 3 (March 1897): 188–193.
27. R. W. G. Hunt and M. R. Pointer, *Measuring Color*, 4th ed. (Chichester, UK: Wiley, 2011), 159; Dorothy Nickerson, "History of the Munsell Color System," *Color Engineering* 7, no. 5 (September–October 1969); Yeshajahu Pomeranz and Clifton E. Meloan, *Food Analysis: Theory and Practice*, 3rd ed. (Gaithersburg, MD: Aspen, 1994), 92–93. For the development of the Munsell Color system, see Blaszczyk, *The Color Revolution*, 45–70.
28. Matthew Luckiesh, *Color and Its Applications* (New York: D. Van Nostrand, 1915), 78.
29. Nickerson, "History," 1.
30. See, for example, Dorothy Nickerson, *Color Measurement and Its Application to the Grading of Agricultural Products: A Handbook on the Method of Disk Colorimetry* (Washington, DC: USDA, 1946); Dorothy Nickerson, *Application of Color Measurement in the Grading of Agricultural Products* (Washington, DC: USDA, 1932); Dorothy Nickerson, *A Method for Determining the Color of Agricultural Products*, USDA Technical Bulletin No. 154 (Washington, DC: Government Printing Office, 1929).
31. Nickerson, *Color Measurement,* 2.
32. A. Maerz and M. Rea Paul, *A Dictionary of Color* (New York: McGraw-Hill, 1930), 1.
33. Nickerson, *Color Measurement*, 2.
34. Gordon W. McBride, "How to Tell What Color It Is," *Food Industries* 13, no. 9 (September 1941): 42.
35. "Tentative United States Standards for Grades of Frozen Peas," *Food Industries* 11, no. 7 (July 1939): 383.
36. "Tentative United States Standards for Grades of Canned Grapefruit Juice," *Food Industries* 11, no. 11 (November 1939): 619.
37. On the standardization of terminology, see Stefan Timmermans and Steven Epstein, "A World of Standards but Not a Standard World: Toward a Sociology of Standards and Standardization," *Annual Review of Sociology* 36 (August 2010): 69–89.

38. F. J. Francis and F. M. Clydesdale, *Food Colorimetry: Theory and Applications* (Westport, CT: AVI, 1975), 61; Dorothy Nickerson, "The Munsell Color Fan: Modern Color Science Is the Background for a New and Useful Color Chart for Horticulture" (proceedings of the Eleventh Annual American Horticultural Congress and Annual Meeting, American Horticultural Council, October 1956).
39. D. B. Judd, "Precision of Color Temperature Measurements under Various Observing Conditions: A New Color Comparator for Incandescent Lamps," *Bureau of Standards Journal of Research* 5, no. 5 (November 1930): 1161–1177; Nickerson, *Application*.
40. Stone and Sidel, *Sensory Evaluation Practices*, 7–8.
41. Kenneth A. Evelyn, "A Stabilized Photoelectric Colorimeter with Light Filters," *Journal of Biological Chemistry* 115, no. 1 (August 1936): 63–75; McBride, "How to Tell," 44; C. E. K. Mees, "The Measurement of Color," *JIEC* 13, no. 8 (August 1921): 729; R. B. Withrow, C. L. Shrewsbury, and H. R. Kraybill, "The Design of a Precision Photoelectric Colorimeter," *JIEC* 8, no. 3 (May 1936): 214–219.
42. Arthur C. Hardy, mechanical integrating device, US Patent 1,799,134, filed November 21, 1928, and issued March 31, 1931; Arthur C. Hardy, method and apparatus for comparing and recording relative intensity of radiant energy, US Patent 1,806,197, filed June 1, 1927, and issued May 19, 1931; Arthur C. Hardy, method and apparatus for comparing and recording radiant energy, US Patent 1,806,198, filed May 2, 1928, and issued May 19, 1931; Arthur C. Hardy, method and apparatus for comparing radiant energy, US Patent 1,806,199, filed May 3, 1928, and issued May 19, 1931. See also Arthur C. Hardy, *Handbook of Colorimetry* (Cambridge, MA: MIT Press, 1936).
43. "Accurate Determination of Color Now Possible," *Food Industries* 1, no. 3 (December 1928): 137; "Color Analyzed and Recorded Automatically," *Food Industries* 3, no. 6 (June 1931): 272.
44. "The Hardy Recording Spectrophotometer," *Oil and Fat Industries* 6, no. 9 (September 1929): 31.
45. Mees, "The Measurement of Color," 729–731.
46. "Accurate Determination of Color Now Possible," *Food Industries* 1, no. 3 (December 1928): 137.
47. "The Hardy Recording Spectrophotometer."
48. B. I. Masurovsky, "How to Obtain the Right Food Color," *Food Industries* 11, no. 1 (January 1939): 13. See also "Color in Food," *Food Industries* 1, no. 15 (December 1929): 721; Horace T. Herrick, "Food Colors Increase Attractiveness in Harmless Fashion," *Food Industries* 1, no. 14 (November 1929): 659.
49. McBride, "How to Tell," 44.

50. Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1990), 24.
51. Mark R. McLellan, "The Technology of Food Color Measurement," *New York's Food and Life Science Quarterly* 18, no. 4 (1988): 12.
52. Nickerson, "Method for Determining," 1. See also "Color of Canadian Bacon," *Food Industries* 14, no. 2 (February 1942): 162–163; "Color Judged by Real Thing," *Food Engineering* 28, no. 3 (March 1956): 7.
53. Neil Harris, "Color and Media: Some Comparisons and Speculations," in *Cultural Excursions*, 336.
54. Silvia Malaguzzi, *Food and Feasting in Art*, trans. Brian Phillips (Los Angeles: J. Paul Getty Museum, 2008), 50–53.
55. Simon Schama, "Perishable Commodities: Dutch Still-Life Painting and the 'Empire of Things,'" in *Consumption and the World of Goods*, ed. John Brewer and Roy Porter (New York: Routledge, 1993), 482. See also Carolyn Korsmeyer, *Making Sense of Taste: Food and Philosophy* (Ithaca, NY: Cornell University Press, 1999), esp. chap. 5, "The Visual Appetite: Representing Taste and Food."
56. Judith A. Barter, ed., *Art and Appetite: American Painting, Culture, and Cuisine* (Chicago: Art Institute of Chicago, 2013); Kenneth Bendiner, *Food in Painting: From the Renaissance to the Present* (London: Reaktion Books, 2004); Norman Bryson, *Looking at the Overlooked: Four Essays on Still Life Painting* (London: Reaktion Books, 1990); Claire Clifton, *The Art of Food: Culinary Inspirations from the Paintings of the Great Masters* (Sydney: Collins, 1988).
57. Susan Bright, *Feast for the Eyes: The Story of Food in Photography* (New York: Aperture, 2017), 24–25.
58. See Walter Benjamin, "The Work of Art in the Age of Its Technological Reproducibility: Second Version," in *The Work of Art in the Age of Its Technological Reproducibility, and Other Writings on Media*, ed. Michael W. Jennings, Brigid Doherty, and Thomas Y. Levin, trans. Edmund Jephcott et al. (Cambridge, MA: Belknap Press of Harvard University Press, 2008), 19–55.
59. Lears, *Fables of Abundance*; Marchand, *Advertising the American Dream*.
60. "Collier's Will Have Four-Color Printing," *JWT Newsletter* no. 92, August 6, 1925, box MN7, Newsletter Collection, RL-JWT; "A Comparison between the Increase in the Color Page Rates and the Growth in Circulation of Women's Magazines," *JWT Newsletter* no. 12, January 31, 1924, box MN6, Newsletter Collection, RL-JWT; "McCall's Has Reduced Rate for Color Inserts," *JWT Newsletter* no. 90, July 23, 1925, box MN7, Newsletter Collection, RL-JWT; Guy Richards, "Shall We Use Color?" *Printers' Ink Monthly* 13, no. 1 (July 1926): 99. In the mid-1920s, color print rates (per 1,000 pages) for major women's magazines were as follows: *Ladies' Home Journal*,

$5.15; *McCall's*, $5.26; *Woman's Home Companion*, $5.34; *Pictorial Review*, $5.49; *Good Housekeeping*, $6.20.

61. Peirce Johnson, "Getting the Most out of Color," *JWT Newsletter* no. 87, June 1922, box MN5, Newsletter Collection, RL-JWT.
62. W. Livingston Larned, *Illustration in Advertising* (New York: McGraw-Hill, 1925), 242, 244. See also Mabel J. Stegner, "The Art of Advertising Food," *Commercial Photography* 3, no. 9 (June 1928): 405.
63. Richards, "Shall We Use Color?" 43.
64. US Printing & Lithography Company advertisement, *Printers' Ink Monthly* 6, no. 6 (June 1923): 101.
65. Lithography advertisement, *Printers' Ink Monthly* 19, no. 1 (July 1929). Many other lithograph and printing companies published advertisements in advertising industry trade journals.
66. "Ladies Home Journal," *JWT Newsletter* no. 92, August 6, 1925, box MN7, Newsletter Collection, RL-JWT.
67. Faber Birren, *Selling with Color* (New York: McGraw-Hill, 1945), 109.
68. Luckiesh, *Light and Color*, 14–20, 92.
69. Ibid., 14; Faber Birren, "Color Strategy in Advertising," *Printers' Ink Monthly* 18, no. 2 (February 1929): 40; Faber Birren, "Work from the Product to Color," *Printers' Ink Monthly* 18, no. 3 (March 1929): 46.
70. Luckiesh, *Light and Color*, 23.
71. Ibid., 9.
72. Ibid., 6–7, 17, 90.
73. "Bibliographical Notes" and "Printed Ephemera," box 1, Rare Book, NYPL-FBP. For the work of Faber Birren, see Blaszczyk, *The Color Revolution*, 215–240.
74. Regina Lee Blaszczyk, "The Importance of Being True Blue: The Du Pont Company and the Color Revolution," in *Culture of Commerce: Representation and American Business Culture, 1877–1960*, ed. Elspeth H. Brown, Catherine Gudis, and Marina Moskowitz (New York: Palgrave Macmillan, 2006): 40; Alfred E. Clark, "Howard Ketcham, Authority on Color Use to Corporations," *New York Times*, May 7, 1982, D19.
75. Birren, "Color Strategy in Advertising," 40.
76. Birren, *Selling with Color*, 105, 114, 125.
77. Quoted in "'Color Engineering' Is Based on Study of Human Reactions," *Confectioners News* 5, no. 8 (August 1939): 8.
78. "Food Advertisers Aid American Art," *Printers' Ink Monthly* 14, no. 4 (April 1927): 54; W. Livingston Larned, "The New Spirit in Color Advertising," *Printers' Ink Monthly* 6, no. 6 (June 1923): 131; Matthew Luckiesh, "The Attention Values of Color in Advertising," *Advertising and Selling* 30, no. 3 (July 1920):

16; Matthew Luckiesh, "The Effectiveness of Color Display," *Advertising and Selling* 30, no. 3 (August 1920): 25.

79. Richards, "Shall We Use Color?" 98. See also Richard A. Dunne, "What Is the Trend in the Use of Color?," *JWT Newsletter* no. 123, July 1925, box MN5, Newsletter Collection, RL-JWT; "Use of Four Color Advertising Continues to Increase," *JWT Newsletter* no. 108, November 27, 1925, box MN7, Newsletter Collection, RL-JWT.
80. Birren, *Selling with Color*, 109.
81. Einar F. Meyer, "Color Advertising in the Modern Periodical," *Advertising and Selling* 30, no. 4 (July 1920): 16. See also "Making Technique Take the Place of Color," *Printers' Ink* 120, no. 2 (July 1922): 41–42.
82. Larned, "New Spirit," 132–134. See also Hester Conklin and Pauline Partridge, "Selling Appetites through the Consumer Magazines," *Advertising and Selling* 30, no. 7 (July 1920): 12; "Food Advertisers Aid American Art," 54.
83. Carl W. Dipman, ed., *The Modern Grocery Store* (New York: Progressive Grocer, 1931), 8.
84. Craig Davidson and Hugo B. Snider, "She Buys Meat with Her Eyes," *Progressive Grocer* 16, no. 5 (May 1937): 32–33.
85. "Food Advertisers Aid American Art," 54. See also Patricia Johnston, *Real Fantasies: Edward Steichen's Advertising Photography* (Berkeley: University of California Press, 1997), 242.
86. E. J. Clary, "The 'Eye Appeal' in Fruit Merchandising," *Citrus Industry* 7, no. 2 (February 1926): 6.
87. Five-color prints were the most popular among these canners: 5.1 percent used six colors; 37.2 percent, five colors; 4.6 percent, four colors; 4.7 percent, three colors; 2.2 percent, two colors; and 1.1 percent, one color. Birren, *Selling with Color*, 117.
88. Ann Vileisis, *Kitchen Literacy: How We Lost Knowledge of Where Food Comes from and Why We Need to Get It Back* (Washington DC: Island Press, 2008), 81.
89. "Swift & Company Account Histories," February 1926, box 41, Account Files Collection, RL-JWT.
90. M. A. Price, "Development of Carcass Grading and Classification Systems," in *Quality and Grading of Carcasses of Meat Animals*, ed. S. D. Morgan Jones (Boca Raton, FL: CRC, 1995), 188.
91. Thomas Walley, *A Practical Guide to Meat Inspection* (New York: William R. Jenkins, 1895), 14, 33; C. Peairs Wilson, "How to Identify the Quality of Beef," in *Beef for Tomorrow: Proceedings of a Conference*, ed. E. R. Kiehl and Roland M. Bethke (Washington, DC: National Academy of Science, National Research Council, 1960), 37–38.

92. H. W. Norton, "Meat Demonstration," *Sixteenth Annual Report of the Pennsylvania Department of Agriculture* (Harrisburg, PA: C. E. Aughinbaugh, 1910), 530.
93. Charles A. Burmeister, Herman M. Conway, and Albert P. Brodell, *Economic Factors Affecting the Beef-Cattle Industry of Virginia*, USDA Technical Bulletin No. 237 (Washington, DC: Government Printing Office, 1931), 51.
94. Alexander Todoroff, *Food Buying Today* (Chicago: Grocery Trade, 1934), 83. See also Armour & Company, Department of Home Economics, *Meat Selection, Preparation and Many Ways to Serve* (Chicago: self-pub., 1934), HML; Armour, "Meat Grades at Your Service," *Consumers' Guide* 4, no. 15 (October 1937): 19. See also "U.S. Graded Beef," *Consumers' Guide* 2, no. 10 (March 1935): 11.
95. Maria Eliza Ketelby Rundell, *American Domestic Cookery Formed on Principles of Economy for the Use of Private Families* (New York: Evert Duyckinck, 1823), 29.
96. Mary Lee White, "Selection of Meat and Poultry," *Ladies' Home Journal*, April 1893, 30. See also Fannie Merritt Farmer, "A Lesson on Marketing," *Boston Cooking School Magazine*, December 1897, 204.
97. Michel Frizot, ed., *A New History of Photography* (Cologne, Germany: Könemann, 1998), 419; Paul Martineau, *Paul Outerbridge: Command Performance* (Los Angeles: J. Paul Getty Museum, 2009), 9; Stephen R. Milanowski, "Factors Influencing the Neglect of Color Photography, 1860 to 1970" (master's thesis, Massachusetts Institute of Technology, 1982): 59–60; Sylvie Pénichon, *Twentieth-Century Color Photographs: Identification and Care* (Los Angeles: Getty Conservation Institute, 2013), 80; Stein, "Rhetoric of the Colorful," 198–199, 236–238.
98. Elspeth H. Brown, *The Corporate Eye: Photography and the Rationalization of American Commercial Culture, 1884–1929* (Baltimore: Johns Hopkins University Press, 2005), 162–163; Anton Bruehl and Fernand A. Bourges, *Color Sells: Showing Examples of Color Photography* (New York: Condé Nast, 1935), n.p.
99. "Additional Comments on the Pen-Camera Controversy . . . ," *JWT Newsletter* no. 186, August 15, 1927, box MN8, Newsletter Collection, RL-JWT. See also Lou Ingwersen, "Yes, the Lens Lends a Hand!" *JWT Newsletter* no. 186, August 15, 1927, box MN8, Newsletter Collection, RL-JWT.
100. A process called "carbro" became the dominant color printing technique in the advertising industry in the 1930s because of its stability, color range, vivid color, and fidelity. The carbro process, patented in 1905 as the Ozobrome, was adapted from carbon printing techniques developed in the 1850s. H. F. Farmer improved the process and coined the name "carbro," which combined the words "carbon" and "bromide," in 1919. Carbro remained the dominant process used for the advertising industry until the 1950s, when it was displaced

by the less expensive dye-transfer process. Elspeth H. Brown, "Rationalizing Consumption: Lejaren à Hiller and the Origins of American Advertising Photography, 1913–1924," *Enterprise and Society* 1, no. 4 (December 2000): 715–738; Johnston, *Real Fantasies*, 28, 31–33; Martineau, *Paul Outerbridge*, 9; Pénichon, *Twentieth-Century Color Photographs*, 80, 99.

101. William Clive Duncan, "Photographing the Appetite Appeal," *Commercial Photography* 4, no. 7 (April 1929): 330–331, 333; Frank Young, *Modern Advertising Art* (New York: Covici, Friede, 1930); Stegner, "Art of Advertising Food," 407. See also Johnston, *Real Fantasies*, 30–31.
102. "Color in Newspaper Advertising," *Printers' Ink Monthly* 28, no. 2 (February 1934): 62; Duncan, "Photographing the Appetite Appeal," 329; "Many New Uses Are Being Found for Photographs of Fruit," *Commercial Photography* 11, no. 8 (May 1936): 295; "Newspaper Color," *Printers' Ink Monthly* 34, no. 1 (January 1937): 78.
103. For the history of the professionalization and commercialization of advertising photography, see Brown, *Corporate Eye*, esp. chap. 4; Johnston, *Real Fantasies*. For the development of food photographers as a profession, see Margaret McAlpine, *Working in the Food Industry* (New York: Gareth Stevens, 2005); Charlotte Plimmer, *Food in Focus* (New York: Amphoto Books, 1988); Ron Stark, *Delicacies: A Personal View of Food through the Art of Photography* (New York: William Morrow, 1978).
104. Brown, *Corporate Eye*, 213–214; Johnston, *Real Fantasies*, 42–43.
105. The team of Bruehl and Bourges was so successful that they produced 479 color photographs for advertisers primarily with Condé Nast between 1932 and 1934. Their advertisements appeared in *Vogue, Vanity Fair,* and *House and Garden*. Milanowski, "Factors Influencing," 53. See also John Rohrbach, *Color: American Photography Transformed* (Austin: University of Texas Press, 2013).
106. Bruehl and Bourges, *Color Sells*.
107. "Biographical Material, 1931–1964," AAA-NMP.
108. Leonard W. Smith, "Why Don't We Let the Eyes Have It?" *Commercial Photography* 9, no. 5 (February 1934): 138. See also "Margaret Bourke-White on Color Photography and Photo-Murals," *Commercial Photography* 9, no. 7 (April 1934): 193; I. Moore, "Sell It with COLOR!" *Printers' Ink Monthly* 34, no. 4 (April 1937): 28; Charles N. Tunnell, "New Opportunities for Photographs in the Food Field," *Commercial Photography* 13, no. 11 (August 1938): 424.
109. For instance, in the January and February 1935 issues of the *Ladies' Home Journal*, there was about the same number of food advertisements with photography as there were with pen-and-ink illustrations.

3. The Color of Dye

1. For a discussion on regulation as standardization, see Nils Brunsson and Bengt Jacobsson, *A World of Standards* (New York: Oxford University Press, 2000); Andrew Russell, "Standardization in History: A Review Essay with an Eye to the Future," in *The Standards Edge: Future Generations*, ed. Sherrie Bolin (Ann Arbor: Sheridan, 2005), 3; Samuel Krislov, *How Nations Choose Product Standards and Standards Change Nations* (Pittsburgh, PA: University of Pittsburgh Press, 1997), 54–60.
2. Donna J. Wood, *Strategic Uses of Public Policy: Business and Government in the Progressive Era* (Marshfield, MA: Pitman, 1986).
3. Maguelonne Toussaint-Samat, *A History of Food,* trans. Anthea Bell (Oxford: Blackwell, 1992), 518–519; Pat Willard, *Secrets of Saffron: The Vagabond Life of the World's Most Seductive Spice* (Boston: Beacon, 2001).
4. Amy Butler Greenfield, *A Perfect Red: Empire, Espionage, and the Quest for the Color of Desire* (New York: HarperCollins, 2005); Elena Phipps, *Cochineal Red: The Art History of a Color* (New York: Metropolitan Museum of Art, 2010). The production of cochineal was a labor-intensive process. After collecting the insects, which were usually bred on cacti, growers boiled them in water or dried them in the oven, then shipped them to the market. The quality of cochineal dyes depended on the treatment of the insects: boiling in water, drying in the oven, or heating on a hot plate. When they were plunged into water, the dye became reddish brown and was partially deprived of the white dust with which the living insect was covered. These dyes were hence less valuable. Those insects dried in the oven assumed an ash gray color with some mottle. When spread on heated plates, however, their color turned to blackish red, traded as the highest-quality dye. *The Art of Confectionery, with Various Methods of Preserving Fruits and Fruit Juices* (Boston: J. E. Tilton, 1865), 19.
5. "Life in a Fair Country," *New York Times*, September 9, 1888, 10.
6. For a history of synthetic dye development and the dye industry, see John J. Beer, *The Emergence of the German Dye Industry* (Urbana: University of Illinois Press, 1959); Regina Lee Blaszczyk, *The Color Revolution* (Cambridge, MA: MIT Press, 2012); Simon Garfield, *Mauve: How One Man Invented a Color That Changed the World* (New York: W. W. Norton, 2000); Anthony S. Travis, *The Rainbow Makers: The Origins of the Synthetic Dyestuffs Industry in Western Europe* (Bethlehem, PA: Lehigh University Press, 1993); Anthony S. Travis, *Dyes Made in America, 1915–1980: The Calco Chemical Company, American Cyanamid and the Raritan River* (Jerusalem: Edelstein Center / Hexagon, 2004).

7. National Aniline & Chemical Company, *"National" Certified Food Colors: Certified to the Bureau of Chemistry, Department of Agriculture* (New York: self-pub., 1922); "New Blue Food Dye Approved," *Food Industries* 1, no. 12 (September 1929): 570.
8. L. F. Haber, *The Chemical Industry, 1900–1930: International Growth and Technological Change* (Oxford: Clarendon, 1971), 186; Kathryn Steen, *The American Synthetic Organic Chemicals Industry: War and Politics, 1910–1930* (Chapel Hill: University of North Carolina Press, 2014), 7–11, 23.
9. H. Kohnstamm & Company, "The Development of Certified Pure Food Colors," in *Chemical Industry's Contribution to the Nation: 1635–1935*, ed. Williams Haynes and Edward L. Gordy (New York: Chemical Markets, 1935), 5–16; "H. Kohnstamm & Co.," in "Fiftieth Anniversary," special issue, *Oil, Paint and Drug Reporter* 101, no. 14 (March 1922): 122; William Barton Marsh, *Service through Chemistry: The Story of H. Kohnstamm & Co., Inc. 1851–1966* (New York: H. Kohnstamm, 1966).
10. Schoellkopf, Hartford & Hanna Company to Gentlemen (announcement of the formation of the company), January 1, 1900, folder 4, box 126, CU-CCP; Benjamin Schwantes and Juliane Hornung, "Jacob Frederick Schoellkopf," Immigrant Entrepreneurship: German-American Business Biographies, German Historical Institute, June 3, 2016, http://www.immigrantentrepreneurship.org/entry.php?rec=188. The three companies were Schoellkopf Aniline & Company; the Schoellkopf, Hartford, & Maclagen Company; and the Hanna-Schoellkopf Company. Schoellkopf established the latter two firms as sales companies to market Schoellkopf Aniline products.
11. Buffalo Evening News, *A History of the City of Buffalo: Its Men and Institutions: Biographical Sketches of Leading Citizens* (Buffalo: self-pub., 1908), 110; Michael Brian Powers, "The Early Industrial Achievements of the Schoellkopf Family" (master's thesis, Niagara University, 1979), 70; Steen, *American Synthetic*, 31.
12. "Dr. Hesse on the Dyestuff Art: The President of the American Chemical Society as Historian and Prophet," in *Bulletin of the National Association of Wool Manufacturers*, vol. 46, ed. Winthrop L. Harvey (Boston: Rockwell and Churchill, 1916): 244; Powers, "Early Industrial Achievements," 67–68.
13. Blaszczyk, *The Color Revolution,* 20–44; Steen, *American Synthetic*, 31.
14. In Paris, a 1936 law banned the coloring of butter. Margaret Visser, *Much Depends on Dinner: The Extraordinary History and Mythology, Allure and Obsessions, Perils and Taboos of an Ordinary Meal* (New York: Grove, 1986), 89.
15. Sewall Guthrie, *The Book of Butter: A Text on the Nature, Manufacture and Marketing of the Product* (New York: Macmillan, 1918), 148; Otto F. Hunziker, *The Butter Industry: Prepared for the Use of Creameries, Dairy Students and Pure Food*

Departments (LaGrange, IL: self-pub., 1920), 300–301; L. S. Palmer, "The Yellow Color in Cream and Butter," University of Missouri-Columbia, *Agricultural Experiment Station Circular*, no. 74 (April 1915); "Use of Coloring in Butter," *Prairie Farmer*, September 26, 1907, 7.

16. See, for example, F. S. Burch, *ABC Butter Making: A Hand-Book for the Beginner* (Chicago: C. S. Burch, 1888), 30–31; "June Butter in Winter," *Farm, Field, and Fireside*, February 25, 1899, 237; G. L. McKay and C. Larsen, *Principles and Practice of Butter-Making* (New York: John Whey & Sons, 1906), 238–239; "The True June Shade," *Elgin Dairy Report* 14, no. 39 (February 1905): 1.
17. Annatto was immersed in water, while potash and sal soda (sodium carbonate) were mixed into water in a different container, and each container was set aside for one day. Then the two solutions were mixed together until they were completely dissolved for two or three days. "Cheese Making," *Cultivator* 1, no. 4 (April 1854): 133–134; "Coloring Butter with Carrots," *Country Gentleman Cultivator* 7, no. 6 (February 1856): 92; X. A. Willard, *A Treatise on American Butter Factories and Butter Manufacture* (Madison, WI: Atwood & Culver, 1871), 42–43.
18. Annatto was also called arnatto or annotto in Jamaica; in the French islands, it was known as roucou, urucu, and rocour; on the Spanish Main, indigenous people called it achiotl. "Annatto," Royal Gardens, Kew, *Bulletin of Miscellaneous Information*, no. 7 (July 1887): 1.
19. "Annatto," Royal Gardens, Kew, *Bulletin of Miscellaneous Information*, no. 9 (September 1887): 4; R. A. Donkin, "Bixa Orellana: 'The Eternal Shrub,'" *Anthropos*, Bd. 69, H. 1 / 2 (1974): 41. See also H. D. Preston and M. D. Rickard, "Extraction and Chemistry of Annatto," *Food Chemistry* 5 (1980): 47–56; George Whitley, "On Cheese-Colouring," *Farmers Magazine* 5 no. 6 (June 1842): 463–467.
20. "Annato," *Bulletin of the Botanical Department Jamaica* 2, no. 7 (June 1888): 4; Leone Levi, ed., *Annals of British Legislation*, vol. 4 (London: Smith, Elder, 1859), 275.
21. Peru and Brazil also supplied annatto to the United States market. "Cultivation and Utilization of Annatto," *Bulletin of the Imperial Institute*, no. 6 (1908): 171; Frank Evans, ed., *Quarterly Bulletin of Miscellaneous Information* (Port-of-Spain, Trinidad: Botanical Department, Government Printing Office, 1908), 5.
22. Christopher Hansen's Laboratory Company (hereafter cited as Christopher Hansen) was founded by Danish pharmacist Christopher Hansen in the early 1870s in Copenhagen, Denmark. The firm had been well-known for its cheese rennet (a substance extracted from cows' stomachs), used for cheese manufacturing. Wells, Richardson, & Company, founded by three American businessmen in Burlington, Vermont, in 1872, manufactured medicines, infant formula, fabric dyes, and other household products, as well as butter colors.

"History," Christopher Hansen, accessed May 1, 2019, https://www.chr-hansen.com/en/about-us/history; Burlington Board of Trade, *Burlington, Vt. as a Manufacturing, Business and Commercial Center, with Brief Sketches of its History, Attractions, Leading Industries, and Institutions* (Glens Falls, NY: Possons, 1889); Charles H. Possons, *Burlington in Brief* (Glens Falls, NY: Possons, 1894).

23. F. C. Blanck to William H. Murray, March 14, 1922, box 340, entry 1001, NACP-FDA; Hunziker, *The Butter Industry*; Publow, *Questions and Answers*, 32.
24. Bernhard C. Hesse, *Coal Tar Colors Used in Food Products*, Bureau of Chemistry Bulletin No. 147 (Washington, DC: Government Printing Office, 1912): 48; Heller & Merz Company to Charles F. Chandler, February 6, 1899, folder 2, box 90, CU-CCP.
25. Wells, Richardson advertisement, *Western Rural*, February 17, 1877, 55. See also "A Reliable Butter Color," *Farm, Field, and Fireside*, December 31, 1898, 1685; "Butter Color Needed Now," *Farm, Field, and Fireside*, March 25, 1899, 365; "Never Varies in Strength," *Farm, Field, and Fireside*, May 6, 1899, 557; "Used in the Best Butter," *Farm, Field, and Fireside*, May 20, 1899, 621.
26. "Abolishing Coal Tar Colors," *Dairy and Produce Review* 4, no. 3 (January 1903): 2; "Butter Color Poison," *Farm, Field, and Fireside*, February 10, 1906, 163.
27. E. H. Farrington, "A Comparison of Aniline and Anatto Butter Colors in Butter Making," *University of Wisconsin Agricultural Experiment Station Bulletin* 152 (June 1907), 6, 9.
28. Wells, Richardson advertisement, *Chicago Dairy Produce* 23, no. 2 (1916): 17.
29. Wells, Richardson advertisement, *Elgin Dairy Report*, February 27, 1905, 1.
30. "Butter Color Prize at State Fair," *Dairy Record* 15, no. 11 (August 1913): 27. See also "Butter Color Prizes," *Dairy Record* 15, no. 19 (October 1913): 6; "Premiums," *Sixteenth Annual Report of the Michigan Dairymen's Association* (Lansing, MI: Wynkoop Hallenbeck Crawford, 1900): 117.
31. See, for example, "Butter Color Needed Now," 365; "Used in the Best Butter," 621.
32. "National Confectioners' Association Convention," *Confectioners' and Bakers' Gazette* 26, no. 287 (1905): 19.
33. Samira Kawash, *Candy: A Century of Panic and Pleasure* (New York: Farrar, Straus and Giroux, 2013), 30–37; Wendy Woloson, "Candy and Candy Bars," in *Oxford Companion to American Food and Drink*, ed. Andrew F. Smith (New York: Oxford University Press, 2007), 90.
34. "Basic Formula for Blending Colors," *Food Industries* 11, no. 1 (1939): 55. See also B. Heller & Company, *Heller's Guide of Ice-Cream Makers* (Chicago: self-pub., 1927); Warner-Jenkinson Manufacturing Company, *Ice Cream, Carbonated Beverages* (St. Louis: self-pub., 1924).

35. "The President's Address, Proceedings of the Twenty-Third Annual Convention of the National Confectioners' Association of the United States," *Confectioners Journal* 32, no. 379 (August 1906): 65.
36. Ibid., 68. See also H. Kohnstamm advertisement, *Confectioners' and Bakers' Gazette* 27, no. 300 (September 1906): 31; "National Confectioners' Association Convention," *Confectioners' and Bakers' Gazette* 27, no. 299 (August 1906): 21.
37. "Boy Killed by Candy," *Confectioners Journal* 32, no. 372 (January 1906): 70; "Girl Is Dead," *Confectioners Journal* 32, no. 378 (July 1906): 89; "Mother and Children Poisoned by Candy," *Confectioners Journal* 32, no. 375 (April 1906): 70; "Poison for Food Coloring," *New York Times*, October 14, 1903, 8; "Poison in a Stick of Red Candy Kills Boy," *Confectioners Journal* 32, no. 379 (August 1906): 107; "Poisoned Candy Killed Child," *Confectioners Journal* 32, no. 375 (April 1906): 71.
38. McArthur, Wirth & Company, *Butchers' and Packers' Tools and Machinery* (Syracuse, NY: self-pub., 1900), 74–76.
39. F. W. Wilder, *The Modern Packing House* (Chicago: Nickerson and Collins, 1905), 356.
40. William J. Stange Company advertisements, *Meat: The Monthly Operating and Management Magazine for Meat Packers*, convention special edition, 1938; *National Provisioner* 101, no. 11 (October 1939): 11.
41. B. Heller advertisement in McArthur, Wirth, *Butchers' and Packers' Tools*, 78 (emphasis in the original).
42. Ralph Hoagland, *Substitutes for Sucrose in Curing Meats*, USDA Bulletin No. 928 (Washington, DC: Government Printing Office, 1921): 22. The practice of adding glucose and corn syrup is still a part of sausage-making processes today. Elton D. Aberle et al., *Principles of Meat Science,* 4th ed. (Dubuque, IA: Kendall / Hunt, 2001), 143–144; Nicholas J. Russell and G. W. Gould, eds., *Food Preservatives*, 2nd ed. (New York: Kluwer Academic / Plenum, 2003); Rodrigo Tarté, ed., *Ingredients in Meat Products: Properties, Functionality and Applications* (New York: Springer, 2009).
43. Harvey Levenstein, *Revolution at the Table: The Transformation of the American Diet* (Berkeley: University of California Press, 2003), 30; Waverley Root and Richard de Rochemont, *Eating in America: A History* (New York: Ecco, 1981), 129–133, 150–155; Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon Books, 1982), 11–12, 16–17.
44. Root and de Rochemont, *Eating in America*, 133.
45. Nancy F. Koehn, "Henry Heinz and Brand Creation in the Late Nineteenth Century: Making Markets for Processed Food," *Business History Review* 73, no. 3 (Autumn 1999): 350.

46. William F. Comply & Company, *Catalogue of Stock of Fresh Groceries* (Philadelphia: self-pub., 1874); Eldridge, Baker Company, *Wholesale Grocery Catalog* (1915), box 6, "Food," NMAH-WCBA.
47. Koehn, "Henry Heinz and Brand Creation," 350.
48. Ohio Dairy and Food Commissioner, *Annual Report* (Columbus, OH: Westbote, 1895), 179–192.
49. Rosemarie D. Bria, "How Jell-O Molds Society and How Society Molds Jell-O: A Case Study of an American Food Industry Creation" (PhD diss., Columbia University, 1991): 40–43.
50. Hesse, "Coal Tar Colors," 11, 20–21.
51. Adam Burrows, "Palette of Our Palates: A Brief History of Food Coloring and Its Regulation," *Comprehensive Reviews in Food Science and Food Safety* 8, no. 4 (October 2009): 396; David Denison Stewart, "A Clinical Analysis of Sixty-Four Cases of Poisoning by Lead Chromate, Used as a Cake-Dye," *Medical News* 51, no. 27 (1887): 753–758. Lead chromate was a highly poisonous chemical compound with a vivid yellow color, usually used in paints.
52. Breed, Abbott & Morgan, *Digest of National and State Food Laws* (New York: National Wholesale Grocers' Association of the United States, 1907); Hesse, "Coal Tar Colors," 41–42.
53. Federal Food and Drugs Act of 1906, Pub. L. No. 59–384, 34 Stat. 768 (1906). Since the late nineteenth century, confectionery had been the primary target of food regulation in many states. Prior to the passage of the 1906 federal act, thirty-nine states had enacted special confectionery provisions within their food laws or entirely separate regulations on confectionery. The regulation of confectionery as a distinct category reflected not only the fact that many inexpensive candies contained poisonous substances but also the general conception of "food" in early twentieth-century American culture. The 1906 Pure Food and Drug Act defined "food" as "all articles used for food, drink, confectionery, or condiment by man or other animals, whether simple, mixed, or compound." Legislators and the public at the time generally considered confectionery, as well as condiments, distinct from food. "Food" meant something that had nutritive value. Hence, legislators specified confectionery and condiments, as well as drink, as part of the "food" category to regulate them under the 1906 act. Lewis A. Grossman, "Food, Drugs, and Droods: A Historical Consideration of Definitions and Categories in American Food and Drug Law," *Cornell Law Review* 93, no. 5 (July 2008): 1098–1103. See also Xaq Frohlich, "Accounting for Taste: Regulating Food Labeling in the 'Affluent Society,' 1945–1995" (PhD diss., Massachusetts Institute of Technology, 2011); Kawash, *Candy*, 11–14, 95–123, 152–178.

54. Daniel Carpenter, *Reputation and Power: Organizational Image and Pharmaceutical Regulation at the FDA* (Princeton, NJ: Princeton University Press, 2010); Lisa Mae Robinson, "Regulating What We Eat: Mary Engle Pennington and the Food Research Laboratory: Agricultural History," *Agricultural History* 64, no. 2 (Spring 1990): 143–153.
55. Political scientist Nolan McCarty argues that as industry and scientific knowledge became complicated and professionalized, regulators came to rely on industry expertise in ways that tilted decision-making toward industry interests. Nolan McCarty, "Complexity, Capacity, and Capture," in *Preventing Regulatory Capture: Special Interest Influence and How to Limit It*, ed. Daniel Carpenter and David A. Moss (New York: Cambridge University Press, 2013), 99–123. See also Edward J. Balleisen and David A. Moss, eds., *Government and Markets: Toward a New Theory of Regulation* (New York: Cambridge University Press, 2010); Thomas K. McCraw, "Regulation in America: A Review Article," *Business History Review* 49, no. 2 (1975): 159–183.
56. "Bernhard C. Hesse," *Oil, Paint and Drug Reporter* 91, no. 7 (1917): 7; F. B. Linton to Enterprise Chemical Company, February 17, 1919, box 55, entry 1001, NACP-FDA; Carl L. Alsberg to Harmon Color Works, Inc., March 13, 1919, box 55, entry 1001, NACP-FDA.
57. USDA, Office of the Secretary, Food Inspection Decision (hereafter cited as FID) 76, "Dyes, Chemicals, and Preservatives in Foods," July 13, 1907. The seven dyes were Amaranth, Ponceau 3R, Erythrosin, Orange I, Naphthol Yellow S, Light Green SF Yellowish, and Indigo Disulfo Acid.
58. Hesse, "Coal Tar Colors," 28.
59. R. L. Emerson to Greever-Lotspeich Manufacturing Co., June 11, 1915, box 7, entry 60, NACP-BAIC; "The Color Laboratory," box 1, entry 62, NACP-BAIC.
60. Hesse, "Coal Tar Colors," 13.
61. Hesse to Harvey Wiley, March 21, 1908, box 160, entry 8, NACP-BAIC.
62. Irving W. Fay, *The Chemistry of the Coal-Tar Dyes*, 2nd ed. (New York: D. Van Nostrand, 1919).
63. Hesse to Wiley, December 8, 1908, box 160, entry 8, NACP-BAIC. See also Hesse to Wiley, November 23, 1908, box 160, entry 8, NACP-BAIC; Hesse to Wiley, December 1, 1909, box 321, entry 8, NACP-BAIC.
64. F. L. Dunlap, *The Food Laws of the United Kingdom and Their Administration*, Bureau of Chemistry Bulletin No. 148 (Washington, DC: Government Printing Office, 1911); C. L. Hinton, *Food Additive Control in the United Kingdom* (Rome: Food and Agriculture Organization, 1960); Derek J. Oddy, "Food Quality in London and the Rise of the Public Analyst, 1870–1939," in *Food and the City in Europe since 1800*, ed. Peter J. Atkins, Peter Lummel, and Derek J. Oddy (New York: Routledge, 2007), 91–103.

65. Volker Hamann, *Food Additive Control in the Federal Republic of Germany* (Rome: Food and Agriculture Organization, 1963); Vera Hierholzer, "The 'War against Food Adulteration': Municipal Food Monitoring and Citizen Self-Help Associations in Germany, 1870s–1880s," in Atkins, Lummel, and Oddy, *Food and the City*, 117–128.
66. Takeo Inoue, "Shokuhin chakushokuryo to sono kisei hourei no rekishiteki hensen [A Historical Study of the Development of Food Colorings and Its Regulation in Japan]," *Japanese Journal for History of Pharmacy* 51, no. 2 (2016): 80.
67. Hesse, "Coal Tar Colors," 35–40; Hugo Lieber, *Use of Coal Tar Colors in Food Products* (New York: self-pub., 1904), 12–32.
68. Hesse to Wiley, December 2, 1909, box 321, entry 8, NACP-BAIC; Sheldon Hochheiser, "Synthetic Food Colors in the United States: A History under Regulation" (PhD diss., University of Wisconsin–Madison, 1984): 50.
69. Hesse to Wiley, February 28, 1908, box 321, entry 8, NACP-BAIC; Hesse to Wiley, March 21, 1908, box 160, entry 8, NACP-BAIC; Hesse to Wiley, July 19, 1909, box 321, entry 8, NACP-BAIC.
70. Hesse to Wiley, February 28, 1908.
71. Hesse to Wiley, July 19, 1909.
72. Hesse to Wiley, October 19, 1909, box 321, entry 8, NACP-BAIC. See also Hesse to Wiley, December 2, 1909, box 321, entry 8, NACP-BAIC; Hesse to Wiley, December 16, 1909, box 321, entry 8, NACP-BAIC.
73. Hesse to Wiley, August 25, 1909, box 321, entry 8, NACP-BAIC.
74. Hesse to Wiley, February 9, 1909, box 321, entry 8, NACP-BAIC.
75. Hesse to Wiley, October 19, 1909; Hesse to Wiley, December 2, 1909.
76. Hesse to Wiley, December 2, 1909.
77. H. Kohnstamm advertisement, *American Food Journal* 4, no. 2 (February 1909): 31. See also "Certified Colors," *American Food Journal* 4, no. 12 (December 1909): 18; "Certified Colors Now on the Market," *American Food Journal* 4, no. 2 (February 1909): 24; H. Kohnstamm & Company, "Development of Certified Pure Food Colors," 32; H. Kohnstamm Pamphlet, August 19, 1909, box 321, entry 8, NACP-BAIC.
78. H. Kohnstamm & Co. Circular, May 1910, box 720, entry 8, NACP-BAIC. See also H. Kohnstamm & Co. to Hesse, May 23, 1910, box 720, entry 8, NACP-BAIC.
79. See H. Kohnstamm advertisement, *Confectioners' and Bakers' Gazette* 29, no. 315 (1907): 111.
80. USDA, Office of Secretary, FID 117, "The Use of Certified Colors," May 3, 1910.
81. H. R. Wright, "The Adulteration of Candy," *American Food Journal* 7, no. 3 (March 1912): 2.

82. Hochheiser, "Synthetic Food Colors," 52–53.
83. "Analysis of the Coal-Tar Dye Industry," *JIEC* 6, no. 12 (1914): 972; Bernhard C. Hesse, "The Industry of the Coal-Tar Dyes: An Outline Sketch," *JIEC* 6, no. 12 (1914): 1013–1027; O. P. Hopkins, "Effect of the War on American Chemical Trade," *JIEC* 10, no. 9 (1918): 692–700.
84. "The Color Laboratory," Color and Farm Waste Division Report (1926), box 1, entry 62, NACP-BAIC.
85. Joseph A. Ambler, "The Work of the Color Laboratory," *JIEC* 15, no. 9 (1923): 970–971; H. D. Gibbs, "The Color Laboratory of the Bureau of Chemistry: A Brief History of Its Objects and Problems," *JIEC* 10, no. 10 (1918): 802–803; Gibbs to Alsberg, January 8, 1916, box 2, entry 2, NACP-CLSF; H. T. Herrick, "The Contribution of the Color Laboratory to Industry," *JIEC* 18, no. 2 (1926): 1334–1335; Gustavus Adolphus Weber, *The Bureau of Chemistry and Soils: Its History, Activities and Organization* (Baltimore: Johns Hopkins University Press, 1928), 50–53.
86. For instance, in 1916, three American chemists established New York Color & Chemical Company to supply dyestuffs. Calco Chemical Company was also founded in 1916 as a subsidiary of textile company Cott-A-Lap Company and primarily supplied dye intermediates, necessary ingredients for manufacturing synthetic dyes. Calco Chemical was acquired by American Cyanamid Company in 1929. The Kohnstamm family continued to operate H. Kohnstamm & Company until 1988, when the firm was acquired by Sensient Technologies Corporation, one of the largest food dye and flavor manufacturers today.
87. "Germany's Grip on U.S. Dye Market," *Drug and Chemical Markets* 5, no. 28 (March 1919): 12; "New Dyestuff Factor," *Textile World Journal* 53, no. 13 (September 1917): 63.
88. "Allied Chemical and Dye Corporation," *JIEC* 12, no. 11 (November 1920): 1132; "Five Companies Merged in Allied Chemical and Dye Corporation," *Drug and Chemical Markets* 7, no. 11 (September 1920): 545; Steen, *American Synthetic*, 250–252.
89. National Aniline & Chemical Company, Inc., *Dyestuffs* 22, no. 9 (September 1921): 694. See also National Aniline, *"National" Certified Food Colors* (New York: self-pub., 1922); "Possibilities of Food Colors," *International Confectioner* 30, no. 7 (July 1921): 75.
90. For a history of self-service stores, see 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); James M. Mayo, *The American Grocery Store: The Business Evolution of an Architectural Space* (Westport, CT: Greenwood, 1993).

91. George W. Stocking and Willard F. Mueller, "The Cellophane Case and the New Competition," *American Economic Review* 45, no. 1 (March 1955): 29–63; C. H. Ward-Jackson, *The "Cellophane" Story: Origins of a British Industrial Group* (Edinburgh: William Blackwood, 1977).
92. The five manufacturers were Warner-Jenkinson Company; Dyestuffs & Chemicals, Inc.; Bates Chemical Company; H. Kohnstamm; and National Aniline. C. E. Senseman, "Report of Progress, Color Laboratory, April 1 to June 30, 1925," box 5, entry 2, NACP-CLSF.
93. US Tariff Commission, *Census of Dyes and Other Synthetic Organic Chemicals* (Washington, DC: Government Printing Office, 1922 and 1925).
94. C. E. Senseman, "Summary of Certification of Food Colors Fiscal Year Ending June 30, 1925," box 5, entry 2, NACP-CLSF. See also Herrick, "Contribution of the Color Laboratory," 1335. The total amount includes straight dyes, repacked dyes, and dye mixture.
95. Joseph A. Ambler, "Coal Tar Dyes We Eat and Drink," *American Food Journal* 18, no. 2 (February 1923): 87.
96. "Abolishing Coal Tar Colors," 2; "Butter Color Poison," 3.
97. Christopher Hansen advertisement, *Dairy Record* 8, no. 1 (May 1907): 7.
98. "Trouble with His Butter Color," *Elgin Dairy Report* 13, no. 44 (April 1904): 1.
99. Georgia E. Cantrell, *Annatto* (Washington, DC: US War Food Administration, Office of Distribution, 1944), 16; "Cultural Exports and Imports," *Bulletin of the Botanical Department Jamaica* 24, no. 39 (1893): 19.
100. F. J. Francis, "Lesser-Known Food Colorants," *Food Technology* 41, no. 4 (April 1987): 62.
101. For Wiley's work in the USDA and his relationships with industry, see Clayton A. Coppin and Jack High, *The Politics of Purity: Harvey Washington Wiley and the Origins of Federal Food Policy* (Ann Arbor: University of Michigan Press, 1999); James Harvey Young, *Pure Food: Securing the Federal Food and Drugs Act of 1906* (Princeton, NJ: Princeton University Press, 1989).
102. Harvey W. Wiley, "The Attitude of the Health Official toward Food Adulteration," *Medical Review of Reviews* 11, no. 5 (May 1905): 424–425. See also Harvey W. Wiley, *Foods and Their Adulteration: Origin, Manufacture, and Composition of Food Products; Infants' and Invalids' Foods; Detection of Common Adulterations* (Philadelphia: P. Blakiston's Son, 1917), 313.
103. Alsberg to Heller & Merz Company, March 22, 1916, box 7, entry 60, NACP-BAIC; Hochheiser, "Synthetic Food Colors," 61.
104. Heller & Merz to Alsberg, January 11, 1916, box 15, NACP-SF73.
105. August Merz to H. D. Gibbs, October 25, 1916, box 15, NACP-SF73.
106. Hochheiser, "Synthetic Food Colors," 60–61.
107. William Salant to Alsberg, July 31, 1916, box 15, NACP-SF73.

108. Gibbs to Alsberg, July 15, 1916, box 15, NACP-SF73.
109. Salant to Alsberg, July 31, 1916.
110. Gibbs to Alsberg, December 4, 1916, box 15, NACP-SF73.
111. Alsberg to Gibbs, July 14, 1916, box 15, NACP-SF73; Alsberg to Walter G. Campbell, January 12, 1917, box 15, NACP-SF73; Alsberg to Heller & Merz, March 22, 1916, box 7, entry 60, NACP-BAIC; P. B. Dunbar to Kirschbraun and Sons, Inc., September 20, 1922, box 340, entry 1001, NACP-FDA. See also Hochheiser, "Synthetic Food Colors," 61–62, 64–66.
112. Alsberg to Jos. F. H. Harold, December 2, 1919, box 55, entry 1001, NACP-FDA; Gordon C. Inskeep and W. H. Kretlow, "Certified Food Colors," *JIEC* 44, no. 1 (January 1952): 14. See also Herbert A. Lubs, "Detection of Added Color in Butter or Oleomargarine," *JIEC* 10, no. 6 (June 1918): 436–439; Walter E. Mathewson, "The Detection and Estimation of Yellow AB and Yellow OB in Mixtures," *JIEC* 12, no. 9 (September 1920): 883–887; William Salant and Robert Bengis, "Physiological and Pharmacological Studies on Coal Tar Colors," *Journal of Biological Chemistry* 27, no. 2 (September 1916): 403–427.
113. Charles M. McGovern, *Sold American: Consumption and Citizenship, 1890–1945* (Chapel Hill: University of North Carolina Press, 2006), 223.
114. Arthur Kallet and Frederick J. Schlink, *100,000,000 Guinea Pigs: Dangers in Everyday Foods, Drugs, and Cosmetics* (New York: Vanguard, 1933), 18.
115. McGovern, *Sold American*, 245.
116. FDA, "Color Additives: FDA's Regulatory Process and Historical Perspectives," reprint from *Food Safety Magazine* (October / November 2003).
117. Geoffrey Jones, *Beauty Imagined: A History of the Global Beauty Industry* (New York: Oxford University Press, 2010), 114.
118. Food, Drug, and Cosmetic Act, Pub. L. No. 75–717, 52 Stat. 1040 (1938).
119. Committee on Food Protection, National Research Council, *Food Colors* (Washington, DC: National Academy of Science, 1971); Hochheiser, "Synthetic Food," 102–110.
120. Certified Color Industry Committee v. Secretary of Health, Education and Welfare, 236 F.2d 866 (2nd Cir. 1956).

4. From Natural Dyes to Cake Mixes

1. For a history of the increasing connections between commercial goods and women's work at home at the turn of the twentieth century, see Priscilla J. Brewer, *From Fireplace to Cookstove: Technology and the Domestic Ideal in America* (Syracuse, NY: Syracuse University Press, 2000); Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983); Carolyn M. Goldstein, *Creating Consumers: Home Economists in Twentieth-Century America* (Chapel Hill:

University of North Carolina Press, 2012); Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon Books, 1982).

2. Kathy Peiss, "Making Up, Making Over: Cosmetics, Consumer Culture, and Women's Identity," in *The Sex of Things: Gender and Consumption in Historical Perspective*, ed. Victoria de Grazia (Berkeley: University of California Press, 1996): 311–336; Kathy Peiss, *Hope in a Jar: The Making of America's Beauty Culture* (Philadelphia: University of Pennsylvania Press, 1998).
3. Katherine Leonard Turner, *How the Other Half Ate: A History of Working-Class Meals at the Turn of the Century* (Berkeley: University of California Press, 2014); Strasser, *Never Done*, 167.
4. Hasia R. Diner, *Hungering for America: Italian, Irish, and Jewish Foodways in the Age of Migration* (Cambridge, MA: Harvard University Press, 2001); Donna R. Gabaccia, *We Are What We Eat: Ethnic Food and the Making of Americans* (Cambridge, MA: Harvard University Press, 1998), 37–63.
5. Richard L. Bushman, *The Refinement of America: Persons, Houses, Cities* (New York: Vintage Books, 1993). The middle class included smaller merchants and professionals, ordinary well-off farmers, successful artisans, schoolteachers, minor government officials, clerks, shopkeepers, industrial entrepreneurs, and managers. Ibid., xiii.
6. Ibid., xvii.
7. For food and gender identity, see Arlene Voski Avakian and Barbara Haber, eds., *From Betty Crocker to Feminist Food Studies: Critical Perspectives on Women and Food* (Amherst: University of Massachusetts Press, 2005); Elizabeth S. D. Engelhardt, *A Mess of Greens: Southern Gender and Southern Food* (Athens: University of Georgia Press, 2011); Sherrie A. Inness, ed., *Kitchen Culture in America: Popular Representations of Food, Gender, and Race* (Philadelphia: University of Pennsylvania Press, 2001); Katherine J. Parkin, *Food Is Love: Advertising and Gender Roles in Modern America* (Philadelphia: University of Pennsylvania Press, 2006); Psyche A. Williams-Forson, *Building Houses out of Chicken Legs: Black Women, Food, and Power* (Chapel Hill: University of North Carolina Press, 2006).
8. Miss Leslie [Eliza Leslie], *Directions for Cookery, in Its Various Branches*, 10th ed. (Philadelphia: E. L. Carey & Hart, 1840), 35–36.
9. See Elizabeth F. Ellet, *The New Cyclopædia of Domestic Economy, and Practical Housekeeper* (Norwich, CT: Henry Bill, 1873), 347, 400–401; *The Good Cook: Containing Eight Hundred First Rate Receipts* (New York: Philip J. Cozans, 1861), 122; A Lady [Maria Eliza Rundell], *A New System of Domestic Cookery: Formed upon Principles of Economy, and Adapted to the Use of Private Families* (Boston: Benjamin C. Buzby, 1807), 30, 113, 119, 176.
10. Leslie, *Directions for Cookery*, 244.

11. Ibid., 40, 248, 252, 339.
12. Catharine Beecher, *Miss Beecher's Domestic Receipt Book: Designed as a Supplement to Her Treatise on Domestic Economy*, 3rd ed. (New York: Harper, 1850), 172, 177.
13. Miss Leslie [Eliza Leslie], *The Lady's Receipt-Book: A Useful Companion for Large or Small Families* (Philadelphia: Carey & Hart, 1847), 250.
14. Beecher, *Miss Beecher's Domestic*, 177.
15. Maria Eliza Rundell, *The Experienced American Housekeeper, or Domestic Cookery: Formed on Principles of Economy for the Use of Private Families* (Hartford, CT: Silas Andrus, 1829), 167.
16. *The Good Cook*, 101; Leslie, *Directions for Cookery*, 333.
17. C. & A. J. Langley advertisement, *Sacramento Daily Union*, January 11, 1856, 4.
18. One dram was one-eighth of a fluid ounce.
19. For cochineal dye recipes, see Ellet, *New Cyclopædia*, 225, 342, 475–476; Charles H. King, *Cakes, Cake Decorations, and Desserts: A Manual for Housewives* (Philadelphia: Arnold, 1896), 45; Elizabeth Ellicott Lea, *Domestic Cookery, Useful Receipts, and Hints to Young Housekeepers*, 13th ed. (Baltimore: Cushing and Bailey, 1869), 108; Miss Leslie [Eliza Leslie], *Seventy-Five Receipts for Pastry, Cakes, and Sweetmeats*, 4th ed. (Boston: Munroe and Francis, 1832), 48, 102; Leslie, *Lady's Receipt-Book*, 250; Mrs. D. A. Lincoln [Mary Johnson Lincoln], *Mrs. Lincoln's Boston Cook Book* (Boston: Roberts Brothers, 1884), 381–382; Rundell, *New System*, 30; Rundell, *Experienced American Housekeeper*, 167; *American Housewife and Kitchen Directory* (New York: Dick and Fitzgerald, 1869), 62.
20. Rebecca Sharpless, *Cooking in Other Women's Kitchen: Domestic Workers in the South, 1865–1960* (Chapel Hill: University of North Carolina Press, 2010); Daniel E. Sutherland, *Americans and Their Servants: Domestic Service in the United States from 1800 to 1920* (Baton Rouge: Louisiana State University Press, 1981).
21. *The Art of Confectionery, with Various Methods of Preserving Fruits and Fruit Juices* (Boston: J. E. Tilton, 1865), 13; Catherine Owen, "Home-Made Christmas Confection: Dainty Work for Fairy Fingers," *Good Housekeeping*, December 26, 1885, 101–102.
22. See, for example, Beecher, *Miss Beecher's Domestic*; Leslie, *Lady's Receipt-Book*; Robert Roberts, *The House Servant's Directory* (New York: Charles S. Francis, 1827). *The House Servant's Directory* was one of the few cookbooks written by an African American author.
23. Cowan, *More Work for Mother*, 120; Strasser, *Never Done*, 167, 176.
24. Amy Butler Greenfield, *Perfect Red: Empire, Espionage, and the Quest for the Color of Desire* (New York: HarperCollins, 2005), 228.

25. "Life in a Fair Country," *New York Times*, September 9, 1888, 10. See also "The Cochineal Industry in Guatemala," *American Druggist* 15, no. 5 (May 1886): 96; "The Practical Value of Science," *Pacific Rural Press*, November 27, 1875, 339. In the 1830s, cochineal prices began decreasing due to the expansion of production from Mexico to other regions. Jeremy Baskes, "Seeking Red: The Production and Trade of Cochineal Dye in Oaxaca, Mexico, 1750–1821," in *The Materiality of Color: The Production, Circulation, and Application of Dyes and Pigments, 1400–1800*, ed. Andrea Feeser, Maureen Daly Goggin, and Beth Fowkes Tobin (Burlington, VT: Ashgate, 2012), 110–112.
26. See, for example, Mary Barrett Brown, "Four Savory Entrées," *Ladies' Home Journal*, December 1894, 25; Catherine Owen, "Fine Cakes," *Good Housekeeping*, February 18, 1888, 187; Mary J. Safford, "Ways of Serving Strawberries," *Ladies' Home Journal*, May 1896, 26; Charles Scranton, "Candy Making Recipes," *Ladies' Home Journal*, November 1899, 16; "Suggestions for Mothers," *Ladies' Home Journal*, August 1895, 27.
27. Marion Harland, *Common Sense in the Household: A Manual of Practical Housewifery* (1871; repr., New York: Scribner, Armstrong, 1873), 324, 443.
28. Marion Harland, *Breakfast, Luncheon and Tea* (New York: Scribner, Armstrong, 1875), 328.
29. "Domestic Economy," *Pacific Rural Press*, February 20, 1875, 119. See also "Answers," *New York Times*, April 2, 1876, 9; "Domestic Recipes," *Pacific Rural Press*, February 4, 1871, 75; "Domestic Economy," *Pacific Rural Press*, December 9, 1882, 443.
30. For a history of nineteenth-century ideal womanhood, see Nancy Cott, *The Bonds of Womanhood: "Woman's Sphere" in New England, 1780–1835* (New Haven, CT: Yale University Press, 1977); Kathryn Kish Sklar, *Catharine Beecher: A Study in American Domesticity* (New Haven, CT: Yale University Press, 1973); Maxine L. Margolis, *Mothers and Such: Views of American Women and Why They Changed* (Berkeley: University of California Press, 1984); Glenna Matthews, *"Just a Housewife": The Rise and Fall of Domesticity in America* (New York: Oxford University Press, 1987); Barbara Welter, "The Cult of True Womanhood, 1820–1860," *American Quarterly* 18, no. 2, part 1 (Summer 1966): 151–174.
31. Sherrie A. Inness, *Dinner Roles: American Women and Culinary Culture* (Iowa City: University of Iowa Press, 2001), 58; Laura Shapiro, *Perfection Salad: Women and Cooking at the Turn of the Century* (New York: Modern Library, 2001), 96–97.
32. *Oxford English Dictionary*, s.v. "dainty," accessed April 30, 2018, http://www.oed.com.
33. For the construction of "middle class," see Stuart M. Blumin, *The Emergence of the Middle Class: Social Experience in the American City, 1760–1900* (New York:

Cambridge University Press, 1989); Cott, *Bonds of Womanhood*; Lori D. Ginzberg, *Women and the Work of Benevolence: Morality, Politics, and Class in the Nineteenth-Century United States* (New Haven, CT: Yale University Press, 1990); Mary P. Ryan, *Cradle of the Middle Class: The Family in Oneida County, New York, 1790–1865* (New York: Cambridge University Press, 1981).

34. Harvey Levenstein, *Paradox of Plenty: A Social History of Eating in Modern America*, rev. ed. (Berkeley: University of California Press, 2003), 35.
35. Inness, *Dinner Roles*, 53–55; Shapiro, *Perfection Salad*, 87, 92.
36. Mary Barrett Brown, "Notes on European Cookery: Superior Cold Sweets," *Ladies' Home Journal*, August 1890, 21.
37. "From Various Sources," *Boston Cooking School Magazine of Culinary Science and Domestic Economics* (hereafter cited as *Boston Cooking School Magazine*), October 1, 1898, 190.
38. Levenstein, *Paradox of Plenty*, 35; Shapiro, *Perfection Salad*, 68, 78, 96–97.
39. "Recipes Used in Preceding Menus," *Boston Cooking School Magazine*, August 1898, 95.
40. "Seasonable Menus for Easter Week," *Boston Cooking School Magazine*, April 1900, 284.
41. See Eleanor M. Lucas, "June Luncheons," *Boston Cooking School Magazine*, June 1900, 3–6; "Menus Illustrative of Class Work," *Boston Cooking School Magazine*, August 1897, 95–97; "News and Notes," *Boston Cooking School Magazine*, February 1899, 277–278. See also Shapiro, *Perfection Salad*, 79.
42. See, for example, *American Housewife*, 62; Ellet, *New Cyclopædia*, 475–476; King, *Cakes, Cake Decorations*, 45; Lincoln, *Mrs. Lincoln's Boston*, 381–382.
43. Beecher, *Miss Beecher's Domestic*, 133; Lea, *Domestic Cookery*, 84; Lincoln, *Mrs. Lincoln's Boston*, 384–385; Rundell, *New System*, 212.
44. *American Housewife*, 62; Ellet, *New Cyclopædia*, 475–476; Fannie Merritt Farmer, *The Boston Cooking-School Cookbook* (Boston: Little, Brown, 1896), 291; Harland, *Common Sense*, 314; Leslie, *Directions for Cookery*, 339; "Queries and Answers," *Boston Cooking School Magazine*, October 1897, 183.
45. King, *Cakes, Cake Decorations*, 40.
46. "Mrs. Rorer's Answers to Questions," *Ladies' Home Journal*, August 1898, 32.
47. Eleanor M. Lucas, "With Peaches In," *Boston Cooking School Magazine*, August 1898, 70.
48. "The Cozy Corner," *Good Housekeeping*, July 7, 1888, 115. See also "The Cozy Corner," *Good Housekeeping*, June 9, 1888, 68.
49. "Household Hints," *Boston Cooking School Magazine*, August 1897, 130. See also Lincoln, *Mrs. Lincoln's Boston*, 305.
50. For the popularity of white sauce in late nineteenth-century cooking, see Shapiro, *Perfection Salad*, 80, 87. For the transformation of food distribution and

marketing, see Harvey Levenstein, *Revolution at the Table: The Transformation of the American Diet* (Berkeley: University of California Press, 2003); Waverley Root and Richard de Rochemont, *Eating in America: A History* (New York: Ecco, 1981).

51. George H. Burnett, "Winning Nationally against 6,000 Local Producers," *Printers' Ink* 81, no. 9 (November 1912): 3–4; Joseph Burnett Company (hereafter cited as Joseph Burnett), *About Vanilla* (Boston: self-pub., 1900).
52. "The Life and Legacy of Joseph Burnett," Southborough Historical Society, June 12, 2014, https://southboroughhistory.org/?page_id=52.
53. Ibid.
54. Burnett's Color Pastes advertisement in Joseph Burnett, *About Vanilla*. By 1915, these color names were changed to orange, blue, caramel, red, rose, green, yellow, scarlet, chestnut, and violet.
55. Joseph Burnett, *Dainty and Artistic Desserts: With Menus and Special Recipes by Mrs. Janet M. Hill* (Boston: self-pub., 1915), 40; Joseph Burnett, *Sixteen Recipes* (Boston: self-pub., 1915), 4; Eldridge Baker Company, *Wholesale Grocery Catalog* (October 1915 and October 1916), box 6, "Food," NMAH-WCBA.
56. Joseph Burnett, *Rounding out the Meal: My Favorite Desserts by Born Cook* (Boston: self-pub., 1935).
57. Joseph Burnett, *Dainty and Artistic Desserts*, 4. See also McKinley Wilton and Norman Wilton, *The Homemaker's Pictorial Encyclopedia of Modern Cake Decorating*, 2nd ed. (Whitefish, MT: Literary Licensing, 1954), 30.
58. Joseph Burnett, *Dainty Desserts*, 4.
59. Joseph Burnett, *Dainty and Artistic Desserts*, 4; Joseph Burnett, *Dainty Desserts and Confections* (Boston: self-pub., 1914): 4.
60. *American Housewife*, 111–112; Lea, *Domestic Cookery*, 163; Leslie, *Directions for Cookery*, 329; Leslie, *Seventy-Five Receipts*, 36; Rundell, *Experienced American*, 162; Rundell, *New System*, 252; J. M. Sanderson, *The Complete Cook: Plain and Practical Directions for Cooking and Housekeeping* (Philadelphia: J. B. Lippincott, 1864), 165.
61. Mary Foster Snider, "Aspic Delicacies," *Good Housekeeping*, February 1904, 207.
62. Wendy A. Woloson, *Refined Tastes: Sugar, Confectionery, and Consumers in Nineteenth-Century America* (Baltimore: Johns Hopkins University, 2002), 214.
63. Shapiro, *Perfection Salad*, 93; Woloson, *Refined Tastes*, 214.
64. Mary J. Lincoln, *Mrs. Lincoln's Boston Cook Book*, rev. ed. (Boson: Little, Brown, 1903), vii. Lincoln recommended specific gelatin brands in her cookbook. For instance, the 1890 edition mentioned Cox's and Nelson's gelatin, while the 1896 edition included Knox's product as well as Cox's and Nelson's. In the 1909 and 1916 editions, only Cox and Nelson were mentioned.

65. For a history of baking powder and its influence on American cooking, see Linda Civitello, *Baking Powder Wars: The Cutthroat Food Fight That Revolutionized Cooking* (Chicago: University of Illinois Press, 2017).
66. Knox advertisement, 1899, box 5, RL-RLC.
67. Janet McKenzie Hill, *Dainty Desserts for Dainty People: Salads and Savories* (Johnstown, NY: Charles B. Knox, 1901), box 29, SL-CCC.
68. Rosemarie D. Bria, "How Jell-O Molds Society and How Society Molds Jell-O: A Case Study of an American Food Industry Creation" (PhD diss., Columbia University, 1991): 44.
69. Peter Cooper, improvement in the preparation of portable gelatine, US Patent 4,084, June 20, 1845.
70. Bria, "How Jell-O Molds," 32; Carolyn Wyman, *Jell-O: A Biography* (New York: Harcourt, 2001), 3.
71. Diane Jesse Nelson, "Jell-O Advertising in *Ladies' Home Journal*, 1902–1929" (master's thesis, Iowa State University, 1989): 25–26.
72. Genesee Pure Food Company, *Jell-O* (LeRoy, NY: self-pub., 1915). See also Jell-O Company, *Jell-O: America's Most Famous Dessert* (LeRoy, NY: self-pub., n.d.), box 7, NMAH-PCC.
73. Joseph Burnett, *Dainty and Artistic Desserts*, 40; Joseph Burnett, *Dainty Desserts*, 27; Christopher Hansen's Laboratory Company (hereafter cited as Christopher Hansen), *Dainty Junkets* (Little Falls, NY: self-pub., 1915), 6.
74. Turner, *How the Other Half Ate*, 35, 62.
75. Sanderson, *Complete Cook*, 95. See also Mary Theiss and Lewis Theiss, "Fake Sweets and Soft Drinks to Be Dodged," *Pearson's Magazine*, July 1911, 81.
76. *Art of Confectionery*, 14–15.
77. "Adulterated Confectionery: The Poisonous Compounds That Are Sold in Cheap Shops for Candy," *New York Times*, December 8, 1877, 2. See also "Things Not Always What They Seem: Adulterated Goods That Have Been Sold to an Unsuspecting Public," *New York Times*, December 27, 1895, 15.
78. Scranton, "Candy Making Recipes," 16.
79. "Suggestions for Mothers," *Ladies' Home Journal*, September 1897, 30.
80. "Mrs. Rorer's Answers to Questions," *Ladies' Home Journal*, April 1898, 48. See also Lucas, "With Peaches In."
81. "Household Hints," *Boston Cooking School Magazine*, February 1899, 291. See also Helen Combs, "Making the Table Attractive," *Ladies' Home Journal*, June 1893, 30; "Crumbs," *Good Housekeeping*, April 1894, 193.
82. Woloson, *Refined Tastes*, 193. See also Philip P. Gott and L. F. Van Houten, *All about Candy and Chocolate: A Comprehensive Study of the Candy and Chocolate Industries* (Chicago: National Confectioners Association, 1958), 17–20; Samira

Kawash, *Candy: A Century of Panic and Pleasure* (New York: Faber and Faber, 2013), 51–72.

83. Price Flavoring Extract Company, *Dr. Price's Delicious Desserts Containing Practical Recipes Carefully Selected and Tested* (Chicago: self-pub., 1904), box 1900s-1, RL-NPC. The firm provided various food colors, including strawberry red, lemon yellow, chocolate brown, purple violet, blood orange, and apple green.
84. "Coloring Compounds," *Sixteenth Biennial Report of the Minnesota State Dairy and Food Commissioner* (Minneapolis: Harrison & Smith, 1917), 39; State of Washington, *Sixth Biennial Report of the Dairy and Food Commissioner* (Olympia, WA: E. L. Boardman, Public Printer, 1907), 81.
85. H. Burnett to W. G. Campbell, February 25, 1919, box 55, entry 1001, NACP-FDA; Campbell to Joseph Burnett Company, March 3, 1919, box 55, entry 1001, NACP-FDA.
86. Joseph Burnett, *Dainty and Artistic Desserts*, 4.
87. Lincoln, *Mrs. Lincoln's Boston*, rev. ed., 551–552. See also Marion H. Neil, *Candies and Bonbons and How to Make Them* (Philadelphia: David McKay, 1913), 22, 32, 51, 56–57.
88. "Mrs. Rorer's Helps for Young Housekeepers," *Ladies' Home Journal*, November 1901, 48.
89. "Some Recipes for Frosting," *Good Housekeeping*, December 1911, 837. See also "Queries and Answers," *Boston Cooking School Magazine*, April 1907, 447.
90. "Chr. Hansen's Junket Colors," *Trained Nurse and Hospital Review* 40, no. 1 (July 1903): 202. H. Kohnstamm & Company, which had initially supplied dye products to the food industry, also supplied packaged food dyes for home use. See H. Kohnstamm & Company advertisement, *Chicago Tribune*, December 31, 1911, 5.
91. Christopher Hansen, *Dainty Junkets*, 6. See also Christopher Hansen advertisement, *Boston Cooking School Magazine*, June 1901, lxiv.
92. Joseph Burnett, *Dainty and Artistic Desserts*, 4; Burnett's Color Pastes advertisement in Joseph Burnett, *About Vanilla*. See also Joseph Burnett, *Dainty Desserts,* 4.
93. Knox, *Dainty Desserts for Dainty People* (Johnstown, NY: self-pub., 1915). See also Jell-O advertisement, 1908, box 5, RL-LBP.
94. For the home economics movement, see Goldstein, *Creating Consumers*; Matthews, *"Just a Housewife."*
95. Quoted in Megan J. Elias, *Stir It Up: Home Economics in American Culture* (Philadelphia: University of Pennsylvania Press, 2008), 26.
96. Joseph Burnett, *Dainty Desserts*, 3.

97. Joseph Burnett, *Dainty and Artistic Desserts*, 3.
98. In the early twentieth century, food manufacturers and home appliance companies increasingly hired well-known domestic scientists, including Mary J. Lincoln, Sarah Tyson Rorer, and Janet MacKenzie Hill, as consultants to write recipes and leaflets to promote their products. Goldstein, *Creating Consumers*, 178–179.
99. Knox, *Knox Gelatine: Desserts, Salads, Candies, and Frozen Dishes* (Johnstown, NY: self-pub., 1933), box 29, SL-CCC.
100. Knox, *Knox Gelatine: Salads, Desserts, Pies, Candies* (Johnstown, NY: self-pub., 1943), box 7, NMAH-PCC.
101. Knox, *Control Your Weight with Knox Gelatine* (Johnstown, NY: self-pub., 1938), box 29, SL-CCC.
102. Knox, *Knox Gelatine: Dainty Desserts Candies Salads* (Johnstown, NY: self-pub., 1931), box 7, NMAH-PCC.
103. See Knox, *Knox Sparkling Gelatine Recipes* (Johnstown, NY: self-pub., 1943), box 7, NMAH-PCC.
104. Ernest Dichter, *Handbook of Consumer Motivations: The Psychology of the World of Objects* (New York: McGraw-Hill, 1964), 37. Ernest Dichter was born in Vienna in 1907. He received a doctorate in psychology from the University of Vienna in 1934 and moved to New York in 1938 to escape the Nazis. He became a pioneer in the development of "motivational research," a marketing methodology that used psychological techniques to probe consumers' desires and responses to products and certain brands.
105. For a historical discussion on Dichter's marketing methodology, see Stefan Schwarzkopf and Rainer Gries, eds., *Ernest Dichter and Motivation Research: New Perspectives on the Making of Post-War Consumer Culture* (New York: Palgrave Macmillan, 2010).
106. John D. Duff and Louis E. Dietrich, process of making a dehydrated flour mixture, US Patent 1,931,892, filed December 10, 1930, and issued October 24, 1933; John D. Duff and Louis E. Dietrich, dehydrated flour mix and process of making the same, US Patent 2,016,320, filed June 13, 1933, and issued October 8, 1935.
107. Laura Shapiro, *Something from the Oven: Reinventing Dinner in 1950s America* (New York: Viking, 2004), 72–73.
108. For a history of postwar consumer culture, see Lizabeth Cohen, *A Consumers' Republic: The Politics of Mass Consumption in Postwar America* (New York: Vintage Books, 2003); Gary Cross, *An All-Consuming Century: Why Commercialism Won in Modern America* (New York: Columbia University Press, 2000); Karal Ann Marling, *As Seen on TV: The Visual Culture of Everyday Life in the 1950s* (Cambridge, MA: Harvard University Press, 1994); Susan Strasser, *Waste and*

Want: A Social History of Trash (New York: Metropolitan Books, 1999), esp. chap. 7.

109. In 1950, about 34 percent of women (single and married) were employed outside the home; in 1920, the rate was about 20 percent. "Changes in Women's Labor Force Participation in the 20th Century," Bureau of Labor Statistics, US Department of Labor, February 16, 2000, http://www.bls.gov/opub/ted/2000/feb/wk3/art03.htm; Mitra Toossi, "A Century of Change: The U.S. Labor Force, 1950–2050," *Monthly Labor Review* (May 2002): 15–28.
110. Dorothy B. Marsh and Elizabeth J. Gillen, "The Bride's First Cake," *Good Housekeeping*, April 1950, 149.
111. Ernest Dichter, "A Psychological Research Study on the Effectiveness of Betty Crocker in Promoting General Mills Products," 1953, box 8, HML-EDP; Marling, *As Seen on TV*, 213–214.
112. Marling, *As Seen on TV*, 224.
113. Myrna Johnston, "Glamour Tricks with Cake Mix," *Better Homes and Gardens*, September 1953, 90.
114. See "Frosting Flowers," *Good Housekeeping*, September 1957, 144; *Good Housekeeping*, August 1957, 138.
115. *Betty Crocker's Cake and Frosting Mix Cookbook* (New York: Colden, 1966).
116. "Frosting Can Make the Cake," *Sunset*, November 1954, 174.
117. See General Foods advertisement, *Ladies' Home Journal*, September 1951, n.p.; Betty Crocker Frosting Mix advertisement, *Good Housekeeping*, November 1957, n.p.
118. General Foods, *Cake Secrets* (New York: self-pub., 1953), box 4, NMAH-PCC. See also "Cake-Frosting Specials," *Better Homes and Gardens*, January 1958, 83–84; Dorothy B. Marsh, "Good Housekeeping's Cake Cook Book," *Good Housekeeping*, February 1952, 77–115.
119. For a history of the Aunt Jemima brand in relation to food marketing and racial issues, see Brian D. Behnken and Gregory D. Smithers, *Racism in American Popular Media: From Aunt Jemima to the Frito Bandito* (Santa Barbara, CA: Praeger, 2015); Thomas Hine, *The Total Package: The Evolution and Secret Meanings of Boxes, Bottles, Cans, and Tubes* (Boston: Little, Brown, 1995); Marilyn Kern-Foxworth, *Aunt Jemima, Uncle Ben, and Rastus: Blacks in Advertising, Yesterday, Today, and Tomorrow* (Westport, CT: Greenwood, 1994); M. M. Manring, *Slave in a Box: The Strange Career of Aunt Jemima* (Charlottesville: University Press of Virginia, 1998); Diane Roberts, *The Myth of Aunt Jemima: Representation of Race and Region* (New York: Routledge, 1994).
120. Aunt Jemima Cake Mix advertisement, *Woman's Day*, 1952, n.p.
121. Elaine Tyler May, *Homeward Bound: American Families in the Cold War Era*, rev. ed. (New York: Basic Books, 2017), esp. chap. 6. For a history of children and

childhood, see Marilyn Irvin Holt, *Cold War Kids: Politics and Childhood in Postwar America, 1945–1960* (Lawrence: University Press of Kansas, 2014); Steven Mintz, *Huck's Raft: A History of American Childhood* (Cambridge, MA: Belknap Press of Harvard University Press, 2004); Steven Mintz and Susan Kellogg, *Domestic Revolutions: A Social History of American Family Life* (New York: Free Press, 1988); Viviana A. Zelizer, *Pricing the Priceless Child: The Changing Social Value of Children* (Princeton, NJ: Princeton University Press, 1985).

122. Benjamin Spock, *The Common Sense Book of Baby and Child Care* (New York: Duell, Sloan and Pearce, 1946), 150. The book sold 500,000 copies in its first six months.
123. Johnston, "Glamour Tricks with Cake Mix," 130.
124. "Cake Decorating," *Good Housekeeping*, March 1957, 101–119. See also "Five Party Cakes," *Good Housekeeping*, April 1955, 88–96.
125. Marsh, "Good Housekeeping's Cake Cook Book," 109.
126. See Marling, *As Seen on TV*, 229–231.
127. Dichter, *Handbook*, 28. See also Institute for Motivational Research, Inc., "A Creative Memorandum on the Psychology of Cake Mixes," 1961, box 64, HML-EDP.
128. Erika Endrijonas, "Processed Food from Scratch: Cooking for a Family in the 1950s," in Inness, *Kitchen Culture*, 157–173.

5. Making Oranges Orange

1. Harvey Levenstein, *Revolution at the Table: The Transformation of the American Diet* (Berkeley: University of California Press, 2003); Gary Y. Okihiro, *Pineapple Culture: A History of the Tropical and Temperate Zones* (Berkeley: University of California Press, 2009); Waverley Root and Richard de Rochemont, *Eating in America: A History* (New York: Ecco, 1981).
2. Levenstein, *Revolution at the Table*, 30; Root and de Rochemont, *Eating in America*, 129–133, 150–155; Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon Books, 1982), 11–12, 16–17.
3. William Boyd, "Making Meat: Science, Technology, and American Poultry Production," *Technology and Culture* 42, no. 4 (October 2001): 631–664.
4. For the transformation of agricultural production, see David B. Danbom, *The Resisted Revolution: Urban America and the Industrialization of Agriculture, 1900–1930* (Ames: Iowa State University Press, 1979); Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven, CT: Yale University Press, 2003); David E. Hamilton, *From New Day to New Deal: American Farm Policy from Hoover to Roosevelt, 1928–1933* (Chapel Hill: University of North Carolina Press, 1991); Robert Paarlberg and Don Paarlberg,

"Agricultural Policy in the Twentieth Century," *Agricultural History* 74, no. 2 (Spring 2000): 136–161.

5. For a contemporary discussion about agricultural marketing in the early twentieth century, see Arthur B. Adams, *Marketing Perishable Farm Products*, Studies in History, Economics and Public Law, Columbia University (New York: Longmans, Green, 1916); Charles J. Brand, "What the Government Is Doing toward Better Production and Better Distribution," *Scientific American*, August 12, 1916, 154–156; L. C. Corbett, "A Successful Method of Marketing Vegetable Products," *Yearbook of the USDA* (Washington, DC: Government Printing Office, 1912), 353–362; Dick J. Crosby, "Agriculture in Public High Schools," *Yearbook of the USDA* (Washington, DC: Government Printing Office, 1912), 471–482; J. Clyde Marquis, "Advertising as an Aid to Direct Selling," *Annals of the American Academy of Political and Social Science* 50, no. 1 (November 1913): 197–202; G. Harold Powell, "Cooperation in the Handling and Marketing of Fruit," *Yearbook of the USDA* (Washington, DC: Government Printing Office, 1910), 391–406; "Report of the Secretary," *Yearbook of the USDA* (Washington, DC: Government Printing Office, 1913), 26–31; Louis Dwight Harvell Weld, *The Marketing of Farm Products* (New York: Macmillan, 1916).
6. The first recorded bananas to reach New York arrived in 1804. Roy Kerr, "The Lowly, but Also the Mighty Banana—a Noble Product," a speech given before the New Orleans Cosmopolitan International Club, May 3, 1962, folder 4, box 8, HBS-HAP.
7. Peter Chapman, *Bananas: How the United Fruit Company Shaped the World* (New York: Canongate, 2007), 19; Dan Koeppel, *Banana: The Fate of the Fruit That Changed the World* (New York: Hudson Street, 2008), xii; John Soluri, *Banana Cultures: Agriculture, Consumption, and Environmental Change in Honduras and the United States* (Austin: University of Texas Press, 2005), 36–37.
8. Kerr, "Lowly"; Mrs. A. L. Webster, *The Improved Housewife, or Book of Receipts, with Engravings and Marketing and Carving*, rev. ed. (Hartford, CT: I. Webster, 1854), 13.
9. I thank Shana Klein for bringing this source to my attention.
10. Mrs. D. A. Lincoln [Mary Johnson Lincoln], *Mrs. Lincoln's Boston Cook Book: What to Do and What Not to Do in Cooking* (Boston: Roberts Brothers, 1884), 393.
11. Quoted in Soluri, *Banana Cultures*, 39.
12. Mel T. Cook, "The Banana," *Scientific American Supplement*, September 23, 1905, 24847. See also "Bananas—Their Culture and Transportation," *Scientific American*, January 28, 1905, 78, 80; "Fruits as Foods and Fruits as Poisons," *Ladies' Home Journal*, June 1898, 25.

13. Soluri, *Banana Cultures*, 62. See also "The Banana," *Scientific American*, March 21, 1896, 186.
14. "Report and Recommendations on Field Survey for the Fruit Dispatch Company," Harvard University Graduate School of Business Administration, *Harvard Advertising Awards*, vol. 8, pt. 1, May 13, 1940, Ms. Div. SPGD H339a, HBS-Arc.
15. See, for example, Fannie Merritt Farmer, *The Boston Cooking-School Cookbook* (Boston: Little, Brown, 1896); Janet M. Hill, "Seasonable Recipes," *Boston Cooking School Magazine of Culinary Science and Domestic Economics*, June 1913, 38–39; Sarah Tyson Rorer, *Mrs. Rorer's New Cook Book: A Manual of Housekeeping* (Philadelphia: Arnold, 1902); Sarah Field Splint, *The Art of Cooking and Serving* (Cincinnati: Procter and Gamble, 1929).
16. Soluri, *Banana Cultures*, 57–62. See also Virginia Scott Jenkins, *Bananas: An American History* (Washington, DC: Smithsonian Books, 2000).
17. Chapman, *Bananas*, 19; Koeppel, *Banana*, xii, xiv; Soluri, *Banana Cultures*, 39.
18. Rob Dunn, *Never out of Season: How Having the Food We Want When We Want It Threatens Our Food Supply and Our Future* (New York: Little, Brown, 2017), 5–6.
19. Hannaford Bros. Company, Price List, "Fruits and Produce," 1903–1904, box 8, "Food," NMAH-WCBA.
20. Fruit Dispatch Company, *From the Tropics to Your Table: Eighty-Three Tested Banana Recipes* (New York: self-pub., 1926), box 4, NMAH-PCC; Fruit Dispatch Company, *A Study of the Banana: Its Every-Day Use and Food Value* (New York: self-pub., 1942), box 4, NMAH-PCC; Fruit Dispatch Company advertisement, *Ladies' Home Journal*, March 1926, n.p.
21. Fruit Dispatch Company, *A Study of the Banana*. See also Banana Growers Association, *Bananas in the Modern Manner: Recipes, Menus, and Suggestions for Housewife and Hostess* (New York: self-pub., 1930), box 1930s–6, RL-NPC; Fruit Dispatch Company, *From the Tropics*.
22. See Lily Haxworth Wallace, *Rumford Fruit Cook Book* (Providence, RI: Rumford, 1927), box 11, NMAH-PCC.
23. Standard Fruit and Steamship Company, *Retail Color and Temperature Guide* (New Orleans: self-pub., n.d.), box 8, HBS-HAP. See also Standard Fruit and Steamship Company posters, "Banana Summertime Handling at the Warehouse," 1965 and "Wintertime Banana Handling at Retail," 1926, both in box 8, HBS-HAP.
24. AAA, *Recent Changes in the Florida Citrus Industry: A Graphic Review of Certain Economic Factors Bearing on the Production and Marketing of Florida Oranges and Grapefruits* (Washington, DC: Government Printing Office, 1938); Arno Johnson, "Client Talk for the Florida Citrus Commission," 1955, box 18, Writings and Speeches, RL-JWT.

25. FSDA, *Citrus Industry of Florida* (Tallahassee, FL: Department of Agriculture, 1955), 16; Institute for Motivational Research, Inc., "A Motivational Research Study of the Sales and Advertising Problems of Citrus Fruit," July 1955, box 22, HML-EDP; "Major Trends in Consumption of Fruits and Vegetables," *Food Industries* 2, no. 8 (August 1930): 364–366; Isabelle Thursday, "Developing the Home Market for Florida Citrus Fruits," *FSHS* 49 (1936): 49.
26. The first carload of oranges was shipped from California to outside the state in the late 1870s. Josephine Kingsbury Jacobs, "Sunkist Advertising" (PhD diss., University of California, Los Angeles, 1966): 3.
27. C. H. Kirkman, *The Sunkist Adventure* (Washington, DC: Farmer Cooperative Service, USDA, 1975).
28. Don Francisco, "The Plans behind the 1920 Sunkist Advertising," *Advertising and Selling* 30, no. 1 (June 26, 1920): 20; Don Francisco, "The Story of Sunkist Advertising," December 9, 1948, Writings and Speeches, RL-JWT; Kirkman, *The Sunkist Adventure*, 12–13; Douglas Cazaux Sackman, "'By Their Fruits Ye Shall Know Them': 'Nature Cross Culture Hybridization' and the California Citrus Industry, 1893–1939," *California History* 74, no. 1 (Spring 1995): 91.
29. FSDA, *Citrus Industry of Florida*, 16.
30. Levenstein, *Revolution at the Table*, 154. See also Sackman, "'By Their Fruits,'" 92.
31. Francisco, "Story of Sunkist Advertising."
32. In 1952, the CFGE changed its name to Sunkist Growers, Inc.
33. Soluri, *Banana Cultures*, 184.
34. Sackman, "'By Their Fruits,'" 83.
35. See, for example, Alfred G. Bauer, *The Art of Window Dressing for Grocers* (Chicago: Sprague, Warner, 1902); Earl W. Brown, "The Value of Exhibits in Advertising Florida and Its Fruits," *FSHS* 49 (1936): 81; William L. Butler, *How to Make Grocery Windows Pay* (New York: Progressive Grocer: 1932); "Color and Light as Expert Salesmen," *Printers' Ink Monthly* 8, no. 4 (April 1924): 92; "New Tricks in Old Windows," *Progressive Grocer* 14, no. 3 (March 1935): 30–31; "What Colors Best Catch the 'Window Shoppers'?" *Printers' Ink Monthly* 11, no. 6 (December 1925): 67. See also Douglas Cazaux Sackman, *Orange Empire: California and the Fruits of Eden* (Berkeley: University of California Press, 2007), 98–99.
36. Francisco, "Story of Sunkist Advertising." See also Brown, "Value of Exhibits," 81; Thomas Patrick Jacobsen, *Pat Jacobsen's Collector's Guide to Fruit Crate Labels* (Pleasant Hill, CA: Patco Enterprises, 1994), 24.
37. Jean Baudrillard, *Consumer Society: Myths and Structures*, trans. Chris Turner (1970; repr., Thousand Oaks, CA: SAGE, 1998), 26.

38. Sackman, "'By Their Fruits,'" 94–96; Donald D. Spencer, *Citrus Crate Labels of Florida* (Ormond Beach, FL: Camelot, 2001), 14. For the digital collection of crate labels, see "Collection of Citrus Labels," Calisphere, California Digital Library, accessed May 1, 2019, https://calisphere.org/collections/26760; "Florida Southern College Fruit and Vegetable Crate Label Collection," McKay Archives Center Digital Collection, Florida Southern College, Lakeland, FL, accessed May 1, 2019, http://archives.flsouthern.edu/cdm/landingpage/collection/labels; NMAH Digital Collection, accessed May 1, 2019, https://americanhistory.si.edu/collections/search?custom_search_id=collections-search&edan_local=1&op=Search+the+Collections&edan_q=crate+labels.
39. The exception to the four-color printing was the American Fruit Grower labels, which were primarily two colors: orange and blue. The size of labels varied, depending on region. Florida and Texas labels were predominantly 9″×9″ in size, with a smaller rectangular strip label for tangerines, whereas California and Arizona labels were 10″×10¾″. Jerry Chicone Jr. and Brenda Eubanks Burnette, *Florida Citrus Crate Labels: An Illustrated History* (Bartow, FL: Bartow Printing, 1996), 85; Jacobsen, *Pat Jacobsen's*, 24.
40. Jacobsen, *Pat Jacobsen's*, 1; Sackman, *Orange Empire*, 87.
41. The peak of Florida citrus crate label production was in the late 1930s, when nearly 420 packinghouses shipped over thirty million boxes of fruit a year. In Florida, all labels were registered with the Florida Citrus Commission. Chicone and Burnette, *Florida Citrus*, 11; William S. Hoofnagle, *Changes in the Marketing Pattern of Florida Fresh Oranges between Prewar and Postwar Periods* (Washington, DC: US Bureau of Agricultural Economics, 1952), 8; Spencer, *Citrus Crate*, 13.
42. Chicone and Burnette, *Florida Citrus*, 1.
43. Gordon Mackinney and Angela C. Little, *Color of Foods* (Westport, CT: AVI, 1962), 232–237; B. F. Walton, "Grading and Packing Fruit to Meet the Wants of the Trade," *Pacific Rural Press*, June 8, 1895, 357.
44. W. S. Killingsworth, "Standardization Promotes Fruit Industry," *Pacific Rural Press*, February 14, 1920, 249; Steven Stoll, *The Fruits of Natural Advantage: Making the Industrial Countryside in California* (Berkeley: University of California Press, 1998), 90.
45. James H. Deering, *Supplement to the Codes and General Laws of the State of California of 1915, Showing the Changes Affecting the Codes and the General Laws for the Years 1917 and 1919* (San Francisco: Bancroft-Whitney, 1919), 1078.
46. H. E. Erdman, *American Produce Markets* (Boston: D. C. Heath, 1928), 255; Stoll, *Fruits of Natural Advantage*, 90; USDA, Bureau of Agricultural Economics, "Handbook of United States Standards for Grading and Marketing

Fresh Fruits and Vegetables," Miscellaneous Publication No. 190 (June 1934): 3–4.

47. L. P. Kirkland, "The 'Color Added' Situation," *FSHS* 49 (1936): 105.
48. "Market Reports," *Ocala Evening Star*, November 23, 1909. See also Sidney Hoos and J. N. Boles, "Orange Industry Trends: Changing Economic Relationships and Technology Affect Returns and Marketing Practices of California Growers," *California Agriculture* 7, no. 3 (March 1953): 31.
49. R. C. Wright, *Coloring Satsuma Oranges in Alabama*, USDA Bulletin No. 1159 (Washington, DC: Government Printing Office, 1923). See also E. M. Chace, "Sweating of Oranges," *American Food Journal* 9, no. 8 (August 1914): 491; E. M. Chace and Frank E. Denny, "Use of Ethylene in the Coloring of Citrus Fruit," *JIEC* 16, no. 4 (April 1924): 339.
50. Chace and Denny, "Use of Ethylene," 339; H. Harold Hume, *Citrus Fruits*, rev. ed. (New York: Macmillan, 1957), 324–325.
51. John McPhee, *Oranges* (New York: Farrar, Straus and Giroux, 1966), 10.
52. In the region, 53 percent of oranges were shipped from Florida, while 46 percent were shipped from California. AAA, *Recent Changes*, 5–7, 38; Elizabeth Hoffman and Gary D. Libecap, "Political Bargaining and Cartelization in the New Deal: Orange Marketing Orders," in *The Regulated Economy: A Historical Approach to Political Economy*, ed. Claudia Goldin and Gary D. Libecap (Chicago: University of Chicago Press, 1994), 194.
53. AAA, *Recent Changes*, 38.
54. Raymond E. Crist, "The Citrus Industry in Florida," *American Journal of Economics and Sociology* 15, no. 1 (October 1955): 7; Sidney Hoos and J. N. Boles, *Oranges and Orange Products: Changing Economic Relationships*, California Agricultural Experiment Station Bulletin No. 731 (Berkeley: California Agricultural Experiment Station, 1953), 5, 11–13; Paul E. Shuler and J. C. Townsend Jr., *Florida Citrus Fruit Annual Summary 1957*, Agricultural Marketing Survey (Orlando: Florida Department of Agriculture, 1958). The national production of oranges averaged 30.2 million boxes a season from the 1919–20 to the 1924–25 seasons and rose to 53.4 million boxes a season from the 1931–32 to the 1936–37 seasons.
55. Hoofnagle, *Changes*, 19.
56. The shipping cost to Chicago in 1938, for instance, was $0.85 per box from Florida and $1.11 from California. AAA, *Recent Changes*, 36, 40; Hoofnagle, *Changes*, 15–19.
57. "Fay Back from California, Says Florida Must Produce Brighter Fruit," *Citrus Industry* 7, no. 4 (April 1926): 28.
58. Kirkland, "The 'Color Added' Situation," 103–104. The Florida Citrus Commission (hereafter cited as FCC) was founded in 1935 and served to centralize

the marketing of Florida citrus by conducting market research and carrying out orange promotion campaigns in national media.

59. "Bright Fruit from the Marketing Viewpoint," *Citrus Industry* 6, no. 4 (April 1925): 6. See also *Hearings on Problems of the Citrus-Fruit Industry, Day 2, 3, before a Subcomm. of the Comm. on Agriculture and Forestry*, 80th Cong., 2nd sess., 105, 247 (1948) (hereafter cited as *1948 Hearings*) (statement of John A. Snivley Sr., Snively Groves, Inc., Winter Haven, FL, and statement of Howard Philips, Executive Vice President, Dr. P. Philips' Cooperative, Orlando, FL).
60. "Calif. Exchange Opens Battle on Florida Oranges," *Chicago Packer*, December 12, 1936, 1.
61. Marvin H. Walker, "Advertising and Publicizing the Citrus Fruits of Florida," *FSHS* 49 (1936): 70.
62. Brown, "Value of Exhibits," 80. See also "Florida Defends Its Fruits," *New York Times*, December 6, 1936, 15.
63. "Food News of the Week," *New York Times*, December 30, 1938, 18; "Vitamin A Is Found to Attack Disease," *New York Times*, September 8, 1936, 23. For the increasing popularity of vitamins in the United States, see Rima D. Apple, *Vitamania: Vitamins in American Culture* (Newark, NJ: Rutgers University Press, 1996).
64. Walker, "Advertising and Publicizing," 70. See also FCC advertisement, *New York Times Magazine*, January 12, 1936, 18.
65. FCC advertisement, *New York Times Magazine*, March 15, 1936, 16.
66. Walker, "Advertising and Publicizing," 70.
67. For place-based marketing of food, see Johan Bruwer and Ray Johnson, "Place-Based Marketing and Regional Branding Strategy Perspectives in the California Wine Industry," *Journal of Consumer Marketing* 27, no. 1 (2010): 5–16; Isabelle Frochot, "An Analysis of Regional Positioning and Its Associated Food Images in French Tourism Regional Brochures," *Journal of Travel and Tourism Marketing* 14, nos. 3–4 (2003): 77–96; N. Papadopoulos and L. A. Heslop, "Country Equity and Country Branding: Problems and Prospects," *Journal of Brand Management* 9, no. 4 (April 2002): 294–314; Stephen F. Thode and James M. Maskulka, "Place-Based Marketing Strategies, Brand Equity and Vineyard Valuation," *Journal of Product and Brand Management* 7, no. 5 (1998): 379–399.
68. Christine Frederick, *Seald Sweet Cook Book* (Tampa: Florida Citrus Exchange, n.d.), box 11, NMAH-PCC.
69. Seald Sweet advertisement, *Ladies' Home Journal*, January 1925, 82–83.
70. L. M. Dennis, *Gas Analysis* (New York: Macmillan, 1902); Arthur F. Sievers and Rodney H. True, *A Preliminary Study of the Forced Curing of Lemons as*

Practiced in California, USDA Bulletin No. 232 (Washington, DC: Government Printing Office, 1912).

71. Frank E. Denny, method of coloring citrus fruits, US Patent 1,475,938, filed March 1, 1923, and issued December 4, 1923. See also Norwood C. Thornton, "The Facts about 'Artificially' Ripened Fruit," *Food Industries* 12, no. 7 (July 1940): 48.
72. E. M. Chace and C. G. Church, "Effect of the Ethylene on the Composition and Color of Fruits," *JIEC* 19, no. 10 (October 1927): 1135–1139; Chace and Denny, "Use of Ethylene," 339–340; Frank E. Denny, "Hastening the Coloration of Lemons," *Journal of Agricultural Research* 27, no. 10 (March 1924): 757–769; E. F. Kohman, "Ethylene Treatment of Tomatoes," *JIEC* 23, no. 10 (October 1931): 1112–1113; J. R. Winston, *The Coloring or Degreening of Mature Citrus Fruits with Ethylene*, USDA Circular no. 961 (Washington, DC: Government Printing Office, 1955); J. R. Winston and R. W. Tilden, *The Coloring of Mature Citrus Fruits with Ethylene Gas* (Washington, DC: Government Printing Office, 1932).
73. Koeppel, *Banana*, 13.
74. Root and de Rochemont, *Eating in America*, 142, 153.
75. William R. Barger and Lon A. Hawkins, *Coloring Citrus Fruits in Florida*, USDA Bulletin No. 1367 (Washington, DC: Government Printing Office, 1926); E. M. Chace, "Health Problems Connected with the Ethylene Treatment of Fruits," *American Journal of Public Health* 24, no. 11 (November 1934): 1152; FSDA, *Citrus Industry of Florida*, 183, 186; Wilfred F. Wardowski, Steven Nagy, and William Grierson, *Fresh Citrus Fruits* (Westport, CT: AVI, 1986), 254.
76. R. H. Hilgeman, "Ripening Fruit with Ethylene," *Arizona Agriculturist* 5, no. 9 (June 1928): 4.
77. Thornton, "Facts about 'Artificially' Ripened Fruit," 51.
78. Kohman, "Ethylene Treatment of Tomatoes," 1112–1113; E. V. Miller, "The Story of Ethylene," *Scientific Monthly* 65, no. 5 (October 1947): 337; J. T. Rosa, "Ripening of Tomatoes," *Proceedings of the American Society for Horticultural Science* 22 (1925): 315; Dean H. Rose, *The Effect of Ethylene on Color and Other Changes in Fruits and Vegetables* (Washington, DC: Government Printing Office, 1929).
79. Hilgeman, "Ripening Fruit," 4.
80. Rosa, "Ripening of Tomatoes," 320–321.
81. FSDA, *Citrus Industry of Florida*, 183; G. R. Williams to Sydney C. Chase, October 21, 1922, UF-CC.
82. F. C. Blanck, W. S. Frisbie, and D. F. Fisher, "Report of the Committee on Citrus Coloration," May 22, 1934, box 2002, NACP-OSA.

83. H. G. Hamilton and M. A. Brooker, *A Study of the Cost of Handling Citrus Fruit from the Tree to the Car in Florida*, Florida Agricultural Experiment Station Bulletin No. 266 (Gainesville: Florida Agricultural Experiment Station, 1934).
84. Paul S. Armstrong to D. F. Fisher, April 26, 1934, box 2002, NACP-OSA.
85. "Much Damage Done to Florida Citrus in Coloring Room," *Citrus Industry* 10, no. 4 (April 1929): 34.
86. Rodney B. Harvey, process of treating fruit, US Patent 1,909,860, filed February 24, 1933, and issued May 16, 1933.
87. A. Mitchell Palmer and Seforde M. Stellwagen, Letter of Transmittal and Brief for Proponents, Before USDA and FDA, October 30, 1933. See also FSDA, *Citrus Industry of Florida*, 189.
88. "Harvey Processed Oranges," *Chicago Packer*, May 5, 1934, 15.
89. Paul B. Dunbar to W. A. Bridgeman, April 21, 1933, box 349, entry 1001, NACP-FDA.
90. W. G. Campbell to R. B. Harvey, July 3, 1933, box 349, entry 1001, NACP-FDA.
91. "Harvey Processed Oranges," 15; "Philadelphia Street Notes," *Chicago Packer*, June 16, 1934, 7.
92. Food Machinery Corporation (hereafter cited as FMC) advertisement, *Citrus Industry* 15, no. 9 (September 1934): 7. See also FMC advertisement, *Citrus Industry* 16, no. 7 (July 1935): 21.
93. "Watch for the Juicetest Color Added U.S. No. 1 Oranges" (FMC advertisement), *Chicago Packer*, June 9, 1934, 18.
94. Polis & Hagan advertisement, "Texas Citrus Color Added Oranges," *Chicago Packer*, December 10, 1938, 6.
95. Charles C. Commander to D. F. Fisher, April 3, 1934, box 2002, NACP-OSA. See also "Bright Fruit from the Marketing Viewpoint," *Citrus Industry* 6, no. 4 (April 1925): 6; "Fruit Color Important Factor in Making Sales," *Citrus Industry* 10, no. 12 (December 1929): 22; Harold Crows to Commander, September 16, 1933, box 1830, NACP-OSA.
96. Kirkland, "The 'Color Added' Situation," 103–104. See also John R. Winston, *Harvesting and Handling Citrus Fruits in the Gulf States*, USDA Farmers' Bulletin No. 1763 (Washington, DC: Government Printing Office, February 1937): 2–3.
97. Paul O. Nyhus, "Citrus Fruit Coloring by Ethylene Process Much Improved Lately," *Yearbook of Agriculture* (Washington, DC: Government Printing Office, 1932), 134.
98. Chace, "Health Problems," 1152. See also George K. Holmes, "Consumers' Fancies," *Yearbook of the USDA* (Washington, DC: Government Printing Office, 1904), 417–434; F. D. Richey to Paul H. Appleby, July 5, 1934, box 2002, NACP-OSA.

99. Sheldon Hochheiser, "May We Dye Our Oranges: Technological Innovation Breeds Political Controversy in the Florida Citrus Industry, 1933–1937," in *The History and Sociology of Technology: Proceedings of the Twenty-Fourth Annual Meeting of the Society for the History of Technology* (Milwaukee: Milwaukee Public Museum, 1982), 306; R. G. Tugwell to Duncan U. Fletcher, April 25, 1934, box 2002, NACP-OSA.
100. Armstrong to Fisher; Karl D. Loos to K. A. Ryerson, March 19, 1934, box 2002, NACP-OSA.
101. Hochheiser, "May We Dye Our Oranges," 306.
102. "Color Added Citrus Fruit to Court Test?" *Chicago Packer*, December 21, 1935, 1; "Florida News Notes," *Chicago Packer*, October 19, 1935, 10; "Florida News Notes," *Chicago Packer*, November 16, 1935, 4; "Florida Notes," *Chicago Packer*, November 2, 1935, 20; "Fosgate Company Adding to Its Packing Facilities," *Chicago Packer*, September 12, 1936, 8; "Orange Growers and Shippers Warned by Wallace on Color," *Chicago Packer*, November 30, 1935, 18.
103. *1948 Hearings, Day 1*, 28 (statement of Marvin H. Walker, General Manager, Florida Citrus Commission, Lakeland, FL); Clementine Paddleford, "Growers Divided on Employing Color to Beautify the Orange," *New York Herald Tribune*, January 20, 1940, 8.
104. Ronald Tobey and Charles Wetherell, "The Citrus Industry and the Revolution of Corporate Capitalism in Southern California, 1887–1944," *California History* 74, no. 1 (Spring 1995): 8.
105. Hoffman and Libecap, "Political Bargaining," 210–211.
106. Florida Citrus Exchange, *Annual Report of the Florida Citrus Exchange* (Tampa, FL: self-pub., 1943–1944), 15; Martin M. Lagodna, "Greens, Grist and Guernseys: Development of the Florida State Agricultural Marketing System," *Florida Historical Quarterly* 53, no. 2 (October 1974): 153; Cleveland Bermuth Geer Rettig, "A Review of Marketing Florida Citrus" (master's thesis, Florida Southern College, 1949): 14; Herman Steen, *Coöperative Marketing: The Golden Rule in Agriculture* (Garden City, NY: Doubleday, Page, 1923), 38.
107. J. Reed Curry to A. T. Gerrans, August 19, 1931, box 349, entry 1001, NACP-FDA. See also "Citrus Industry Divided in Florida," *New York Times*, December 9, 1934, E7.
108. Hoffman and Libecap, "Political Bargaining," 208–209.
109. Ibid., 195–196, 209; AAA, *Recent Changes*, 36–37; Hoos and Boles, "Oranges and Orange Product," 26–27.
110. Hoffman and Libecap, "Political Bargaining," 208–209; Larry K. Jackson and Frederick S. Davies, *Citrus Growing in Florida*, 4th ed. (Gainesville: University Press of Florida, 1999), 15–19.

111. "Bright Fruit from the Marketing Viewpoint," 6.
112. Palmer and Stellwagen, Letter of Transmittal.
113. D. F. Fisher to Henry A. Wallace, May 22, 1934, box 2002, NACP-OSA; Kohman, "Ethylene Treatment of Tomatoes," 1112–1113; Richey to Appleby.
114. Fisher to Wallace. The Committee members included W. S. Frisbie (Food and Drug Administration), F. C. Blanck (Bureau of Chemistry and Soils), and D. F. Fisher (Bureau of Plant Industry). See also Thornton, "Facts about 'Artificially' Ripened Fruit," 48.
115. Richey to Appleby.
116. Winston and Tilden, "Coloring of Mature Citrus Fruits." See also Winston, "Harvesting and Handling," 2–3.
117. The USDA maturity standard for oranges in all states was 8-to-1 (oranges needed to contain eight parts soluble solid to one part acid). In Florida, color-added oranges had to pass the sweeter 9-to-1 state test. Colored fruits were also required to contain 4½ gallons of juice per standard box. Only color-added oranges were required to have this high juice requirement; others were not tested for juice at all. "Florida Orange Industry Pleased with Color Rule," *Chicago Packer*, August 15, 1936, 11; R. D. Gerwe, "Citrus Red #2 Color for Oranges: Application for Listing and Approval," research report sponsored by American Cyanamid Company, August 1957, FCA; "Practice of Coloring Oranges to Be Continued," *Citrus Industry* 17, no. 10 (October 1936): 13; Henry A. Wallace, "Notice to Growers and Shippers of Citrus Fruits," July 16, 1934, box 2002, NACP-OSA; Henry A. Wallace, "Notice to Growers and Shippers of Citrus Fruits," November 23, 1935, box 2171, NACP-OSA.
118. Sam H. Farabee, "The New Era in Citrus Cooperation," *Lakeland Sunday Ledger*, May 17, 1936, 15. See also *1948 Hearings, Day 1*, 28 (statement of Walker).
119. Brown, "Value of Exhibits," 81.
120. "Waverly Growers Co-op. Explains 'Color Added,'" *Chicago Packer*, December 14, 1935, 5.
121. "'Color Added' Stamp a Mark of Superiority, L. P. Kirkland Declares," *Chicago Packer*, August 15, 1936, 11; "R. B. Woolfolk Says Color Added Method Boon to Growers," *Chicago Packer*, February 1, 1936, 4.
122. Isabelle Thursday, "Developing the Home Market for Florida Citrus Fruits," *FSHS* 49 (1936): 52.
123. Ibid. See also Nick Havas, *Consumer Acceptance of Florida Oranges with and without Color Added*, Marketing Research Report no. 537 (Washington, DC: Government Printing Office 1962).
124. Paddleford, "Growers Divided," 8.

125. Quoted in Paddleford, "Growers Divided," 8. See also Thursday, "Developing the Home Market," 49–54.
126. Quoted in Paddleford, "Growers Divided," 8.
127. Mrs. Irving D. Datz to the USDA, November 10, 1942, box 157, NACP-BAIC.
128. *1948 Hearings, Day 4*, 300 (statement of R. D. Keene, president of United Growers and Shippers Association and President of Winter Garden Canners Association).
129. *1948 Hearings, Day 1*, 57 (statement of W. H. Cornett, Brandon, FL).
130. Fitzgerald, *Every Farm a Factory*, 8.

6. Fake Food

1. Ann Vileisis, *Kitchen Literacy: How We Lost Knowledge of Where Food Comes from and Why We Need to Get It Back* (Washington, DC: Island Press, 2008), 4–95.
2. Charles Wilson, *The History of Unilever: A Study in Economic Growth and Social Change*, vol. 2 (London: Cassell, 1954), 25.
3. Hippolyte Mège-Mouriès, improvement in treating animal fats, US Patent 146,012, filed November 1, 1873, and issued December 30, 1873. When beef fat was cooked at a higher temperature, the finished product attained an objectionable odor. See Elliott G. Brackett, "The Healthfulness of Oleomargarine as an Article of Food," in *Report of the State Board of Health of Massachusetts to the Legislature upon Oleomargarine* (Boston: Office of State Board of Health, 1888), 54–85; Henry A. Mott, *Complete History and Process of Manufacture of Artificial Butter* (New York: John F. Trow & Son, 1876); "The Oleo-Margarin Industry," *Scientific American*, March 17, 1877, 168.
4. Mège-Mouriès, improvement in treating animal fats. See also J. van Alphen, "Hippolyte Mège-Mouriès," in *Margarine: An Economic, Social and Scientific History 1869–1969*, ed. J. H. van Stuyvenberg (Liverpool: Liverpool University Press, 1969), 5–7; William Clayton, *Margarine* (London: Longmans, Green, 1920), 59–60.
5. Martha C. Howard, "The Margarine Industry in the United States: Its Development under Legislative Control" (PhD diss., Columbia University, 1951): 12; Katharine Snodgrass, *Margarine as a Butter Substitute* (Stanford, CA: Stanford University Press, 1930), 1–2.
6. W. G. Hoffman, "100 Years of the Margarine Industry," in van Stuyvenberg, *Margarine*, 14; Snodgrass, *Margarine*, 217–221; Wilson, *History of Unilever*, 24–28.
7. Mège-Mouriès, improvement in treating animal fats. For the early years of margarine production and consumption in the United States, see "Artificial Butter," *New York Times*, January 27, 1874, 6; "Home and Foreign Gossip,"

Harpers' Weekly, March 1874, 651; "Oleo-Margarine," *Nature* 25, no. 638 (January 1882): 269–270; "The Oleo-Margarin Industry," 168.

8. "Oleomargarine," *Report of the Dairy Commissioner of the State of New Jersey* (Trenton, NJ: John L. Murphy, 1886): 17; R. A. Pearson, "Statistics of Oleomargarine, Oleo Oil, and Filled Cheese," reprinted from the *Sixteenth Annual Report of the Bureau of Animal Industry* (Washington, DC: Government Printing Office, 1899), 300.
9. Snodgrass, *Margarine*, 222.
10. Wilson, *History of Unilever*, 29.
11. "About the Oleomargarine Law," *Dairy and Creamery* 5, no. 4 (February 1903): 11; "Dairy Farmers Using Oleo," *Dairy Record* 8, no. 32 (January 8, 1908): 5; "Is the Oleo Law a Failure," *Dairy and Creamery* 5, no. 3 (February 1903): 11; "Oleo on the Farm Table," *American Butter Review* 4, no. 9 (September 1942): 308.
12. "The Oleo-Margarin Industry," 168. See also J. S. Abbott, *The Composition and Food Value of Margarine*, Institute of Margarine Manufacturers Bulletin No. 10 (Columbus, OH: Institute of Margarine Manufacturers, 1930).
13. Swift & Company, *Bread and Swift's Premium Butterine: Sweet–Pure–Clean* (Chicago: self-pub., 1911), HML-CLC.
14. Capital City Dairy Company, *Purity Pointer* (Columbus, OH: self-pub., 1901), HML-CLC.
15. A. M. Hannay, *The Influence of Weather on Crops: 1900–1930*, USDA Miscellaneous Publication No. 118 (Washington, DC: Government Printing Office, 1931), 30; R. P. Lamont and William L. Cooper, *The Margarine Industry of Europe*, US Department of Commerce Bulletin No. 677 (Washington, DC: Government Printing Office, 1930); T. R. Pirtle, *A Handbook of Dairy Statistics* (Washington, DC: Government Printing Office, 1922); Siert F. Riepma, *Margarine in Western Europe* (Washington, DC: USDA, 1960); Snodgrass, *Margarine*, 181.
16. Bureau of the Dairy Industry, USDA, "History of the Dairy Division," October 1921, box 1, NAL-BDI; Commercial Manufacturing Company, *Oleomargarine Butter: The New Article of Commerce* (New York: self-pub., 1880); *Oleomargarine and Butterine: A Plain Presentation of the Most Gigantic Swindle of Modern Times* (New York: T. L. McAlpine, 1886).
17. Snodgrass, *Margarine*, 247–249; Edward Wiest, *The Butter Industry in the United States: An Economic Study of Butter and Oleomargarine* (New York: Columbia University Press, 1916), 181–209, 257–262.
18. For the economic conditions of the dairy industry in the late nineteenth and early twentieth centuries, see Bureau of the Dairy Industry, "History of the Dairy Division."

19. "Bright 'Butter' Was Oleo," *Dairy Record* 10, no. 6 (July 14, 1909): 22; "Oleo as an Adulterant," *New York Times*, May 23, 1886, 3; "The Traffic in Oleomargarine Sold as Butter," *Brownell's Dairy Farmer* 7, no. 5 (June 1, 1915): 6.
20. Dairy associations and farmers sent thousands of letters and petitions to Congress between the 1880s and the 1910s. The National Archives (Washington, DC) holds a number of petitions sent from dairy producers to Congress in the Records of the United States House of Representatives. See Committee on Ways and Means, HR61A–H34.23, box 812; Legislations Governing the Manufacture and Sale of Oleomargarine, HR46A–H13.3; Oleomargarine, HR51A–H1.5, box 88; Petns., Memls., & Res. of State Leg. & Related Documents, HR56A. H1.7, box 121, and HR52A–H2.5, boxes 139–142; Petitions and Memorials, HR63A–H1.20, box 437, HR64A–H1.13, box 400, HR64A–H26.16, box 480; Promotion of the Manufacture and Sale of Oleomargarine, HR46A–H2.4, NAB-USHR.
21. Geoffrey P. Miller, "Public Choice at the Dawn of the Special Interest State: The Story of Butter and Margarine," *California Law Review* 77, no. 1 (January 1898): 99, 122; William R. Pabst Jr., *Butter and Oleomargarine: An Analysis of Competing Commodities* (New York: Columbia University Press, 1937), 12–17.
22. US Department of Commerce, *Sixteenth Census of the United States: 1940, Agriculture: Cows Milked and Dairy Products* (Washington, DC: Government Printing Office, 1942), 39.
23. Richard A. Ball and J. Robert Lilly, "The Menace of Margarine: The Rise and Fall of a Social Problem," *Social Problems* 29, no. 5 (June 1982): 489; Howard, "Margarine Industry," 40–42; Snodgrass, *Margarine*, 30, 46–47.
24. Howard, "Margarine Industry," 40–41; *The Manufacture and Sale of Imitation Dairy Products: Hearings on S. Rep. 131, before the Comm. on Agriculture and Forestry*, 49th Cong., 1st sess., 125, 132 (1886) (hereafter cited as *1886 Hearings*) (statement of Gardiner B. Chapin, Boston Chamber of Commerce; R. M. Littler, secretary of the Chicago Produce Exchange); Snodgrass, *Margarine*, 49–51.
25. *1886 Hearings*, 138–139, 171–172 (statement of Littler; W. S. Truesdell, vice-president of the Mississippi Valley Dairy and Creamery Association).
26. Howard, "Margarine Industry," 76. By 1903, the number of states with anticolor laws had increased to thirty-two.
27. Ruth Dupré, "'If It's Yellow, It Must Be Butter': Margarine Regulation in North America since 1886," *Journal of Economic History* 59, no. 2 (June 1999): 355; Snodgrass, *Margarine*, 32, 90–91.
28. Plumley v. Massachusetts, 155 U.S. 461 (1894).
29. See, for example, United States v. E. C. Knight Co., 156 U.S. 1 (1895).

30. Collins v. New Hampshire, 171 U.S. 30 (1898). See also "Pink Oleo," *Farmers' Review*, October 2, 1895, 632.
31. Oleomargarine Act of 1886, ch. 840, 24 Stat. 209. See also Chris Burns, "Bogus Butter: An Analysis of the 1886 Congressional Debates on Oleomargarine Legislation" (master's thesis, University of Vermont, 2009).
32. E. O. Grosvenor, "The Oleomargarine Question: Should It Be Handled by National or State Authority?" *Sixteenth Annual Report of the Michigan Dairymen's Association* (Lansing, MI: Wynkoop Hallenbeck Crawford, 1900), 88; Snodgrass, *Margarine*, 43.
33. H. C. Adams, *Addresses and Writings upon Oleomargarine and Pure Food Legislation, Dairy and Agricultural Topics* (Madison, WI: self-pub., 1902); J. W. Helmer Jr., "Needed Dairy Legislation, and How to Secure It," *Sixteenth Annual Report of the Michigan Dairymen's Association*, 17–22; "Status of Oleomargarine: From an Address of H. C. Adams before the Wisconsin Dairymen's Association," *Dairy and Creamery* 3, no. 3 (February 1901): 4.
34. *Oleomargarine and Other Imitation Dairy Products: Hearings on Bills Relating to Oleomargarine Legislation, before the Comm. on Agriculture*, 57th Cong., 1st sess., 76, 79 (1902) (hereafter cited as *1902 Hearings*) (statement of W. D. Hoard, chairman of National Dairy Union).
35. David M. Higgins and Mads Mordhorst, "Reputation and Export Performance: Danish Butter Exports and the British Market, c. 1880–c. 1914," *Business History* 50, no. 2 (March 2008): 185–204; Markus Lampe and Paul Sharp, "Greasing the Wheels of Rural Transformation? Margarine and the Competition for the British Butter Market," *Economic History Review* 67, no. 3 (August 2014): 769–792.
36. Van Stuyvenberg, "Aspects of Government Intervention," in van Stuyvenberg, *Margarine*, 316.
37. *1902 Hearings*, 215 (statement of A. Larsen, general manager of the Standard Butterine Company, Washington, DC). For the consumption of margarine in the United States and Europe, see also Snodgrass, *Margarine*, 176–197.
38. *1902 Hearings*, 257 (statement of William M. Springer, representative of the National Live Stock Association).
39. Higgins and Mordhorst, "Reputation and Export Performance," 185–204; Lampe and Sharp, "Greasing the Wheels," 769–792.
40. *1902 Hearings*, 248 (statement of Springer).
41. Oleomargarine Act of 1902, ch. 784, 32 Stat. 193.
42. McCray v. United States, 195 U.S. 27 (1904).
43. Armour & Company advertisement, *Chicago Tribune*, June 27, 1902, 7. See also "Oleomargarine to Be Boomed: Armour to Sell Uncolored Article with Cute Capsule," *San Francisco Call* 87, no. 7 (June 1902): 14; "Oleomargarine,"

Sixteenth Annual Report of the State Dairy Commissioner to the Governor of the State of Iowa (Des Moines: Bernard Murphy, 1902), 13–14.

44. "Oleomargarine," *Treasury Decisions* 17, no. 22 (June 1909): 51; "Violation of Margarine Law," *Treasury Decisions* 17, no. 10 (March 1909): 27–28.
45. "About the Oleomargarine Law," 11; "Is the Oleo Law a Failure"; "Oleo in Kansas," *Dairy and Creamery* 5, no. 12 (July 1903): 28.
46. John F. Jelke Company, *How to Color Jelke High Grade Margarine for Your Own Family Table* (Chicago: self-pub., c. 1916). See also John F. Jelke Company, *Jelke Good Luck Margarine: The Finest Spread for Bread for Table Use and for Cooking* (Chicago: self-pub., c. 1920).
47. The production of margarine for the year after the act went into effect was 44 percent less than it was the preceding year. "Decline in Oleo Products," *Dairy and Creamery* 5, no. 11 (June 1, 1903): 9; "Oleomargarine Notes," *Dairy and Creamery* 5, no. 14 (September 1903): 9; Wiest, *Butter Industry*, 258.
48. "About the Oleomargarine Law," 11; "Is the Oleo Law a Failure," 11; "Oleo in Kansas," 28.
49. Michael French and Jim Phillips, *Cheated Not Poisoned? Food Regulation in the United Kingdom, 1875–1938* (Manchester: Manchester University Press, 2000), 41–42; David M. Higgins, *Brands, Geographical Origin, and the Global Economy: A History from the Nineteenth Century to the Present* (Cambridge: Cambridge University Press, 2018), 73–77; van Stuyvenberg, "Aspects," 282–327.
50. Snodgrass, *Margarine*, 117–20; Frances Steel, "'New Zealand *Is* Butterland': Interpreting the Historical Significance of a Daily Spread," *New Zealand Journal of History* 39, no. 2 (2005): 4–5.
51. French and Phillips, *Cheated Not Poisoned?* 50; Lampe and Sharp, "Greasing the Wheels," 787–788; Snodgrass, *Margarine*, 117–120.
52. Clayton, *Margarine*, 16–17; C. Ainsworth Mitchell, *Science and the Criminal* (Boston: Little, Brown, 1911), 220–221.
53. Snodgrass, *Margarine*, 118; van Stuyvenberg, "Aspects," 300.
54. "Color in Butter," *Dairy Record* 8, no. 9 (July 1907): 7.
55. "Advised to Color Butter," *Farm, Field, and Fireside*, July 26, 1902, 854; "Abolishing Coal Tar Colors," *Dairy and Produce Review* 4, no. 3 (January 1903): 6; "Color Butter Higher," *Dairy and Produce Review* 5, no. 25 (December 1903): 2; "Never Sell Uncolored Butter," *Dairy Record* 12, no. 37 (February 1912): 3.
56. "Advised to Color Butter." See also "Coloring Butter," *Dairy and Produce Review* 3, no. 8 (August 1902): 2.
57. Sally McMurry, "Women's Work in Agriculture: Divergent Trends in England and America, 1800 to 1930," *Comparative Studies in Society and History* 34, no. 2 (April 1992): 251; Ralph Selitzer, *The Dairy Industry in America* (New York: Magazines for Industry, 1976), 40–51.

58. Henry E. Alvord, "Dairy Development in the United States," *Yearbook of the USDA* (Washington, DC: Government Printing Office, 1899), 381–402; Charles E. North, "Memorandum regarding Dr. North's Nursery Butter," box 12, NAL-CNP; X. A. Willard, *Willard's Practical Butter Book: A Complete Treatise* (New York: Rural Publishing, 1875), 61.
59. "Butter-Making on the Farm," *Prairie Farmer,* June 16, 1900, 3; Kenneth D. Ruble, *Men to Remember: How 100,000 Neighbors Made History* (Chicago: R. R. Donnelley & Sons, 1947), 48; Kendra Smith-Howard, *Pure and Modern Milk: An Environmental History since 1900* (New York: Oxford University Press, 2014), 44.
60. Smith-Howard, *Pure and Modern Milk*, 36.
61. In 1899, about 70 percent of butter was produced on the farm, while creamery production accounted for 30 percent. In 1909, the farm production of butter still exceeded creamery production: 61 percent and 39 percent, respectively. H. E. Erdman, *American Produce Markets* (Boston: D. C. Heath, 1928), 37; Snodgrass, *Margarine*, 17–23, 309–311; Wiest, *Butter Industry*, 11–43.
62. For dairy manuals, see Willis P. Hazard, *Butter and Butter Making with the Best Methods for Producing and Marketing It* (Philadelphia: Porter & Coates, 1877); Otto F. Hunziker, *The Butter Industry* (LaGrange, IL: self-pub., 1920); G. L. McKay and C. Larsen, *Principles and Practice of Butter-Making* (New York: John Wiley & Sons, 1906); Pabst, *Butter and Oleomargarine*; Willard, *Willard's Practical Butter Book*. These manuals were also used as textbooks at land grant universities.
63. Edwin H. Webster, *Butter Making on the Farm*, USDA Farmers' Bulletin No. 241 (Washington, DC: Government Printing Office, 1905).
64. "Don't Overlook the Color," *Dairy Record* 11, no. 11 (August 1910): 2.
65. James Sorenson, "Practical Butter Making," *Dairy Record* 15, no. 27 (December 1913): 27.
66. "Advised to Color Butter," 854; "Butter Color," *Farmers' Review*, January 5, 1907, 6; "Butter-Making on the Farm," *Prairie Farmer*, June 16, 1900, 3; C. B. Cochran, "Butter Colors," Pennsylvania State Department of Agriculture Bulletin No. 13 (1886); "Color Butter Higher," 2; "Don't Forget the Color," *Dairy Record* 11, no. 28 (December 1910): 8; "Don't Overlook the Color"; "How to Color Butter," *Wallace's Farmer*, January 15, 1904, 79; "In the Dairy," *Farmer's Wife*, June 1, 1907, 31; "June Butter in Winter," *Farm, Field, and Fireside*, February 25, 1899, 237; "Remarkable Workmanship as to Color and Salt," *Dairy Record* 12, no. 39 (February 1912): 12; Sorenson, "Practical Butter Making"; "The True June Shade," *Elgin Dairy Report* 14, no. 39 (February 1905): 1.
67. Hunziker, *The Butter Industry*, 303.
68. "Advised to Color Butter," 854.

69. Hunziker, *The Butter Industry*, 304.
70. "Impending Storm in the Butter World," *American Food Journal* 10, no. 11 (November 1915): 565. See also "A Legal Butter Color," *American Food Journal* 12, no. 6 (June 1917): 299; "Prof. McKay and Butter," *American Food Journal* 11, no. 6 (June 1916): 242.
71. *Address of Prof. James F. Babcook before the Committee on Agriculture on a Petition for the Further Regulation on the Sale of Oleomargarine, January 24, 1890* (Boston: Daniel Gunn, 1890). See also "Doping Butter with Dye," *Chicago Livestock World* (September 1902): 2; National Dairy Union, *First Annual Report of the National Dairy Union* (Chicago: self-pub., 1894); National Dairy Union, *The Buttered Side of the Oleomargarine Question* (Chicago: self-pub., 1910); *Oleomargarine Bill: Hearings before the Comm. on Agriculture and Forestry*, 56th Cong., 2nd sess., 32–33 (1901) (statement of Rathbone Gardner, representative of the Oakdale Manufacturing Company, Providence, RI).
72. Committee on Agriculture and Forestry, "Oleomargarine and Other Imitation Dairy Products, Etc.," S. Rep. No. 56-2043 (1901).
73. "Coloring Butter," *Wallace's Farmer*, February 27, 1903, 323; Hazard, *Butter and Butter Making*, 12; "Should Butter Be Colored," *Farmers Voice*, April 28, 1900, 528.
74. "The Farmer's Point of View," *Farmers Voice*, February 3, 1900, 133.
75. "Coloring Butter," *Dairy and Produce Review* 3, no. 8 (August 1902): 2.
76. "Coloring Butter," *Wallace's Farmer*, 323. See also "Use of Butter Color," *Prairie Farmer*, July 12, 1906, 8.
77. *1886 Hearings*, 51 (statement of Henry Morton, president of the Stevens Institute of Technology); Harvey W. Wiley, *Foods and Their Adulteration: Origin, Manufacture, and Composition of Food Products; Infants' and Invalids' Foods; Detection of Common Adulterations* (Philadelphia: P. Blakiston's Son, 1917), 185.
78. "'Uncolored' Yellow Oleo-Margarine," *Dairy and Produce Review* 5, no. 11 (August 1903): 2; "Yellow Oleomargarine," *Dairy and Produce Review* 5, no. 20 (October 1903): 1.
79. Pabst, *Butter and Oleomargarine*; M. K. Schwitzer, *Margarine and Other Food Fats: Their History, Production and Use* (London: Leonard Hill Books, 1956), 143.
80. "A Fight on Colored Oleomargarine," *Dairy and Creamery* 5, no. 9 (May 1903): 7.
81. "Commissioner Yerkes' 'Palm Oil' Decision," *National Provisioner* 27, no. 8 (August 1902): 15. See also "Can't Use Palm Oil," *Chicago Livestock World*, August 15, 1902, 2; "A Fight on Colored Oleomargarine," *Dairy and Creamery* 5, no. 9 (May 1903): 7; "In the Clutch of the Law," *Dairy and Produce Review* 5, no. 1 (June 1903): 1; "Oleomargarine Legislation," *Dairy and Creamery* 3, no. 22 (November 1901): 9; "Palm Oil Oleomargarine," *Dairy and Creamery* 4, no. 17 (September 1902): 9.

82. Moxley v. Hertz, 216 U.S. 344 (1910). See also "Oleo Case Is Lost," *Chicago Live-stock World*, February 22, 1910, 3; Snodgrass, *Margarine*, 66. For Supreme Court cases concerning the color of margarine, see Cliff v. United States, 195 U.S. 159 (1904); McCray v. United States, 195 U.S. 27 (1904).
83. Snodgrass, *Margarine*, 66.
84. Howard, "Margarine Industry," 170.
85. Walter H. Eddy, "What Is Margarine Good For?" *Good Housekeeping*, April 1929, 97; National Cooperative Milk Producers Federation, *Oleomargarine and the Farmer* (Arlington, VA: self-pub., 1948). During the 1920s, coconut oil became a major ingredient, used in roughly half of the total margarine produced, because the oil was more plentiful and cheaper than beef fat. *Annual Report of the Commissioner of Internal Revenue* (Washington, DC: Government Printing Office, 1921), 118; Walter H. Eddy, "Something New in Foods," *Good Housekeeping*, May 1931, 102; Howard, "Margarine Industry," 164, 213.
86. Pabst, *Butter and Oleomargarine*. See Ruth Dupré, "'If It's Yellow,'" 355.
87. *Oleomargarine Legislation: Speech of Hon. Elbert S. Brigham of Vermont in the House of Representatives, January 31, 1930* (Washington, DC: Government Printing Office, 1930), 3.
88. The act provided that margarine shall be yellow when it had a shade containing more than "1.6 degrees of yellow, or of yellow and red collectively, as indicated by the colorimeter." The 1.6 degrees was practically no color at all to the naked eye. Howard, "Margarine Industry," 272–274; "Margarine Regulations Amended to Conform with New Legislation," *Oil and Fat Industries* 8, no. 7 (July 1931): 274–275; Pabst, *Butter and Oleomargarine*. See also Sean F. Johnston, *A History of Light and Colour Measurement: Science in the Shadows* (Boca Raton, FL: CRC, 2001).
89. Howard, "Margarine Industry," 75a, 208, 327a.
90. Ibid., 177–178.
91. Harvey Levenstein, *Revolution at the Table: The Transformation of the American Diet* (Berkeley: University of California Press, 2003), 30, 34–37; Waverley Root and Richard de Rochemont, *Eating in America: A History* (New York: Ecco, 1981), 158–159; Katherine Leonard Turner, *How the Other Half Ate: A History of Working-Class Meals at the Turn of the Century* (Berkeley: University of California Press, 2014), 4–6, 29, 34–35.
92. Eleanor Lee Wright, "The Economic and Dietetic Value of Canned Fruits," *American Food Journal* 14, no. 4 (April 1919): 17.
93. Arthur L. Hunt, *Fruits and Vegetables, Fish, and Oysters, Canning and Preserving*, Twelfth Census of the United States, Census Bulletin No. 209 (Washington,

DC: Census Bureau, 1902): 7; National Canners Association (hereafter cited as NCA), *Story of the Canning Industry* (Bel Air, MD: self-pub., 1937): 7.

94. H. A. Baker, "The Canning Industry—Some Accomplishments and Opportunities along Technical Lines," *JIEC* 10, no. 1 (January 1918): 69; James H. Collins, "How America Made Canning Its Own," *Canning Age* 3, no. 7 (July 1922): 35; Turner, *How the Other Half Ate*, 4–6, 29, 34–35.
95. E. G. Montgomery, "Consumption of Canned Foods Shows Continued Increase," *Food Industries* 3, no. 1 (January 1931): 9.
96. John A. Lee, *Canned Foods: How to Buy, How to Sell; Statistical and Practical Information about the Canning Industry* (Baltimore: Canning Trade, 1914), 52.
97. Wright, "Economic and Dietetic Value," 18.
98. Lee, *Canned Foods*, 17.
99. A. W. Bitting and K. G. Bitting, "Commercial Canning," *American Food Journal* 12, no. 6 (June 1917): 311.
100. William Vere Cruess, *Commercial Fruit and Vegetable Products: A Textbook for Student, Investigator and Manufacturer* (New York: McGraw-Hill Book, 1924), 58.
101. Ibid.
102. "Packing Tomato Pulp," NCA Bulletin No. 18, August 12, 1913.
103. W. D. Bigelow, "Inspection of Canned Foods," *American Food Journal* 11, no. 9 (September 1916): 459.
104. Lawrence V. Burton, "The High Quality of Canned Foods," *American Food Journal* 12, no. 6 (June 1917): 316.
105. Lee, *Canned Foods*, 13; Root and de Rochemont, *Eating in America*, 264; Wright, "Economic and Dietetic Value," 17.
106. "Packing Tomato Pulp."
107. Burton, "High Quality," 316.
108. Ibid., 317.
109. Richard A. Hawkins, *A Pacific Industry: The History of Pineapple Canning in Hawaii* (New York: I. B. Tauris, 2011), 19; Gary Y. Okihiro, *Pineapple Culture: A History of the Tropical and Temperate Zones* (Berkeley: University of California Press, 2009), 130–137.
110. Lee, *Canned Foods*, 89.
111. Ibid., 90–91; Burton, "High Quality," 317.
112. See Association of Hawaiian Pineapple Canners, *Hawaiian Pineapple as 100 Good Cooks Serve It* (San Francisco: self-pub., 1928), box 6, NMAH-PCC; H. K. & F. B. Thurber & Co., canned pineapple label, box 16, "Food," NMAH-WCBA.
113. Okihiro, *Pineapple Culture*, 143–152.

114. "Formal Menu for December," *Boston Cooking School Magazine of Culinary Science and Domestic Economics* (hereafter cited as *Boston Cooking School Magazine*), December 1910, 244. See also Association of Hawaiian Pineapple Canners, *Hawaiian Pineapple*; Janet M. Hill, "Seasonable Recipes," *Boston Cooking School Magazine*, January 1911, 282; "Menu for Week in Lent," *Boston Cooking School Magazine*, March 1911, 387; "Menus for a Week in September," *Boston Cooking School Magazine*, August–September 1911, 91.
115. Eldridge, Baker Company, "Wholesale Grocery Catalog" (1915), box 6, "Food," NMAH-WCBA.
116. Wright, "Economic and Dietetic," 17–18.
117. Lee, *Canned Foods*, 108.
118. Charles A. Shinkle, *American Commercial Methods of Manufacturing Preserves, Pickles, Canned Foods, etc.* (Menominee, MI: self-pub., 1912), 67, 69.
119. Lee, *Canned Foods,* 92.
120. Shinkle, *American Commercial Methods,* 67, 69.
121. Bitting and Bitting, "Commercial Canning," 314; Cruess, *Commercial Fruit and Vegetable Products,* 52, 106; William V. Cruess, *Home and Farm Food Preservation* (New York: Macmillan, 1918), 113.
122. Lee, *Canned Foods*, 101, 107–108, 111; Shinkle, *American Commercial Methods*, 161.
123. C. H. Campbell, "Detecting Artificial Colors in Jellies," *Canner* 51, no. 15 (October 1920): 37.
124. Shinkle, *American Commercial Methods*, 92.
125. George E. Colby to Harvey W. Wiley, November 9, 1903; H. A. Taylor to James Wilson, December 19, 1903, both in box 1, entry 4, NACP-BAIC.
126. Lee, *Canned Foods*, 16–17; Shinkle, *American Commercial Methods*, 149.
127. Wright, "Economic and Dietetic," 17–18.
128. Lee, *Canned Foods*, 61–62.
129. Susan Strasser, *Satisfaction Guaranteed: The Making of the American Mass Market* (New York: Pantheon Books, 1989), 39–43.
130. William Braznell, *California's Finest: The History of Del Monte Corporation and the Del Monte Brand* (San Francisco: Del Monte, 1982), 45–46, 90–93.
131. See canned food labels and trade cards, box 16 and 22, "Food," NMAH-WCBA.
132. See, for example, C. M. Hovey, *The Fruits of America, Containing Richly Colored Figures, and Full Descriptions of All the Choicest Varieties Cultivated in the United States* (Boston: C. C. Little & Jas. Brown, and Hovey, 1851).
133. "Canned Tomatoes, Cherries, and Apricots Are Given Tentative Standards," *Food Industries* 3, no. 4 (April 1931): 177; "Label Wording and Canning Standards Officially Announced," *Food Industries* 3, no. 3 (March 1931): 132; Faith M.

Williams, "Standard Specifications for Household Buying Are Being Developed," *Yearbook of Agriculture* (Washington, DC: Government Printing Office: 1931), 487–488.

134. NCA, *Manual for Canned Food Labels* (Washington, DC: self-pub., 1942), 98, 100.

7. The Visuality of Freshness

1. 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), 13; James M. Mayo, *The American Grocery Store: The Business Evolution of an Architectural Space* (Westport, CT: Greenwood, 1993), 43–75; Susan Strasser, *Satisfaction Guaranteed: The Making of the American Mass Market* (New York: Pantheon Books, 1989), 58–88.
2. "The Marketing Problem," *Chicago Tribune*, December 28, 1884, 9, 53. See also Deutsch, *Building*, 24.
3. The definition of "supermarkets" has changed over time. In the early 1930s, the Supermarket Institute, one of the largest trade organizations for food retailers, originally defined a "supermarket" as a food outlet with minimum annual sales of $250,000, and with a grocery department operated on a self-service basis. In 1951, this definition was revised and the minimum annual sales volume was raised to $500,000 annually. In 1955, the minimum volume was raised to $1 million. Today, the Food Marketing Institute (the successor of the Supermarket Institute) defines the term as a store offering a full line of groceries, meat, and produce with at least $2 million in annual sales. This chapter follows the Supermarket Institute's first two definitions of a supermarket. Edward A. Brand, *Modern Supermarket Operation* (New York: Fairchild, 1963), 3; Food Marketing Institute, "Supermarket Facts," accessed May 1, 2019, https://www.fmi.org/our-research/supermarket-facts; Mayo, *American Grocery Store*, 117.
4. Susanne Freidberg, *Fresh: A Perishable History* (Cambridge, MA: Belknap Press of Harvard University Press, 2009).
5. For a history of the grocery business since the seventeenth century, see Mayo, *American Grocery Store*, esp. chap. 2.
6. Arieh Goldman, "Stages in the Development of the Supermarket," *Journal of Retailing* 51, no. 4 (Winter 1975–76): 57; Mayo, *American Grocery Store*, 134.
7. A. M. Pearson, "Factors Indicative of Quality in Beef and Their Measurements," in *Beef for Tomorrow: Proceedings of a Conference* (Washington, DC: National Academy of Science, National Research Council, 1960), 37.
8. Deutsch, *Building*, 69; Mayo, *American Grocery Store*, 159; "Produce Self-Service Successful," *Progressive Grocer* 24, no. 8 (August 1945): 140.

9. Nelson A. Miller and Harvey W. Huegy, *Establishing and Operating a Grocery Store*, US Department of Commerce, Bureau of Foreign and Domestic Commerce, Industrial Series no. 21 (Washington DC: Government Printing Office, 1946): 228.
10. M. M. Zimmerman, *The Super Market: A Revolution in Distribution* (New York: McGraw-Hill, 1955), 221.
11. Brand, *Modern Supermarket*, 43.
12. "Trim Them Properly," *Progressive Grocer* 14, no. 2 (February 1935): 18.
13. "Give Produce Display Appetite Appeal," *Progressive Grocer* 14, no. 9 (September 1935): 44.
14. "Fruits and Vegetables Offer Best Chance to Draw Shoppers," *Progressive Grocer* 16, no. 1 (January 1937): 38–39.
15. Miller and Huegy, *Establishing and Operating*, 227.
16. "Calls Color Secret of Fruit Display," *Progressive Grocer* 16, no. 1 (January 1937): 135; Carl W. Dipman, Robert W. Mueller, and Ralph E. Head, *Self-Service Food Stores* (New York: Progressive Grocer, 1946), 54; Henry Frommes, "The 'Eye Appeal' in Selling," *Meat Merchandising* 5, no. 12 (January 1930): 24.
17. Frommes, "The 'Eye Appeal' in Selling," 24.
18. Carl W. Dipman, ed., *The Modern Grocery Store* (New York: Progressive Grocer, 1931), 12. See also Carl W. Dipman and John E. O'Brien, *Self-Service and Semi-Self-Service Food Stores* (New York: Progressive Grocer, 1940); Miller and Huegy, *Establishing and Operating*, 54–55; C. V. Hill & Company, *Modern Food Merchandising: A Book of Practical Suggestions* (Trenton, NJ: self-pub., 1934), 23.
19. Dipman, Mueller, and Head, *Self-Service Food Stores*, 148–150; Miller and Huegy, *Establishing and Operating*, 54–57; C. V. Hill, *Modern Food Merchandising*, 23–31.
20. Deutsch, *Building*, 67–71.
21. A. T. Edinger, "Prepackaged Meat Sells Itself," *Marketing Activities* 13, no. 1 (January 1950): 6; "Here Are Facts on Color Changes," *National Provisioner* 143, no. 27 (December 31, 1960): 10–12; Mayo, *American Grocery Store*, 159.
22. George E. Kline, "How to Merchandise Prepackaged Produce for Better Sales," *Progressive Grocer* 33, no. 9 (September 1954): 60; "Prepackaging, Refrigerated Displays Cut Produce Spoilage Losses to 1½% of Sales," *Progressive Grocer* 33, no. 1 (January 1954): 46–47; Jonathan Rees, *Refrigeration Nation: A History of Ice, Appliances, and Enterprise in America* (Baltimore: Johns Hopkins University Press, 2013), 117–118.
23. William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W. W. Norton, 1991), 212, 234–235; Roger Horowitz, *Putting Meat on the American Table: Taste, Technology, Transformation* (Baltimore: Johns Hopkins University Press, 2006), 19.

24. Cronon, *Nature's Metropolis*, 237; Louis F. Swift, *The Yankee of the Yards: The Biography of Gustavus Franklin Swift* (Chicago: A. W. Shaw, 1927): 75–76.
25. See, for example, Mrs. D. A. Lincoln [Mary Johnson Lincoln], *Mrs. Lincoln's Boston Cook Book: What to Do and What Not to Do in Cooking* (Boston: Roberts Brothers, 1884), 210–211, 214, 232, 245; Maria Parloa, *Miss Parloa's New Cookbook: A Guide to Marketing and Cooking* (New York: C. T. Dillingham, 1880), 10, 30, 36.
26. "Here Are Facts on Color Changes," *National Provisioner* 143, no. 27 (December 1960): 10; Jerry Lee Mautz, "A Discussion of the History and Development of the In-Store Merchandising and Packaging of Fresh Red Meat with Emphasis on the Effect of Polyvinyl Chloride Film on a Traditional Cellophane Market" (master's thesis, Michigan State University, 1966): 25–26; Gordon L. Robertson, *Food Packaging: Principles and Practice*, 3rd ed. (Boca Raton, FL: CRC, 1993), 445–446.
27. B. Heller & Company, *Secrets of Meat Curing and Sausage Making: How to Cure Hams, Shoulders, Bacon, Corned Beef, Etc., and How to Make All Kinds of Sausage, Etc., and Comply with All Pure Food Laws*, 2nd ed. (Chicago: self-pub., 1913), 186.
28. F. W. Wilder, *The Modern Packing House* (Chicago: Nickerson and Collins, 1905), 72–73. See also B. Heller, *Secrets of Meat Curing*, 75–76, 186.
29. Ai Hisano, "Cellophane, the New Visuality, and the Creation of Self-Service Food Retailing" (Harvard Business School Working Paper 17–106, May 2017).
30. Horowitz, *Putting Meat*, 32–35.
31. David A. Fellers, "'Pair Testing' Compares How Films Maintain Color of Fresh Meat," *Package Engineering* 10, no. 6 (June 1965): 92; Robertson, *Food Packaging*, 446.
32. Robertson, *Food Packaging*, 446–450; C. B. Thor and F. Warren Tauber, "New Ideas on Developing Packaging Films for Cured and Fresh Meats," *National Provisioner* 133, no. 11 (November 1955): 23, 25–26.
33. Mautz, "Discussion," 30–32; Robertson, *Food Packaging*, 452.
34. Brian S. Smith, "Marination: Ingredient Technology" and J. M. Martin, "Meat-Curing Technology," in *Handbook of Meat and Meat Processing*, ed. Y. H. Hui (Boca Raton, FL: CRC, 2012), 488–489, 532.
35. See "Self-Service for Meat Uncorks Super-Market Bottleneck," *Meat Merchandising* 17, no. 9 (September 1941): 24; "Self-Serve Meats," *Meat Merchandising* 18, no. 5 (May 1942): 66.
36. Brand, *Modern Supermarket*, 32.
37. Dipman, *The Modern Grocery Store*, 165. See also "Artistic—but Easy," *Progressive Grocer* 15, no. 9 (September 1936): 23; Frommes, "The 'Eye Appeal' in Selling," 24–27.
38. "Give Produce Display Appetite Appeal," 44.

39. Ralph E. Head, "The Power of Produce," *Progressive Grocer* 20, no. 6 (June 1941): 41, 43.
40. "Produce Needs Eye Appeal to Sell," *Progressive Grocer* 17, no. 11 (November 1938): 78.
41. See "Artistic—but Easy," 23; "Give Produce Display Appetite Appeal," 44; Head, "The Power of Produce," 43; "Produce Needs Eye Appeal," 78.
42. John P. Gleason, display device, US Patent 1,898,769, filed June 6, 1932, and issued February 21, 1933; John P. Gleason, display device, US Patent 2,095,564, filed April 20, 1935, and issued October 12, 1937; Lynn H. McClintock, decorative article, US Patent 1,929,366, filed February 7, 1933, and issued October 3, 1933.
43. Alsteel Products Company advertisement, *Meat Merchandising* 6, no. 12 (January 1931): 21 (emphasis in the original). See also Craig Davidson and F. O. Britton, *How to Make Money Selling Meat* (New York: Progressive Grocer, 1938), 30; "Use Greens to Increase Eye Appeal," *Progressive Grocer* 17, no. 2 (1938 February): 31.
44. "Rubber Greens Give Color Contrast to Meats," *Meat Merchandising* 22, no. 3 (March 1946): 53; "A Successful Super Market," *Meat Merchandising* 22, no. 8 (August 1946): 86. See also "How to Build Meat Displays That Sell," *Progressive Grocer* 27, no. 4 (April 1948): 90–92.
45. Shaw & Slavsky Inc. advertisement, *Progressive Grocer* 27, no. 3 (March 1948): 49. See also "How to Build Meat Displays," 90–92.
46. "These Pointers on Meat Display Will Help You Sell More Meat," *Meat Merchandising* 17, no. 3 (March 1941): 20.
47. "Green Lights Enhance Produce," *Progressive Grocer* 20, no. 9 (September 1941): 88.
48. "Sales-Tempting Produce Dept.," *Progressive Grocer* 20, no. 7 (July 1941): 216.
49. "Mirrors over Produce Section Beautify Display and Pull More Sales," *Progressive Grocer* 20, no. 5 (May 1941): 73–74; "Small-Town Store Can Be Good Too—Look This One Over," *Progressive Grocer* 24, no. 10 (October 1945): 88.
50. "Food Shoppers and Food Selling: Yesterday and Today," reprinted from *Progressive Grocer* 18, no. 4 (April 1939), n.p., folder 8, box 47, HML-DPAD. See also "Cleanliness in the Market," *Meat Merchandising* 2, no. 8 (August 1926): 10. For the increasing importance of sanitation and cleanliness in food stores, see Lisa C. Tolbert, "The Aristocracy of the Market Basket: Self-Service Food Shopping in the New South," in *Food Chains: From Farmyard to Shopping Cart*, ed. Warren Belasco and Roger Horowitz (Philadelphia: University of Pennsylvania Press, 2009), 183.
51. Head, "The Power of Produce," 41, 43.
52. "Give Produce Display Appetite Appeal," 42, 90.

53. Matthew Luckiesh and Frank K. Moss, *The New Science of Lighting* (Cleveland: Nela Park Engineering Department, General Electric, 1934), 3–4. See also Matthew Luckiesh, *Seeing and Human Welfare* (Baltimore: Williams and Wilkins, 1934).
54. "Colored Lights Are Silence Salesmen," *Progressive Grocer* 18, no. 8 (August 1939): 98; "Good Lighting Is Meat Dept. Asset," *Progressive Grocer* 17, no. 6 (June 1938): 131. See also "Better Lighting Builds a Bigger Business," *Meat Merchandising* 3, no. 12 (January 1928): 15; Dipman, *The Modern Grocery Store*, 165–170; "Good Lighting Means More Business," *Meat Merchandising* 5, no. 12 (January 1930): 10; "Is Your Store Lighting Up to Date?," *Progressive Grocer* 16, no. 9 (September 1937): 44; "New Ways to Light without Glare," *Progressive Grocer* 17, no. 7 (July 1938): 40.
55. General Electric advertisement, *Progressive Grocer* 24, no. 2 (February 1945): 194 (emphasis in the original). See also General Electric Company, *75 Years of Progress in Electric Lamps and Lighting* (Cleveland: self-pub., 1954), WRHS.
56. Parker Collins, "Sale Increase 30% for Seattle Market as Ultra-Violet Lamps Go to Work to Save Meat," *Meat Merchandising* 17, no. 4 (April 1941): 60.
57. "Outshining Competition," *Meat Merchandising* 17, no. 8 (August 1941): 22–24.
58. Ibid., 20.
59. Seeger Refrigerator Company advertisement, *Progressive Grocer* 20, no. 3 (March 1941): 177. See also "Store Lighting and Meat Sales," *Meat Merchandising* 29, no. 4 (April 1953): 68, 70.
60. "Self-Service Packaged Meats," *Progressive Grocer* 24, no. 4 (April 1945): 166.
61. "Outshining Competition," 25.
62. "Discolored Meat," *Meat Merchandising* 24, no. 8 (August 1948): 43.
63. "Store Lighting and Meat Sales," 66.
64. "Outshining Competition," 25.
65. "Discolored Meat," 43.
66. "Colored Spotlight Increases Appeal," *Progressive Grocer* 14, no. 6 (June 1935): 56.
67. General Electric advertisement, *Progressive Grocer* 20, no. 3 (March 1941): 16. See also "Colored Lights," 98; Ralph F. Linder, ed., *New Idea Book for Food Merchants* (New York: Progressive Grocer, 1941).
68. Robertson, *Food Packaging,* 451; "Self-Service Meat Forum," *Meat Merchandising* 27, no. 8 (August 1951): 64.
69. Howard Ketcham, *Color Planning for Business and Industry* (New York: Harper and Brothers, 1958), 57.
70. Regina Lee Blaszczyk, *The Color Revolution* (Cambridge, MA: MIT Press, 2012), 220–221; Howard Ketcham, "Putting the Rainbow on the Pay Roll: A New Type of Engineer Is Increasing Sales, Preventing Accidents, Improving Efficiency Merely by the Use of Colors Properly Chosen and Applied," *Nation's*

Business, June 1939, 88; Matthew Luckiesh, "Color at Work," *Popular Mechanics* 77, no. 3 (March 1942): 18.

71. As early as the twelfth or thirteenth century, Chinese growers used a thick layer of molten wax to retard desiccation of citrus fruits. R. E. Hardenburg, *Wax and Related Coatings for Horticultural Products: A Bibliography*, Agriculture Research Service Bulletin No. 51–15 (Washington, DC: USDA, 1967); "Waxed Fruit You Eat It," *Changing Times* 4, no. 3 (March 1950): 36.
72. Joseph W. Eckert and Irving I. Eaks, "Postharvest Disorders and Diseases of Citrus Fruits," in *The Citrus Industry*, ed. Walter Reuther, E. Clair Calavan, and Glenn E. Carman, vol. 5, *Crop Protection, Postharvest Technology, and Early History of Citrus Research in California* (Oakland: University of California, Division of Agriculture and Natural Resources, 1989), 182.
73. *Progressive Grocer* 15, no. 3 (March 1936): 121.
74. C. W. Hitz and I. C. Haut, *Effects of Waxing and Pre-Storage Treatments upon Prolonging the Edible and Storage Qualities of Apples*, Bulletin of the Maryland Agricultural Experiment Station No. A14 (College Park: Maryland Agricultural Experiment Station, 1942); R. M. Smock, "Certain Effects of Wax Treatments on Various Varieties of Apples and Pear," *Journal of the American Society for Horticultural Science* 33 (1935): 284–289; S. A. Trout, E. G. Hall, and S. M. Sykes, "Effects of Skin Coatings on the Behaviour of Apples in Storage: I. Physiological and General Investigations," *Australian Journal of Agricultural Research* 4, no. 1 (1953): 57–81.
75. Elizabeth A. Baldwin, "Edible Coatings for Fresh Fruits and Vegetables: Past, Present, and Future," in *Edible Coatings and Films to Improve Food Quality*, ed. John M. Krochta, Elizabeth A. Baldwin, and Myrna Nisperos-Carriedo (Boca Raton, FL: CRC, 1994), 35–36; Hans Platenius, *Wax Emulsions for Vegetables*, Cornell University Agricultural Experiment Station Bulletin No. 723 (Ithaca, NY: Cornell University Agricultural Experiment Station, 1939).
76. Trout, Hall, and Sykes, "Effects of Skin Coatings," 57–81.
77. Baldwin, "Edible Coatings," 28–32.
78. "Trim Them Properly," 19.
79. Brand, *Modern Supermarket*, 42–43.
80. Ward Prickett, "Because We Display with Ice, Our Vegetables Always Look Fresh, Crisp, Appetizing," *Progressive Grocer* 29, no. 7 (July 1950): 75.
81. Andrew D. Althouse and Carl H. Turnquist, *Modern Electric and Gas Refrigeration*, 4th ed. (Chicago: Goodheart-Willcox, 1944), 361–363.
82. Zimmerman, *Super Market*, 154–155.
83. Brand, *Modern Supermarket*, 32; Mayo, *American Grocery Store*, 159.
84. Allied Store Utilities Company, HUSSMANN advertisement, *Meat Merchandising* 16, no. 7 (July 1940): 32–33. See also C. V. Hill & Company advertisement,

Progressive Grocer 20, no. 5 (May 1941): 28; Ed Friedrich Sale Corp. advertisement, *Progressive Grocer* 20, no. 7 (July 1941): 3; Super-Cold advertisement, *Progressive Grocer* 24, no. 5 (May 1945): 183.

85. Remus Harris, "Self-Service Meats Are Introduced by A&P," *Progressive Grocer* 20, no. 6 (June 1941): 46.
86. Ibid., 46–69; Zimmerman, *Super Market*, 61.
87. Mayo, *American Grocery Store*, 159.
88. Harris, "Self-Service Meats," 61.
89. DuPont, "Color Sells Prepackaged Meats," *Packages and People* 15, no. 3 (1951), folder 8, box 1, HML-DPFD. *Packages and People* was DuPont's in-house magazine. See also "Here Are Facts on Color Changes," *National Provisioner* 143, no. 27 (December 1960): 10.
90. Mautz, "Discussion," 42; "Maximum Salable Life for Fresh Meats Can Be Achieved by Use of Proper Packaging Materials and Methods," *National Provisioner* 134, no. 15 (April 1956): 34; "Problems in Packaging Meat Products," *National Provisioner* 114, no. 16 (April 1946): 76–76A.
91. "Problems in Packaging," 76.
92. DuPont was engaged in the cellophane business through its subsidiary, DuPont Cellophane Company, in which DuPont held 52 percent interest and La Cellophane held the rest. George W. Stocking and Willard F. Mueller, "The Cellophane Case and the New Competition," *American Economic Review* 45, no. 1 (March 1955): 22–23; C. H. Ward-Jackson, *The "Cellophane" Story: Origins of a British Industrial Group* (Edinburgh: William Blackwood, 1977), 37.
93. United States v. E. I. du Pont de Nemours & Co., 118 F. Supp. 41 (D. Del. 1953).
94. David A. Hounshell and John Kenly Smith Jr., *Science and Corporate Strategy: Du Pont R&D, 1902–1980* (New York: Cambridge University Press, 1988), 170.
95. DuPont, *Cellophane: Modern Merchandising Aid* (Wilmington, DE: self-pub., 1928), HML.
96. Mautz, "Discussion," 45–46; John M. Ramsbottom, "Some Aspects of Meat Packaging," in *New Potentials in Consumer Packaging*, ed. M. J. Dooher (New York: American Management Association, 1955), 14.
97. "Self-Service for Meat Uncorks," 24.
98. "How the A&P Packages Meat for Self-Service," *Progressive Grocer* 20, no. 7 (July 1941): 58–59.
99. 118 F. Supp. 41 (D. Del. 1953).
100. DuPont licensed Sylvania to manufacture and sell moisture-proof cellophane produced under the DuPont patents at a royalty of 2 percent of sales. The contract also required that sales of moisture-proof cellophane by Sylvania be restricted to 20 percent of the two companies' combined sales of

moisture-proof cellophane. The rate was to increase by 1 percent until it reached 29 percent in 1942. Although the production and sale of cellophane by Sylvania gradually increased after 1933, due to the 20 percent limiting clause, DuPont could still maintain an 80 percent share of the cellophane market. Sylvania paid DuPont approximately $1,500,000 in royalties under the 1933 agreement from April 1933 to January 1, 1945, when the limiting clause was dropped. Stocking and Mueller, "Cellophane Case," 43; 118 F. Supp. 41 (D. Del. 1953); United States v. E. I. du Pont de Nemours & Co., 351 U.S. 377 (1956).

101. Stocking and Mueller, "Cellophane Case," 49.
102. Some store operators employed women in their meat department during the war. "Man Power in the Market," *Meat Merchandising* 18, no. 5 (May 1942): 20; "The Women Take Over," *Meat Merchandising* 18, no. 1 (January 1942): 18.
103. "First Self-Service Meats in Arkansas They Made It Work," *Meat Merchandising* 23, no. 7 (July 1947): 42; Mayo, *American Grocery Store*, 159. See also Sam Teitelman, "Self-Service Meat Retailing in 1950," *Journal of Marketing* 15, no. 3 (January 1951): 30.
104. Brand, *Modern Supermarket*, 32, 34.
105. Friedrich Refrigerators Inc. advertisement, *Meat Merchandising* 22, no. 11 (November 1946): 13.
106. Deutsch, *Building*, 188
107. Mautz, "Discussion," 46–47; "Oxygen Control Key to Fresh Meat Color," *National Provisioner* 132, no. 7 (February 12, 1955): 21; "Problems in Packaging," 76A; Thor and Tauber, "New Ideas," 23–24.
108. "Give Me Packaged Meats," *Meat Merchandising* 24, no. 6 (June 1948): 31; G. C. Lavers, "Discoloration of Packaged Red Meat," *Modern Packaging* 22, no. 1 (January 1948): 127; "Maximum Salable Life for Fresh Meats Can Be Achieved by Use of Proper Packaging Materials and Methods," *National Provisioner* 134, no. 15 (April 1956): 34; "Problems in Packaging," 76A–B; Ramsbottom, "Some Aspects," 14–16.
109. "The Case for Self-Service: What Can You Lose?" *Meat Merchandising* 22, no. 12 (December 1946): 24–28; Bernard Immerman, "Careful Handling of Meats for Self-Service," *Meat Merchandising* 25, no. 11 (November 1949): 43–46, 98–99; Lavers, "Discoloration," 125.
110. DuPont, Cellophane Division, *Merchandising Trends in Fresh Fruits and Vegetables* (Wilmington, DE: self-pub., 1940), HML; DuPont, Cellophane Division, *Self-Service Meats: Progress Report on a Promising New Development* (Wilmington, DE: self-pub., 1945), HML.
111. DuPont, "Presentation Book 'Help Yourself,'" Bulletin 32–NN (1938), folder 15, box 46, HML-DPAD.

112. Horowitz, *Putting Meat*, 141–142; Mayo, *American Grocery Store*, 177.
113. DuPont, Cellophane Division, *Forward Step in Vegetable Merchandising: Soup Mix, Shredded Salad Bowl* (Wilmington, DE: self-pub., 1944), HML; DuPont, *Merchandising Trends*; "Produce Self-Service Successful," *Progressive Grocer* 24, no. 8 (August 1945): 140; W. J. Stelpflug, "Pre-Packaging of Perishable Foods: Another Step Forward in the Evolution of Grocery Merchandising," reprinted from *Modern Packaging* 17 (August 1944), n.p., folder 1, box 49, HML-DPAD.
114. Zimmerman, *Super Market*, 147.
115. John R. Mitchell, "I Slashed Spoilage and Boosted Produce Sales by Prepackaging + Refrigeration," *Progressive Grocer* 26, no. 4 (April 1947): 187.
116. "Which Fruits and Vegetables Shall I Package First?" *Meat Merchandising* 33, no. 5 (May 1953): 40.
117. Ibid.
118. Brand, *Modern Supermarket*, 46; John D. Lucas, "Why We're Strong for Prepackaged Produce in Open Refrigerated Cases," *Progressive Grocer* 26, no. 1 (January 1947): 74; Zimmerman, *Super Market*, 234.
119. "How Self-Service Experts Sell Fresh Fruits & Vegetables," *Progressive Grocer* 24, no. 8 (August 1945): 66; Kline, "How to Merchandise," 56; "Produce Self-Service Successful," *Progressive Grocer* 24, no. 8 (August 1945): 140; Francis E. Simmons, "Packaging Aids to Marketing," *Journal of Marketing* 13, no. 4 (April 1949): 516; F. W. Spannagel, "Pre-Packaging Produce at Retail Store Level," *Meat Merchandising* 29, no. 2 (February 1953): 37.
120. "How to Pre-Package Lettuce at Retail Level," *Meat Merchandising* 29, no. 1 (January 1953): 29
121. "Pre-Packaging Has Boosted My Gross Profit on Produce by 7 Percent," *Meat Merchandising* 28, no. 10 (October 1952): 37–38.
122. *Progressive Grocer* 27, no. 4 (April 1948): 124; "Tests in Sixty Stores Prove Prepackaging Lifts Produce Sales," *Progressive Grocer* 33, no. 7 (July 1954): 40.
123. Lucas, "Why We're Strong," 72.
124. Kline, "How Super Valu Stores Package Produce for Better Sales, Margins, Profits," *Progressive Grocer* 33, no. 8 (August 1954): 52.
125. Albert Eisner Jr., "What We Have Learned about Prepackaged Produce," *Chain Store Age* 22 (October 1946).
126. *Progressive Grocer* 27, no. 4 (April 1948): 124; Lucas, "Why We're Strong," 72.
127. Mitchell, "I Slashed Spoilage," 193.
128. DuPont, *You Can Sell More Tomatoes: A Consumer and Retail Store Survey on the Use of a "Cellophane" Transparent Wrap* (Wilmington, DE: self-pub., 1934), folder 7, box 45, HML-DPAD.
129. For the transformation of the relationships between grocery employees and consumers, see Deutsch, *Building*.

130. "They Pre-Package All Perishables," *Meat Merchandising* 23, no. 3 (March 1947): 42; "Operating Costs," *Meat Merchandising* 24, no. 6 (June 1948): 70.
131. "Big Boom in Self-Service Meats," *Meat Merchandising* 25, no. 6 (June 1949): 39; Mayo, *American Grocery Store*, 177–178.

8. Reimagining the Natural

1. For the Kitchen Debate and consumer culture in the Soviet Union, see Ruth Oldenziel and Karin Zachmann, eds., *Cold War Kitchen: Americanization, Technology and European Users* (Cambridge, MA: MIT Press, 2009); Susan E. Reid, "Cold War in the Kitchen: Gender and the De-Stalinization of Consumer Taste in the Soviet Union under Khrushchev," *Slavic Review* 61, no. 2 (summer 2002): 211–252.
2. Betty Friedan, *The Feminine Mystique* (New York: W. W. Norton, 1963); John Kenneth Galbraith, *The Affluent Society* (Boston: Houghton Mifflin, 1958); Vance Packard, *The Hidden Persuaders* (New York: David McKay, 1957); Vance Packard, *The Status Seekers: An Exploration of Class Behavior in America and the Hidden Barriers That Affect You, Your Community, Your Future* (New York: David McKay, 1959); Vance Packard, *The Waste Makers* (New York: David McKay, 1960). See also Daniel Horowitz, *The Anxieties of Affluence: Critiques of American Consumer Culture, 1939–1979* (Amherst: University of Massachusetts Press, 2004); Daniel Horowitz, *Consuming Pleasures: Intellectuals and Popular Culture in the Postwar World* (Philadelphia: University of Pennsylvania Press, 2012).
3. Harvey Levenstein, *Paradox of Plenty: A Social History of Eating in Modern America*, rev. ed. (Berkeley: University of California Press, 2003), 133, 179; Andrew F. Smith, *Food in America: The Past, Present, and Future of Food, Farming, and the Family Meal*, 3 vols. (Santa Barbara, CA: ABC-CLIO, 2017), 2:46–47; Ann Vileisis, *Kitchen Literacy: How We Lost Knowledge of Where Food Comes from and Why We Need to Get It Back* (Washington, DC: Island Press, 2008), 208–209.
4. Levenstein, *Paradox*, 109.
5. See, for example, "Chemistry Crusades for More Food!" *DOW Diamond* 11, no. 5 (September 1948): 18–23. See also Levenstein, *Paradox*, 114; Smith, *Food in America*, 1:41, 2:45–46.
6. Warren J. Belasco, *Appetite for Change: How the Counterculture Took on the Food Industry*, 2nd ed. (Ithaca, NY: Cornell University Press, 2007), 169–171.
7. Ibid.; Michael A. Haedicke, *Organizing Organic: Conflict and Compromise in an Emerging Market* (Stanford, CA: Stanford University Press, 2016); Geoffrey Jones, *Profits and Sustainability: A History of Green Entrepreneurship* (Oxford: Oxford University Press, 2017).

8. Andrew F. Smith, *Eating History: 30 Turning Points in the Making of American Cuisine* (New York: Columbia University Press, 2009), 168.
9. Geoffrey Jones, *Renewing Unilever: Transformation and Tradition* (Oxford: Oxford University Press, 2005), 10.
10. "Commercially processed foods" include canned and frozen foods; commercially dried, cured, and baked goods; and commercial dairy products. Marguerite C. Burk, "Pounds and Percentages," *Yearbook of Agriculture* (Washington, DC: Government Printing Office, 1959), 596.
11. "Highlights of U.S. Food Retailing in 1954," in *Facts in Food and Grocery Distribution* (New York: Progressive Grocer, 1955), 6.
12. Belasco, *Appetite for Change*, 53, 80, 122–126; Levenstein, *Paradox*, 106.
13. *Food Additives: Hearings on Bills to Amend the Federal Food, Drug, and Cosmetic Act with Respect to Chemical Additives in Food, Day 9, before a Subcomm. of the Comm. on Interstate and Foreign Commerce*, 85th Cong., 1st sess., 315 (1957) (statement of Emil M. Mark, chairman of the Department of Food Technology, University of California Agricultural Experiment Station, Davis).
14. James F. Best, "Color Stability in Carbonated Beverages," *Dyestuffs* 43, no. 7 (September 1960): 177.
15. *Annual Report of the Federal Security Agency* (Washington, DC: Government Printing Office, 1950), 221.
16. Norman R. Goldsmith, "Dermatitis from Orange I in a Candy Factory," *AMA Archives of Dermatology and Syphilology* 62, no. 5 (November 1950): 695–696.
17. *Color Additives: Hearings on H.R. 7624 and S. 2197, Day 5, before the Comm. on Interstate and Foreign Commerce*, 86th Cong., 2nd sess., 335 (1960) (statement of Harold Aaron, medical adviser to Consumers Union); DHEW, *Annual Report* (Washington, DC: Government Printing Office, 1956), 204; Edna M. Lovering to Valeria Spada, October 12, 1967, box 3979, entry 5, NACP-FDA.
18. Julie N. Barrows, Arthur L. Lipman, and Catherine J. Bailey, "Color Additives History," reprinted from *Food Safety Magazine*, October–November 2003, https://www.fda.gov/ForIndustry/ColorAdditives/RegulatoryProcessHistoricalPerspectives/default.htm; Sheldon Hochheiser, "Synthetic Food Colors in the United States: A History under Regulation" (PhD diss., University of Wisconsin–Madison, 1984): 117–121; Daniel M. Marmion, *Handbook of U.S. Colorants: Foods, Drugs, Cosmetics, and Medical Devices*, 3rd ed. (New York: John Wiley & Sons, 1991), 16; "News of Food: U.S. May Outlaw Dyes Used to Tint Oranges and Other Foods," *New York Times*, January 19, 1954, 28.
19. William J Barbour, "Limited Survey of Extant Stocks of Coal Tar Colors," August 5, 1959, box 2682, entry 5, NACP-FDA; "U.S. Orders Hearings on 3

Food Colorings," *New York Times*, December 19, 1953, 18. Florida orange growers began using Red No. 32 in 1938, and the USDA approved the dye as a certified color in 1939. Arthur V. Gemmill, "Appetizing Food Colors Boost Appeal of Your Products," *Food Engineering* 29, no. 4 (April 1957): 120; "House Okays Coal Tar Dye for Oranges," *Citrus*, May 1956, 9; Howard L. Shannon to Florida and Texas participants of the color certification fund, April 13, 1954, "1954–55 Color-Added" file, box 69, UF-CC.

20. "News of Food," 28; "U.S. Moves to Bar 3 Coal Tar Dyes," *New York Times*, January 20, 1954, 31; "U.S. Orders Hearings on 3 Food Colorings," 18.
21. Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962).
22. See Andrew N. Case, *The Organic Profit: Rodale and the Making of Marketplace Environmentalism* (Seattle: University of Washington Press, 2018).
23. Adelle Davis, *Let's Eat Right to Keep Fit*, rev. ed. (1954; repr., New York: New American Library, 1970), 214.
24. Bernard L. Oser, "Chemicals in Foods: Where Do They Stand?" *Food Engineering* 26, no. 6 (June 1954): 70.
25. Belasco, *Appetite for Change*, 72; Jones, *Profits and Sustainability*, 93.
26. Wade Greene, "Guru of the Organic Food Cult," *New York Times Magazine*, June 6, 1971, 30.
27. Belasco, *Appetite for Change*, 71–72; Jones, *Profits and Sustainability*, 92.
28. Jones, *Profits and Sustainability*, 94–96. See also Joan Reardon, *M. F. K. Fisher, Julia Child, and Alice Waters: Celebrating the Pleasures of the Table* (New York: Harmony Books, 1994), 203–266.
29. Belasco, *Appetite for Change*.
30. Sylvester Graham, *A Treatise on Bread, and Bread-Making* (Boston: Light & Stearns, 1837). See also Jones, *Profits and Sustainability*, 26–27.
31. Aaron Bobrow-Strain, *White Bread: A Social History of the Store-Bought Loaf* (Boston: Beacon, 2012), 12; R. A. McCance and E. M. Widdowson, *Breads White and Brown: Their Place in Thought and Social History* (London: Pitman, 1956); Waverley Root and Richard de Rochemont, *Eating in America: A History* (New York: Ecco, 1981), 231.
32. Ernest Dichter, "Psychological Research Study of Effectiveness of Current Packaged White Bread Advertising" (1956), box 28, HML-EDP; Ernest Dichter, "A Creative Memorandum on Consumer Attitudes to White Bread" (1959), box 56, HML-EDP.
33. Dichter, "Psychological Research Study."
34. "Do We Need All That in the Bread?" *New York Times*, September 24, 1972; Belasco, *Appetite for Change*, 49–50.
35. Dichter, "Psychological Research Study."
36. Quoted in Bobrow-Strain, *White Bread*, ix.

37. Ibid. See also Belasco, *Appetite for Change*, 49.
38. Belasco, *Appetite for Change*, 37–42, 49; Tom Fisher, "Plastics in Everyday Life: Polymorphous (In)authenticity," in *Plastics: Looking at the Future and Learning from the Past: Papers from the Conference Held at the Victoria and Albert Museum, London, 23–25 May 2007*, ed. Brenda Keneghan and Louise Egan (London: Archetype, 2009): 145–152; Jeffrey L. Meikle, *American Plastic: A Cultural History* (New Brunswick, NJ: Rutgers University Press, 1995).
39. "Bread: You Can't Judge a Loaf by Its Color," *Consumer Reports* 41 (May 1976): 256–260. See also Robert A. Peterson, "Consumer Perceptions as a Function of Product Color, Price and Nutrition Labeling," *Advances in Consumer Research* 4 (1977).
40. Belasco, *Appetite for Change*, 48–50; Bobrow-Strain, *White Bread*, 149–150.
41. Marmion, *Handbook of U.S. Colorants*, 16. For the Delaney Committee, see Suzanne Rebecca White, "Chemistry and Controversy: Regulating the Use of Chemicals in Foods, 1883–1959" (PhD diss., Emory University, 1994).
42. Bureau of Field Administration to Chiefs of Districts, September 30, 1959, box 2682, entry 5, NACP-FDA; DHEW, *Annual Report* (Washington, DC: Government Printing Office, 1957): 208; DHEW, *Annual Report* (Washington, DC: Government Printing Office, 1959): 210; Dyestuffs and Chemicals, Inc., v. Arthur S. Flemming, 271 F.2d 281 (8th Cir. 1959); Federal Register: 24 Fed. Reg. 8019 (October 6, 1959); Gordon C. Inskeep, "Certified Food Colors," *JIEC* 44, no. 1 (January 1952): 13.
43. The order became effective in 1959. Federal Register: 24 Fed. Reg. 884 (February 6, 1959).
44. DHEW, *Annual Report* (Washington, DC: Government Printing Office, 1961): 325; Memorandum of Telephone Conversation between Mr. Allman and Edgar A. Reed, January 8, 1960, box 2864, entry 5, NACP-FDA; A. T. Schramm, "Certified Colors—Facts behind the Headlines," *Dyestuffs* 42, no. 1 (March 1957): 12–21; A. T. Schramm, "Food Colors—a Study in Civics," *Dyestuffs* 43, no. 1 (March 1959): 7–14.
45. "Colored Casings Get Nod," *National Provisioner* 135, no. 3 (July 1956): 30; "Coloring Meats under the Rules," *National Provisioner* 131, no. 17 (October 1954): 116–118; "New Orleans May Ban Use of Colored Casings," *National Provisioner* 130, no. 18 (May 1954): 40; "Sausage Coloring Banned," *National Provisioner* 129, no. 5 (August 1953): 16.
46. George P. Larrick to George A. Smathers, February 7, 1955, "1954–55 Color-Added" file, box 69, UF-CC; Marmion, *Handbook of U.S. Colorants*, 17.
47. *Federal Food, Drug, and Cosmetic Act (Coloring of Oranges): Hearing on H.R. 7732, before a Subcomm. of the Comm. on Interstate and Foreign Commerce*, 84th Cong., 2nd sess. (1956) (hereafter cited as *1956 Hearings*); Florida Citrus Exchange

(hereafter cited as FCE) v. M. B. Folsom, Frank R. Schell v. M. B. Folsom, 246 F.2d 850 (5th Cir. 1957).

48. Until the introduction of Orange No. 2 in 1935, orange growers had used such dyes as annatto, Yellow AB, and Yellow OB. Seventy-five percent of Orange No. 2 was used for coloring Florida oranges at the time. Gemmill, "Appetizing Food Colors," 120; "News of Food," 28.
49. The order became effective in February 1956. The Certified Color Industry Committee (hereafter cited as CCIC) v. Marion B. Folsom, 236 F.2d 866 (2nd Cir. 1956); DHEW, *Annual Report* (Washington, DC: Government Printing Office, 1956), 215; "Highest Court Bans Orange Dye as Poison," *Chicago Daily Tribune*, December 16, 1958, n.p.
50. The CCIC consisted of major dye manufacturers, including Allied Chemical & Dye Corporation, American Cyanamid Company, Bates Chemical Co., Dyestuffs and Chemicals, H. Kohnstamm & Co., William J. Stange Co., Sterwin Chemicals, and Warner-Jenkinson Manufacturing Co. CCIC v. Folsom; "Highest Court Bans."
51. FCE v. Folsom, Schell v. Folsom.
52. Hochheiser, "Synthetic Food Colors," 129.
53. Comm. on Interstate and Foreign Commerce, Amending Section 406 of the Federal Food, Drug, and Cosmetic Act Relating to the Artificial Coloring of Oranges, H.R. Rep. No. 84-1982 (1956); Hochheiser, "Synthetic Food Colors," 130.
54. Walter J. Page, "Congressman Herlong's Bill to Prohibit Color-Add Process Stirs Controversy; Lake County Opposition Strengthens," *Citrus*, April 1953, 23–24; *1956 Hearings*, 13 (statement of Roscoe N. Skipper, vice president and sales manager at Snively Groves, Inc.).
55. Quoted in Page, "Congressman Herlong's Bill," 23.
56. Quoted in "Food and Drug Agency Banned 'Color Added' Dyes on Unfair Tests, Charges Tampan," *Citrus*, March 1956, 6. See also Randall Chase to M. H. Givens, January 15, 1955, "1954–55 Color-Added" file, box 69, UF-CC; "House Okays Coal Tar Dye for Oranges," 9; "Pure Food Agency Agrees to Permit Coloring of Oranges Pending Research," *Citrus*, March 1956, 30.
57. Comm. on Labor and Public Welfare, Amending Section 406 of the Federal Food, Drug, and Cosmetic Act Relating to the Artificial Coloring of Oranges, H.R. Rep. No. 84-2391 (1956); FCE v. Folsom, Schell v. Folsom.
58. Pub. L. No. 672–530, 52 Stat. 1046 (1956). See also FCE v. Folsom, Schell v. Folsom; "Orange Bill Signed: Measure Allows Coloring to Be Added to Fruit," *New York Times*, July 10, 1956, 19; "Orange Oranges Saved by Appeal," *New York Times*, February 11, 1956, 14; "U.S. May Ban Four Tar Dyes," *Citrus*, March 1957, 30.

59. "Coal-Tar Dye Held Legal for Oranges, *New York Times*, July 16, 1957, 22; "Color-Add Ban Ruled Out by US Court of Appeals," *Citrus*, August 1957, 6, 9.
60. Comm. on Interstate and Foreign Commerce, Amending the Federal Food, Drug, and Cosmetic Act to Permit the Temporary Listing and Certification of Citrus Red No. 2 for Coloring Mature Oranges, H.R. Rep. No. 86-88 (1959); J. C. Dacre, "Chronic Toxicity and Carcinogenicity Studies on Citrus Red No. 2," *Proceedings from the University of Otago Medical School* 43 (1965): 31–33; "Determination of Mixture of Red No. 32 and Citrus Red No. 2 Dyes on Oranges," *Citrus*, January 1960, 18, 30; J. L. Radomski, "The Absorption, Fate, and Excretion of Citrus Red No. 2 (2,5-dimethoxyphenyl-azo-2-na phthol) and External D&C Red No. 14 (1-xylylazo-2-naphthol)," *Journal of Pharmacology and Experimental Therapeutics* 134, no. 1 (October 1961): 100–109.
61. Pub. L. No. 86–2 (March 17, 1959). See also DHEW, *Annual Report* (Washington, DC: Government Printing Office, 1959): 210; "Orange-Dyeing Backed: Bill Aiding Citrus Growers Goes to the White House," *New York Times*, March 14, 1959, 23; "Purity Standards Regulation Set for Color on Oranges," *Citrus*, June 1959, 19.
62. H.R. Rep. No. 88.
63. John R. Matchett, "The Development of New Foods," *Yearbook of Agriculture* (Washington, DC: Government Printing Office, 1959), 434, 436.
64. Adam Burrows, "Palette of Our Palates: A Brief History of Food Coloring and Its Regulation," *Comprehensive Reviews in Food Science and Food Safety* 8, no. 4 (October 2009): 400; "High Court Weighs a Dye for Oranges," *New York Times*, March 18, 1958, 25; A. T. Schramm, "Certified Food Colors—a Half Century of Achievement," *Dyestuffs* 41, no. 6 (June 1956): 154–155.
65. Comm. on Interstate and Foreign Commerce, Color Additive Amendments of 1960, H.R. Rep. No. 86-1761 (1960); Dyestuffs and Chemicals v. Flemming; CCIC v. Arthur S. Flemming, 283 F.2d 622 (2nd Cir. 1960).
66. Flemming v. FCE, 358 U.S. 153 (1958). See also "Highest Court Bans"; John Walford, "Historical Development of Food Coloration," in *Developments in Food Colours*, ed. John Walford, vol. 1 (London: Applied Science, 1980), 15.
67. Burrows, "Palette of Our Palates," 400; H.R. Rep. No. 86-1761 (1960); Winton B. Rankin, "Color Additives," a speech draft for the Food and Drug Administration–Food Law Institute Conference, Washington, DC, November 24 and 25, 1958, box 2522, entry 5, NACP-FDA.
68. Color Additive Amendments of 1960, approved July 12, 1960, Public Law 86–618, 74 Stat. 397.
69. Burrows, "Palette of Our Palates," 400; DHEW, *Annual Report* (Washington, DC: Government Printing Office, 1960): 252; A. T. Schramm, "Color Legislation Creates New Problems," *Dyestuffs* 43, no. 8 (December 1960): 234–239.

70. Walford, "Historical Development," 16.
71. "The Growing Worry about the Chemicals in Our Food, Changing Times: Cyclamate, Red No. 2, Saccharin—Will We Ever Know What's Safe?" *Changing Times* 31, no. 6 (June 1977): 37–40.
72. Barrows, Lipman, and Bailey, "Color Additives History"; H.R. Rep. No. 86-1761 (1960); R. M. Schaffner, "Current Regulations and Future Activities of the Food and Drug Administration for Regulating Colors," in *Current Aspects of Food Colorants*, ed. Thomas E. Furia (Cleveland: CRC, 1977), 88.
73. Mildred M. Boggs and Clyde L. Rasmussen, "Modern Food Processing," *Yearbook of Agriculture* (Washington, DC: Government Printing Office, 1959), 421, 423.
74. Bud Brewster, "50 Years of Cosmetic Color," *Cosmetics and Toiletries*, December 1995, 107ff; Burrows, "Palette of Our Palates," 400.
75. DHEW, *Annual Reports* (Washington, DC: Government Printing Office, 1946–1970).
76. Marian Burros, "Immediate U.S. Ban on Tar Dyes Asked," *Washington Post*, January 12, 1977, A3; "Summary of Color Additives for Use in the United States in Foods, Drugs, Cosmetics, and Medical Devices," FDA, November 15, 2017, https://www.fda.gov/industry/color-additive-inventories/summary-color-additives-use-united-states-foods-drugs-cosmetics-and-medical-devices.
77. "FDA Bans Use of Red No. 4 Dye and Carbon Black in Food Items," *New York Times*, September 23, 1976, 18; "Two Dyes Banned," *Chemical Week*, September 29, 1976, 19.
78. Robert J. Marsh to Fruit Cocktail Packers, August 23, 1965, folder 3, box 6, UCD-CLF.
79. Belasco, *Appetite for Change*, 170–171; Horowitz, *Anxieties of Affluence*, 162–176.
80. "Nader Asks FDA Dye Probe," *San Francisco Examiner*, January 4, 1971, 10.
81. James S. Turner, *The Chemical Feast: The Ralph Nader Study Group Report on Food Protection and the Food and Drug Administration* (New York: Grossman, 1970), v.
82. Ruth Cookerham to Michael Jacobson, April 18, 1972, box 4612, entry 5, NACP-FDA; Ruth Cookerham to Michael Jacobson, May 15, 1972, box 4612, entry 5, NACP-FDA; Michael Jacobson to Charles Edwards, March 23, 1972, box 4612, entry 5, NACP-FDA; Memorandum of Telephone Conversation, between Michael Jacobson and Charles J. Kokoski, September 21, 1971, box 4496, entry 5, NACP-FDA.
83. Michael F. Jacobson, *Eater's Digest: The Consumer's Fact-Book of Food Additives* (Garden City, NY: Doubleday, 1972).

84. M. J. Ryan to Sally W. Gross, July 21, 1971, box 4456, entry 5, NACP-FDA.
85. Mrs. Harry Flynn to the FDA, May 12, 1971, box 4496, entry 5, NACP-FDA (emphasis in the original).
86. See Mrs. Willard L. Tether to the FDA, January 13, 1959, box 2682; Mrs. E. B. Jones to the FDA, December 7, 1960, box 2864; Mrs. Karl Haller to the FDA, April 7, 1969, box 4227, all in entry 5, NACP-FDA.
87. See Reed to Tether, March 26, 1959, box 2682; Dorothy H. Koegler to Jones, February 8, 1960, box 2864; Ralph F. Kneeland Jr. to Dinah R. Rosenblatt, May 20, 1960, box 2864; Consumer Research Staff, Office of the Assistant Commissioner for Education and Information to Haller, April 29, 1969, box 4227, all in entry 5, NACP-FDA.
88. Ernst Abramson, "Food Legislation in Sweden," *Food Drug Cosmetic Law Journal* 10, no. 1 (January 1955): 18–19; Daniel Carpenter, *Reputation and Power: Organizational Image and Pharmaceutical Regulation at the FDA* (Princeton, NJ: Princeton University Press, 2010), 138–139; "Legislation and Regulations: Swedish Food Law Summarized," *Journal of Agricultural and Food Chemistry* 2, no. 25 (December 1954): 1297.
89. Walford, "Historical Development," 11–13.
90. L. E. Parker, "Regulatory Approaches to Food Coloration," in *Developments in Food Colours*, ed. John Walford, vol. 2 (London: Elsevier Applied Science, 1984), 1–18. Following the E-number list for food colors, a list was created for other additives, including preservatives (1964), antioxidants (1970), and emulsifiers (1974).
91. Theodore Nixon (CEO, DDW, The Color House Corporation) and Campbell Barnum (vice president of brand and market development, DDW), in interview with the author, April 10, 2018. See also "European Colours for Food Application Markets," *Frost and Sullivan Report* B063–88 (2002): 1–8.
92. 25 Fed. Reg. 11201 (November 26, 1960); J. E. Noonan, "The Present and Future Status of Certified Color Additives: The Uncertain Additives," in Furia, *Current Aspects*, 61.
93. Nancy Bowen, *Ralph Nader: Man with a Mission* (Brookfield, CT: Twenty-First Century Books, 2002), 70–72.
94. It was one of the first seven color additives approved for use in food in 1907 under the terms of the Pure Food and Drug Law of 1906, Pub. L. 58–384, 34 Stat. 768. Certified Color Manufacturers Association et al. (hereafter cited as CCMA) v. F. David Mathews, et al., 543 F.2d 284 (D.C. Cir. 1976).
95. Committee on Food Protection, Food and Nutrition Board, Division of Biology and Agriculture, National Research Council, *Food Colors* (Washington, DC: National Academy of Sciences, 1971), 12. In 1967, among ten certified

synthetic dyes, three dyes (Red No. 2, Yellow No. 5, and Yellow No. 6) accounted for more than 90 percent of total food use.

96. Philip M. Boffey, "Death of a Dye?" *New York Times Magazine*, February 29, 1976, 9.
97. According to a 1967 survey, about 40 percent of Red No. 2 in the food business was used for soft drinks, and 30 percent was used for candy, confections, pet food, and dessert powder. The remaining 30 percent colored bakery goods, sausages, ice cream, dairy products, cereals, maraschino cherries, snack foods, processed fruits, juices, vegetables, fish and meat products, alcoholic beverages, pill coatings, liquid medicines, and cosmetics. Boffey, "Death of a Dye," 9, 48–51. See also "FDA Approves a Challenged Food Dye," *New York Times*, December 19, 1974, 1, 51; "Red Dye Is Called a Peril to Births," *New York Times*, January 31, 1971, 86.
98. "FDA Approves a Challenged Food Dye," 51.
99. Burrows, "Palette of Palates," 403.
100. "FDA Approves a Challenged Food Dye," 51; Ronald J. Glasser, *The Greatest Battle* (New York: Random House, 1976), 115.
101. CCMA v. Mathews.
102. The major manufacturers of Red No. 2 were the Allied Chemical Corporation, Crompton & Knowles Corporation, H. Kohnstamm & Company, Stange Company, Sterling Drug Inc., and Warner-Jenkinson Manufacturing Company. Boffey, "Death of a Dye," 9.
103. "Regulation: Death of a Dye," *Time*, February 2, 1976, 45.
104. "FDA Approves a Challenged Food Dye," 51.
105. M. M. Andrianova, "Carcinogenic Properties of the Red Food Dyes, Amaranth, SX Purple and 4R Purple," *Voprosy Pitaniia* 29, no. 5 (September–October 1970): 61–65.
106. Memorandum of telephone conversation between Pat Brown and Charles J. Kokoski, September 24, 1971, box 4496, entry 5, NACP-FDA.
107. The Soviet reports did not specify the composition of the amaranth paste employed; therefore, it may not have conformed to FDA specifications for Red No. 2. Additionally, FDA scientists were concerned with two unusual circumstances present in the Soviet studies: rats in the control groups had no tumors whatsoever, and malignant tumors were found in a variety of organs—an unusual result in that carcinogens are generally believed to have a target organ. CCMA v. Mathews; "FDA Asks Reduced Use of a Popular Food Coloring," *New York Times*, September 12, 1971, 42.
108. "FDA Approves a Challenged Food Dye," 51. See also Ethel L. Payne, "From Where I Sit: F.D.A. and the Food We Eat," *Tri-State Defender*, March 8, 1975, 6.
109. "FDA Approves a Challenged Food Dye," 51.

110. 36 Fed. Reg. 177 (September 11, 1971); Thomas E. Furia, *CRC Handbook of Food Additives*, 2nd ed., vol. 2 (Boca Raton, FL: CRC, 1980), 344; Memorandum of Conference, November 18, 1971, box 4611, entry 5, NACP-FDA.
111. "FDA Approves a Challenged Food Dye," 51.
112. "FDA Stands by Decision on the Use of Red Dye," *New York Times*, July 14, 1971, 41.
113. "Red Dye No. 2: The 2-Year Battle," *New York Times*, February 28, 1976, 20.
114. "Red Dye Is Called a Peril to Births," 86.
115. Committee on Food Protection, Food and Nutrition Board, *Report of Ad Hoc Subcommittee on the Evaluation of Red No. 2* (June 1972), box 4610, entry 5, NACP-FDA; "Red Dye No. 2: The 2-Year Battle," 20.
116. Boffey, "Death of a Dye," 9; "Red Dye 2 Fade-Out?" *Chemical Week*, January 21, 1976, 17; "Red Dye No. 2 Is Linked to Cancer," *New York Times*, January 10, 1976, 20.
117. "March of Dimes Urges a Ban for Now on Red No. 2 Food Dye," *New York Times*, December 20, 1974, 24.
118. "FDA Approves a Challenged Food Dye," 51; "Regulatory Fate of Red 2 Is Still in Doubt," *Food Chemical News*, December 30, 1974, 11.
119. Quoted in "FDA Approves a Challenged Food Dye," 51.
120. Jacqueline Verrett and Jean Carper, *Eating May Be Hazardous to Your Health: How Your Government Fails to Protect You from the Dangers in Your Food* (New York: Simon and Schuster, 1974).
121. Jerry Ruskin, Nina Mende, and Paul McIsaac, "Eating May Be Hazardous to Your Health," broadcast by WBAI, April 17, 1975, Collection of American Women Making History and Culture: 1963–1982, Pacifica Radio Archives, accessed May 1, 2019, https://archive.org/details/pacifica_radio_archives-BC2249.10.
122. CCMA v. Mathews; "FDA Is Assailed for Keeping a Controversial Food Dye on Market," *New York Times*, October 25, 1975, 13.
123. "FDA Approves a Challenged Food Dye," 51.
124. "Red Dye No. 2: The 2-Year Battle," 20.
125. The ban became effective in February 1976. CCMA v. Mathews; "FDA Bans New Use of Red Food Dye, but US Court Sets Further Hearings," *New York Times*, February 12, 1976, 10; "Red Dye No. 2: The 2-Year Battle," 20.
126. CCMA v. Mathews; Memorandum from D. W. Gaylor to Lloyd Tepper, December 31, 1975, MAF 460 / 75, UKNA; "Red Dye No. 2 Is Linked to Cancer," 20.
127. Quoted in "Regulation: Death of a Dye," 45.
128. Boffey, "Death of a Dye," 50.
129. I. K. Charlton to Derek F. E. Hogg, January 9, 1975, box 11, MAF 460, UKNA.

130. "Red Dye No. 2: The 2-Year Battle," 20.
131. "FDA Approves a Challenged Food Dye," 51; Glasser, *The Greatest Battle*, 115.
132. Food Additives and Contaminants Committee, "Amaranth," May 1977, MAF 460 / 57, UKNA.
133. Department of Health and Welfare Canada (hereafter cited as DHWC), Newsletter, "Canadian Position on the Food Colour Amaranth," February 2, 1976, folder 47, box 5, UCD-CLF.
134. Mr. Cifarelli, "Written Question No. 262: To the Commission of the European Communities," May 1977, MAF 460 / 57, UKNA; Gordon Dawes to Miss S. Gibbons, December 19, 1978, MAF 460 / 57, UKNA.
135. DHWC, "Canadian Position"; Leatherhead Food Research Association, Information Sheet, "Sweden: Proposals on Food Colours," September 1974, box 11, MAF 460, UKNA.
136. "Candy Mints Recalled," *New York Times*, June 11, 1976, A20.
137. "112,420 Pounds of Sugar Candies with Banned Red Dye Recalled," *New York Times*, October 21, 1976, 15.
138. "Red Dye No. 2: The 2-Year Battle," 20.
139. Mars used Red Nos. 3 and 40. Bob Greene, "Once Again, Candy Lovers Will See Red," *Chicago Tribune*, January 21, 1987; "Red M&Ms Back by Popular Demand," *Washington Post*, January 15, 1987, E7.
140. Joël Glenn Brenner, *The Emperors of Chocolate: Inside the Secret World of Hershey and Mars* (New York: Broadway Books, 2000), 249, 254; Greene, "Once Again"; Chris Lamb, "M&M Candy Got the Red Out . . . but He Got It Back In," *Los Angeles Times*, February 5, 1987.
141. "Regulation: Death of a Dye," 45.
142. "Suit Hits Red Dye Pact," *Chemical Week*, June 30, 1976, 23; John Walford, "Novel Synthetic Colours for Food," in Walford, *Developments in Food Colours*, 1:96.
143. "Regulation: Death of a Dye," 45.
144. "FDA Approves a Challenged Food Dye," 51.
145. Philip M. Boffey, "Color Additives: Is Successor to Red Dye No. 2 Any Safer?" *Science* 191, no. 4229 (February 27, 1976): 832; "Red Dye No. 40 Is Called 'Substantial' Risk," *San Francisco Chronicle*, December 17, 1976, 30; Warner-Jenkinson Company and H. Kohnstamm & Company, Inc., v. Allied Chemical Corporation, U.S. Court of Appeals, 2nd Circuit, 567 F.2d 184 (1977).
146. J. A. Bainton to J. R. Murphy, February 7, 1975, box 11, MAF 460, UKNA; Boffey, "Color Additives," 832. Countries that approved Red No. 40 included Australia, Brazil, Colombia, Denmark, Guatemala, Mexico, Peru, and the Philippines.

147. "Allied to Boost Production of Red Dye No. 2 Substitute," *Chemical Week*, January 28, 1976, 9; "Red M&M Candies Make a Comeback," *Chemical Week*, January 28, 1987, 41; Warner-Jenkinson and H. Kohnstamm v. Allied Chemical. The amount of Red No. 40 certified by the FDA grew from 26,000 pounds in the third quarter of 1971 to more than 160,000 pounds per quarter on average in the years 1973 to 1975.
148. "Court Rules Additives May Stay on Market," *New York Times*, October 20, 1982, B15.
149. Burros, "Immediate U.S. Ban," A3.
150. Walford, "Historical Development," 22.
151. H. T. Gordon, "The Carotenoids—Current Status as Food Colorants," in Furia, *Current Aspects*, 42.
152. Andrew Loesel, "Colorful Growth; Future of the Food Colorings Market," *Chemical Marketing Reporter*, June 15, 1992, SR25; Paul Rogers, "Rainbow Coalition: Color Additives in Candy," *Candy Industry*, January 1, 2001, 40; R. J. Soukup and Il-Young Maing, "The Color Needs of the Food Industry," in Furia, *Current Aspects*, 79; Walford, "Historic Development," 22.
153. Robert Eckard, "Food Additives: The U.S. Market," *Packaged Facts Report* (Rockville, MD: Packaged Facts, 2013); John George, "Colouring Foodstuffs Threaten Natural Colour Dominance," *Euromonitor International*, May 27, 2015; Antal Neville, "Natural Food Coloring Manufacturing in the US," *IBIS World Industry Report OD4939* (Los Angeles: IBISWorld, 2015).
154. J. Coulson, "Miscellaneous Naturally Occurring Colouring Materials for Foodstuffs," in Walford, *Developments in Food Colours*, 1:193–195.
155. J. N. Counsell, "Some Synthetic Carotenoids as Food Colours," in Walford, *Developments in Food Colours*, 1:162, 164; "Wide Use of Carotene as Food Color Seen," *Food Engineering* 27, no. 7 (July 1955): 178.
156. C. W. McClelland, "Economic Constraints on the Use of Naturally Derived Food Colors," in Furia, *Current Aspects*, 70.
157. Charles E. Morris, "Natural Yellow Color," *Chilton's Food Engineering*, January 1981, 106–107; "Natural Look for Colors?" *Chemical Week*, August 4, 1976, 22.
158. F. J. Francis, "Anthocyanins," in Furia, *Current Aspects*, 19–20, 25; Walford, "Historic Development," 23–24. The grape extract was also the only anthocyanin pigment permitted for food use by the FDA.
159. Francis, "Anthocyanins," 26.
160. Walford, "Historic Development," 22.
161. O. Isler, R. Rüegg, and U. Schwieter, "Carotenoids as Food Colourants," *Pure and Applied Chemistry* 14, no. 2 (1967).

162. Counsell, "Some Synthetic Carotenoids," 155; "Wide Use of Carotene as Food Color Seen," *Food Engineering* 27, no. 7 (July 1955): 178; Janet Lynn Williams, "A Study on Carotenoids of Wild-Type and Mutant Strains of the Alga, *Scenedesmus obliquus*" (master's thesis, Oregon State University, 1971): 3.
163. Gerald Bennett to the Popcorn Institute, October 26, 1960, box 2864, entry 5, NACP-FDA; Gordon, "The Carotenoids," 44.
164. Gordon, "The Carotenoids," 44, 46; "Synthetic Orange Color Approved by FDA," *Food Engineering* 36, no. 2 (February 1964): 113.
165. Gordon, "The Carotenoids," 42, 44, 47.
166. "Apo-Carotenal: A Potent Color," *Food Engineering* 36, no. 5 (May 1964): 77.
167. Roche advertisement, *Food Engineering* 36, no. 4 (April 1964): 110. See also "Stable Additives Provide Natural Yellow Color," *Food Engineering* 27, no. 8 (August 1955): 136; "The Story of Nature's Yellow," *Food Engineering* 30, no. 4 (April 1958): 49–53.
168. Roche advertisement, *Food Engineering* 36, no. 4 (April 1964): 110. See also Roche pamphlets, *For Processed Dairy-Type Products,* n.d.; *For Salad Dressings*, n.d., both in box 47, Food Technology, Food Standards, Nutrition Labeling Collection, NACP-FDA.
169. William J. Stange Company advertisement, *National Provisioner* 142, no. 22 (May 28, 1960): 37. Other dye manufacturers, including H. Kohnstamm and Company and Allied Chemical Corporation—among the earliest manufacturers of food dyes—advertised mainly synthetic dyes. See Allied Chemical Corporation, *National Certified Colors*, 1970; H. Kohnstamm and Co., *Atlas Food Color Guide*, n.d., both in box 47, Food Technology, Food Standards, Nutrition Labeling Collection, NACP-FDA.
170. Belén Añíbarro et al., "Occupational Asthma Induced by Inhaled Carmine among Butchers," *International Journal of Occupational Medicine and Environmental Health* 16, no. 2 (February 2003): 133–137; Matthew J. Greenhawt and James L. Baldwin, "Carmine Dye and Cochineal Extract: Hidden Allergens No More," *Annals of Allergy, Asthma and Immunology* 103, no. 1 (July 2009): 73–75.
171. U.S. Department of Health and Human Services, FDA, "Small Entity Compliance Guide: Declaration by Name on the Label of All Foods and Cosmetic Products That Contain Cochineal Extract and Carmine," April 2009, http://www.fda.gov/ForIndustry/ColorAdditives/GuidanceComplianceRegulatoryInformation/ucm153038.htm.
172. DHEW, *Annual Report* (Washington, DC: Government Printing Office, 1961), 347.

9. *Eye Appeal Is Buy Appeal*

1. General Mills (@GenMillsCereal), "Trix fans! Finding your mornings are duller? We've got something special coming with a little color!" Twitter, September 21, 2017, 10:26 a.m., https://twitter.com/GenMillsCereal/status/911233724729225217. See also Jeff Gelski, "'Classic Trix' to Contain Synthetic Colors," *Food Business News*, September 22, 2017; Phil Wahba, "Original Trix Is Coming Back, Artificial Colors and All," *Fortune*, September 22, 2017.
2. For more on "ugly food," see Jennifer Medina, "Getting Ugly Produce onto Tables So It Stays out of Trash," *New York Times*, November 24, 2015, A16; Dan Mitchell, "Why People Are Falling in Love with 'Ugly Food,'" *Time*, March 27, 2015; Amanda Mull, "The Murkey Ethics of the Ugly-Produce Business: America's Wonkiest Fruits and Vegetables Have Ignited a Food War, *Atlantic*, January 25, 2019; "A New Market for Old and Ugly Fruit and Vegetables Takes Shape," *Economist*, January 11, 2018.

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