3 Visibly Invisible

The Enigmatic History of Technology in the Fashion-Industrial Complex

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Fashion studies and fashion history have long focused on the cultural meaning of dress and the aesthetic appreciation of textiles and costume without due consideration of the supply chain within the fashion system. This chapter, in contrast, examines the important, but little-studied, role of technology and technical data flows in the global fashion system. It advocates for a broad view of fashion production that stretches across the supply chain from fiber manufacturing to clothing distribution. Elsewhere, I have articulated the need to reposition the historical analysis of fibers, fabrics, and fashions within the economic framework I call the "fashion-industrial complex." To understand fashion as a business, we need to grapple more fully with production and distribution, developing a deeper appreciation for industrial districts and manufacturing centers, where layers of intermediaries labored to link commerce and culture. From Paris to New York, the fashion economy was built around a complex network of firms and industries engaged in business-to-business or B2B transactions. With the help of "fashion intermediaries" working behind the scenes, the network generated new styles for a segmented market comprised of everyone from the couture-dressed princess to the rayon-clad clerk typist.[1]

This chapter elaborates on the concept of the fashion-industrial complex and the importance of fashion intermediaries by highlighting the visibly invisible role of the chemical and textile industries in the creation of style goods (Figure 3.1). The main historical actors in this chapter are the manufacturers and marketers who produced, sold, and promoted dyestuffs, color forecasts, man-made textiles, and synthetic fibers. The case studies in the four sections of this chapter explore the symbiotic relationships among chemical companies, converters, textile mills, fashion creators, and apparel makers during the long Second Industrial Revolution. Significantly, this period, dating from around 1850 to 1970, witnessed the triumph of ready-to-wear and mass-market fashion.

The discussion starts with a look at the color revolution that transformed the visual culture of fashion in Victorian and Modern times. Major innovations in dyestuffs led to the development of new forms of information sharing within the fashion-industrial complex. The first section, The Colorful World of William Henry Perkin, examines the role of a new scientific discipline, synthetic organic chemistry, in introducing high-performance dyes to the textile industry between 1856 and 1914. The principal actors in this sea change were the scientists in the new chemical field, the entrepreneurs who commercialized the synthetic materials, and the textile mills of Europe and America who used them to transform the look and feel of fabrics.

The next section, The Carte de Nuance as a Design Tool, explores how the dye explosion wreaked havoc with the design process and how the chaos led to the development of modern information-sharing practices. The proliferation of colorants forced the

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Figure 3.1 The important role of chemical technologies in fashion production is often overlooked by academic researchers. This vignette from the larger exhibition of Imperial Chemical Industries at the British Industries Fair in London, 1929, shows stylish calicos, artificial silk, and cottons that were made using ICI products. Courtesy, Hagley Museum and Library, Wilmington, DE, USA.

dye houses in French textile centers like Lyon and the style bureaus of Paris to devise novel ways for managing the palette and disseminating news on the latest shades. This challenge led to the widespread adoption of the shade card and the swatch book as tools for marketing the latest color trends. The fold-out shade card—illustrated with ribbons, thread samples, or fabric swatches—was adopted to promote new colors to all fashion producers, from fabric mills to knitwear factories, couture houses, and ready-to-wear designers. The key mediators were the color watchers who interpreted trendy Parisian hues for broad dissemination. While the business of trend watching originated in France, it was the sprawling American fashion-industrial complex that perfected the shade card as a color forecasting tool in the years between World War I and World War II.

The second half of the chapter shifts from color forecasts to textile materials by examining the impact of man-made and synthetic fibers on the fashion trades. In the long twentieth century, the textile development of the greatest consequence was the introduction of artificial fibers to rival Mother Nature's bounty of cotton, silk, wool, and flax. The upheaval occurred in two stages. First, the man-made materials known as artificial silk, or rayon, gained a toehold; this occured during the early twentieth century. In the second stage, test-tube fibers such as nylon, acrylic, polyester, and spandex entered the fashion scene in the postwar era.

The third section, The Rayon Age, considers the rise of man-made fibers from the late Victorian era to World War II. The discussion focuses on the influence of rayon makers on the fashion business, with reference to how rayon companies promoted man-made materials to textile mills, clothing creators, and consumers. The fourth section, Test-Tube Fibers and the Midcentury Textile Revolution, takes the discussion into the post–World War II era, when American companies like E. I. du Pont de Nemours & Company and British firms such as the Calico Printers' Association and Imperial Chemical Industries (ICI) developed the first synthetic fibers and promoted these miracle materials within the Western fashion economy. Whether they made rayon or polyester, the fiber makers, working through fashion intermediaries, kept tabs on Parisian taste-makers, and those important relationships are explored.

The concept of the fashion-industrial complex acknowledges that style creation is an economic activity that involves the entire supply chain, starting with fiber makers and moving forward to clothing retailers. There are many economic activities involved in the making of style goods. The handful of technical innovations considered here—dyes, shade cards, rayon yarns, and synthetic fibers—facilitated the rise of mass-market fashion by creating the ability for manufacturers and retailers to introduce novel designs at an affordable price. The combination of low prices, convenience of use, eye-catching colors, and softness of touch made possible by technics helped ready-to-wear to succeed in the mass market. Synthetic materials and color management systems were invisible to consumers, but those technologies enabled the stenographer, factory worker, or housewife to buy a colorful frock in a washable rayon crepe that didn't wrinkle, shrink, or fade. This analysis, ultimately, pulls back the curtain on the hidden history of technology and the role of fashion intermediaries in the democratization of fashion.

The Colorful World of William Henry Perkin

In the Victorian era, William Henry Perkin (1838–1907) was celebrated in popular culture as an icon of British inventiveness. The Second Industrial Revolution was just taking off in 1856 when Perkin, a teenaged student at the Royal College of Chemistry on Oxford Street in central London (later merged with Imperial College London), tackled an assignment that would transform his life—and launch a new industry. His professor was August Wilhelm von Hoffmann (1818–1892), a pioneer in the emerging discipline of synthetic organic chemistry. Keen to find an anti-malarial drug for the British tropics, Hoffmann asked Perkin to work on synthetizing quinine from coal-tar, a waste-product from the manufacture of gas for lighting. Over Easter break, Perkin squirrelled away at his parents' home on Cable Street in the East End, a working-class section of London. While mixing chemicals in his makeshift laboratory, Perkin knocked over a beaker, spilled some liquid, and watched a rag turn deep purple. He rushed to the drapery shops in Piccadilly and bought a skein of plain white silk. He re-created the experiment—and successfully dyed the silk a beautiful shade of mauve.[2]

Perkin was on to something. For centuries, purple robes had been reserved for kings, due to the arduous task of extracting the dark, rich color from a type of Mediterranean mollusk. By the 1840s, French dye houses in Lyon and Mulhouse experimented with coal-tar and other materials to produce stunning hues for silk and cotton. Although they gained some favor, these expensive colors were fugitive on the fabric. By serendipity, Perkin had stumbled across a new way to make a *colorfast* purple dye. The young chemist left school and, with some of his relatives, opened the world's first factory for

aniline dyes. Perkin had his satisfaction when two royals gave their imprimatur the new *couleur mauve*. In the summer of 1857, Empress Eugénie (1826–1920), the wife of Napoleon III, wore a lilac-hued silk dress and bonnet that were reported to match the mauve color of her eyes. A few months later in the spring of 1858, Queen Victoria (1819–1901) wore a mauve velvet gown to the wedding of her daughter Victoria, the Princess Royal, to Prince Frederick of Prussia. Both aristocratic fashion choices were likely created with French colorants, rather than with the Perkin dyes that were still under commercial development. But mauve was soon *the* fashion color on both sides of the Atlantic Ocean, and the future of Perkin's aniline business was secure.

Competition emerged. In 1862, the Perkin factory exhibited mauve materials at the International Exhibition in South Kensington, London—as did other British firms. But the real threat came from Central Europe. Within a few short years, the chemical industry of Germany wrested the synthetic dye industry away from the first movers in France and Britain. After the Franco-Prussian War and German unification, chemical companies such as Badische Anilin- & Soda-Fabrik (BASF) captured the market for colorants. The German chemical industry, clustered in the Rhine Valley, became one of the high-tech sectors of the Second Industrial Revolution. Its success can be attributed to major changes in the national political economy and the global textile sector. Several internal factors in Germany fostered growth: first, favorable trading conditions among the states before and after unification; second, patent laws that encouraged innovation; third, the expansion of universities and polytechnical institutes to train scientists and engineers; and fourth, major investments in science-based industrial research. Throughout the world, the textile industry was always on the lookout for new ways to enhance appeal of their fabrics, thereby creating a global market for German dyes.

The European and American nations of the Second Industrial Revolution had sophisticated textile industries and were advancing ready-to-wear production. In the United States, the Civil War (1861–1865) spurred the demand for warm, durable soldiers' uniforms in standard sizes. Firms like Wanamaker and Brown, Philadelphia menswear clothiers with a store called Oak Hall, supplied clothing to the Union army. Some clothiers of this period adopted menswear tailoring techniques to make women's and children's apparel, including ladies' mantles or cloaks. But most women's clothing still had to be custom made. The trendy hour-glass silhouette was achieved by wearing figure-shaping layers: a laced corset and a tight bodice above the waist, and a crinoline or bustle, petticoats, and a long billowy skirt below. A consumer could buy a factory-made corset, but a professional dressmaker had to fit the complicated outer costume to her figure. As consumer society blossomed, the shopping areas of good-sized cities and towns were filled first with dry-goods shops, or haberdasheries, that stocked yard goods and sewing necessities. These retailers were later joined by the new department stores that carried fabrics, millinery, and ready-to-wear. Concurrently, the appetite for stylish Paris-inspired ladies' attire was stimulated by the fashion press. Magazines like *Godey's Lady's Book* (1830–1898) in the United States and the *Englishwoman's Domestic Magazine* (1852–1879) in the United Kingdom featured hand-colored fashion plates showing the latest designs—influenced by the silhouettes of Paris and the colors of the Rhine Valley. The fashion-industrial complex ran on an intricate system of interlocking gears, all moving in sync to generate the new style trends for popular consumption.

The chemical industry's dyes were one of the building blocks of the fashion-industrial complex. Aniline colors had launched the Victorian chromatic explosion, but the Germans soon discovered more and better synthetic dyes, starting with the alizarin group in 1868

and continuing with other inventions.[3] Constant innovation led to Germany's global dominance of the color market by the outbreak of World War I, when the chemical industry of the Rhine Valley produced about 90 percent of the world's dyestuffs.[4] Even indigo, the plant-based dye that gave denim its distinctive blue, was displaced by a synthetic alternative discovered in 1883 and commercialized by BASF at the turn of the century.[5] It is important, however, to acknowledge that synthetics did not entirely eliminate natural dyes. Materials such as logwood, used by the wool textile industry to create black fabrics, found continued application during the era of high-tech dyes.

German prowess in research, engineering, and manufacturing was superseded only by efficient distribution. To expand sales globally, firms like BASF set up central marketing departments in the home country and branch sales offices around the world. Besides adopting new information technologies like the typewriter and the cablegram, the Rhineland dye makers developed a sophisticated communications system for keeping their agents and customers abreast of the latest technical, economic, and aesthetic developments. Today, archives such as the Science History Institute in Philadelphia have extensive collections of fold-out cardboard books, or shade cards, that were created by chemical companies to promote their colorants. With every seasonal fashion shift, the dye manufacturers offered new hues to the dye houses, finishers, and fabric mills in textile districts around the world. The shade cards were lined with ribbons, yarns, or swatches that were dyed in the trendy shades for the upcoming season. Shade cards were intended to sell Rhineland colorants, but textile mills began to use them creatively. As will be discussed in the next section, textile stylists came to think of them as forecasts of seasonal color trends.

The retired William Henry Perkin watched the rise of the German dye industry with interest. His two sons, William Henry Perkin, Jr. (1860–1929) and Arthur George Perkin (1861–1937), shared his penchant for chemistry but developed careers that were, in a backhanded way, a salute to Germany. Both sons held academic appointments at universities tied to the textile industry. William Jr. earned a German doctorate and then worked at universities in Edinburgh, Manchester, and Oxford. Arthur, more of a practical bench chemist, spent much of his career at the University of Leeds, which began as the Yorkshire College of Science, a textile school. The transatlantic scientific community feted the elder Perkin as a Victorian technological pioneer. In 1866, he was elected a Fellow of the Royal Society in London and later received the organization's two high honors: the Royal Medal in 1879 and the Davy Medal in 1889. He was knighted in 1906. That year, the aged inventor steamed across the Atlantic Ocean to New York, where the local section of the Society of Chemical Industry, a scientific body, honored him with its inaugural Perkin Medal to mark the jubilee of his discovery of mauveine in an East End rowhouse. Perkin, the one-time mauve wunderkind, died the next year.[6]

The Carte de Nuance as a Design Tool

Let's pretend it's 1910. Picture yourself working as a fabric designer in Lowell, Massachusetts, a major textile city in the New England cotton manufacturing district. As a youngster in the 1880s, you studied textiles at the Massachusetts Institute of Technology (MIT), then in Boston's Back Bay, under "a practical designer of long experience."[7] MIT engendered you with a reverence for new techniques—and for old design traditions. You learned to be a copyist, an expert in the "art of utilizing the work of other men with a view to getting the best results."[8] Class field trips to local museums

exposed you to "the artistic creations of designers of past generations," and you appreciated "ancient specimens of fabrics, glassware, wall paper, pottery and floor coverings rich in colors and figures."[9] You knew of the legendary William Henry Perkin, and in your design job at Lowell, you planned fabrics that would be colored with synthetic dyes. Your workspace was a large room of the mill, illuminated by natural light pouring through tall windows. Most of the day, you sat at a drawing board, creating watercolor renderings of patterns to be printed on woven cotton cloth. Those calico patterns were based on motifs and colorways from the past. The design department had a reference library filled with books of classical motifs, stacks of ladies' fashion magazines, and swatch books containing fabrics made by the mill and its competitors. But one of the most valuable tools to you as a copyist was the collection of color cards or shade cards.

The color card is not unique to the fashion-industrial complex.[10] It belongs to a long tradition of sales aids in the style industries. For centuries, businesses in the creative industries had made samples that showed the range of design options for texture, quality, decoration, and hue. European porcelain makers created sample plates that showcased the enamel colors they could paint on chinaware at the customer's request.[11] As the demand for stylish textiles grew, the fashion-industrial complex excelled at the production of sample cards. There were sample cards for almost every component of a fashion outfit, from metal snaps to straw braid. The most important type of sample card was the shade card or carte de nuance.

As discussed, the German chemical manufacturers created sophisticated shade cards to promote new hues, but their customers, the dyers that colorized yarns and fabrics for the converters, weaving mills, and knitting mills, began to produce their own color cards to market their dyeing services locally. Shade cards eventually took on a life of their own to become an essential design tool in textiles and fashion. The Musée des Tissus et des Arts décoratifs in Lyon has shade cards from local dyehouses whose major customers included the nearby broadsilk and ribbon mills. One of the earliest cartes de nuance in their holdings, donated by the dye firm of Marnas, Bonnet & Fils, shows the silk shades for autumn 1882.[12] The artifact is an accordion envelope holding 12 of the 18 or more original removable floss cards, each having loops of dyed yarns lined up in a row to show harmonious shade combinations. By studying a set of shade cards like this, the textile stylist could hone their understanding of how colors might work together to create a fabric that was right for the moment. Over time, the shade cards of the dye industry became more sophisticated. The Textilmuseum in St. Gallen, Switzerland, another important silk manufacturing center, has a BASF sample book from Ludwigshafen am Rhein, which is filled with large cotton fabric swatches of printed designs created from the firm's alizarin dyes.[13] These color cards and sample books promoted the new dyes, and along the way, suggested trendy color combinations and edgy fabric designs.

The creators of the cartes de nuance took their cues from the fashion trades of Paris, from the silk mills, trim makers, feather suppliers, shoe manufactories, and milliners. Two upmarket neighborhoods of Paris, the first and the eighth arrondissements, are sometimes referenced in fashion history because they were home to the elite dressmaking salons. But Paris was also the major Western European distribution center for factory-made style merchandise, the go-to place for artistic goods and fashion tips. The tenth arrondissement, also known as the Entrepôt or "warehouse," was a bustling commercial center. This district has two of the city's main railway stations—Gare du Nord and Gare de l'Est—and in walking around the streets today, one can see the old commercial buildings that were essential to the fashion-industrial complex. During the Second

Industrial Revolution, the railroads provided connections to textile centers like Lyon, Saint-Étienne, and Mulhouse. The tenth arrondissement, and the adjacent second, third, and ninth arrondissements, thronged with showrooms, shops, and stores stocked with beautiful goods made throughout Europe. Buyers from all around the continent, Britain, and America flocked there to select goods to sell back home. In 1880, the luxury department store John Wanamaker of Philadelphia became the first American retailer to invest in a resident-buying office in Paris. By 1899, Wanamaker operated a more extensive buying operation in the tenth arrondissement out of a restored historic hôtel at 44, rue des Petites Écuries.[14] After the turn of the century, even American retailers from the hinterlands maintained buying offices in commercial Paris. In 1906, one newspaper in Omaha, Nebraska, featured a lavish advertisement from a local dry-goods emporium that boasted of the "Brandeis Paris Office" in the ninth arrondissement at 1, rue Ambroise Thomas.[15]

As Paris became a global hub for style goods, entrepreneurs determined that the carte de nuance could serve a broader purpose and reach a wider market. French trade associations began using the shade card to promote Paris as a style center. Organizations such as the Chambre syndicale de la confection et de la couture, which oversaw ready-to-wear and haute couture, issued shade cards that were sold by their own offices or by sampling companies such as J. Claude Frères & Cie, at 10, rue d'Uzès in the second arrondissement. Sample companies like Claude also acquired bolts of fabrics from the textile mills and then cut the material into swatches to send to their subscribers, which included other mills, designers, apparel cutters, and retailers. Many of the samples were experimental patterns, "'trial balloons' put out to see whether the public would buy."[16] Between the swatches, trend reports, and color cards, the sample bureaus kept their subscribers abreast of Paris styles. The French shade cards were created by and for the fashion industry, disseminating fashion news straight from the world's fashion capital.

Whether they originated in Paris or Saint-Étienne, French shade cards were exported around the world. In the United States, buyers at dry-goods stores used the French shade cards when selecting the new season's merchandise. Merchants referred to the "late shades from [the] Paris color-card" when advertising newly imported dress goods.[17] In March of 1890, the *Ladies' Home Journal*, a Philadelphia-based national magazine, explained how fashion creators used the shade cards. The "new color-cards show a variety of shades with new French names," noted the *Journal*, "but manufacturers of stuffs and trimmings in both millinery and gowning, continue to ring the changes on a few old favorites, such as reseda, old rose, old blue, heliotrope and beige, the new shades are simply variations of these."[18] Few Americans blindly adhered to the French color cards, but instead used them as a base line to create a palette better suited to the nation's multicultural tastes. When "Paris announces the new shades of the season, we less favored mortals are supposed to bow to the decree," explained the *Journal* in September of 1892, "but if the truth is known our own manufacturers pull the French color-card to pieces, and after gleaning ideas from it and many other directions produce a color-card unsurpassable in variety and beauty."[19]

The carte de nuance was Americanized in the years that immediately followed World War I. The most important fashion intermediary in this transition was Margaret Hayden Rorke (1883–1969), managing director of the Textile Color Card Association of the United States (TCCA, later called the Color Association of the United States or CAUS). This trade association was incorporated in 1915 to handle the problem of color choice for the textile, fashion, and retailing trades when wartime exigencies reduced the steady

flow of German dyes and French shade cards to America. The New York textile and garment industries emulated the hues on imported French shade cards until Rorke transformed the business by introducing a new set of color management tools specially created for the American fashion producers who subscribed to the TCCA's service. She looked to Paris for inspiration, but her major objective was to create a triumvirate of color resources—color standards, seasonal color forecasts, and occasional trend reports—that were suited to the growing demand for everyday fashion and the tastes of America's heterogenous mass market.

When Rorke started her position as managing director of the TCCA in 1919, American textile mills were struggling to design stylish goods for a multiethnic society. One silk mill owner who wanted to make "beautiful things" for women's dresses was constantly pressured to produce "a number of rank blues and rotten pinks because the people insist on having them."[20] Rorke's remit was to standardize basic colors for the purpose of helping the textile industry achieve economies of scale and reduce prices, but she also was a dedicated follower of French fashion. She routinely issued Paris-influenced seasonal color forecasts with the aim to uplift tastes in the American market. Rorke secured color information from several sources: from TCCA's corporate members; from studying merchandise in the stores; by watching consumers on the streets; and by communicating with color scouts in Paris. Her color informants in the City of Light included Lucien Schloss at Adolphe Schloss Fils & Cie, a commissionaire at 4, rue Martel in the tenth arrondissement, and Bettina Bedwell, an American-born fashion journalist for the *Chicago Daily Tribune* who worked out of an office in the first arrondissement near the Palais-Royal. Rorke spent her career sitting on a fence, trying to balance quantity production and good taste. Her decisions were informed by fashion developments in Paris and the practical demands of the style scene in New York.

One of Rorke's major fashion contributions was to introduce the concept of color-coordinated accessories to the mass market. Ensemble dressing—the practice of wearing a hat, gloves, handbag, belt, and shoes in matching colors—provided pennywise consumers with an easy way to update their closets. Today, the designer handbag is a coveted investment, often the most expensive part of the wardrobe. Before the luxury tote covered with flashy designer logos became the must-have status symbol of the New Millennium, pocketbooks were simple, affordable, and often locally made. In Rorke's time, a shopper might freshen up her spring-summer look with a new Easter bonnet and matching leather pocketbook from a local fashion store. As late as the 1980s, the matchy-matchy look was the hallmark of a well-turned-out lady, a famous example being British Prime Minister Margaret Thatcher (1925–2013), who shopped at Jaeger, an upmarket high-street women's apparel chain, and always carried a large handbag that complemented her suit.[21] From the perspective of manufacturers and retailers, it was imperative that the new season's straw hats were perfectly color harmonized with the new season's leather shoes, or stores would be left with stock they couldn't sell. Ensemble dressing needs to be understood within the context of the Modern era, which valued coordination, consistency, efficiency, and technical virtuosity. Behind the scenes, the shade card, a ubiqutious if unglamourous design tool, was essential to creating the perfect color match.

The Rayon Age

As the discussion of shade cards shows, color effected the fashion business of the Second Industrial Revolution in important ways. Chemistry, engineering, and marketing

catapulted Germany to global leadership in dye production and introduced consumers to the idea that color-coordinated outfits were stylish. These transformations took hold at a moment when fabrics were still synonymous with fashion, when the ready-to-wear industry was in the bloom of youth. In the United States, World War I changed the balance of power. The ready-to-wear industry gained momentum by producing military uniforms and practical, stylish civilian clothing. After the war, the trend toward simplified dress accelerated, and American ready-to-wear took off. This development went hand-in-hand with the birth and growth of the man-made fiber industry.

In nineteenth-century Europe, inventors saw a bright future in new textile fibers that could be produced by chemically treating abundant natural materials. Cotton was the dominant textile fiber, with wool, silk, and linen trailing behind. The most desirable fabrics were made from the ultra-fine filaments spun by silkworms, the little inhabitants of mulberry trees that only grew in certain climates, mainly the Far East, southern France, and northern Italy. Because fashion placed a premium on silk, entrepreneurs began looking for ways to produce imitations. The French chemist Louis-Marie Hilaire de Berniguad, Count de Chardonnet (1839–1924), a camera enthusiast, accidently discovered that the nitrocellulose used in photography might be treated to make a silk substitute. "Nitrocellulose" fabrics, known as "Chardonnet silk," were displayed at the Exposition Universelle de Paris in 1889, and within a few years, the Chardonnet artificial silk factory in Besançon, the count's hometown on the Swiss border, ramped up production to commercial scale. Other European inventors followed different pathways. In 1899, a German firm called the Vereinigte Glanzstoff-Fabriken (VGF, or United Factories for Making Lustrous Material) was established in Elberfeld, near Wuppertal, to make fiber by the "cuprammonium" process. A third technique, "acetate," was pioneered by the Swiss brothers Camille and HenryDreyfus who marketed their fiber under the Celanese brand, first in Britain, then in America. But the most important man-made fiber was "viscose," a material reconstituted from the cellulose tissue in wood pulp and in cotton. In 1905, an aging British silk manufacturer named Courtaulds invested in this technology, which proved to be the best method for making artificial silk.[22]

Viscose turned out to be a golden goose for Courtaulds—and a coup de maître for the fashion-industrial complex. In the nineteenth century, Samuel Courtauld & Co. capitalized on the vogue for ladies' black mourning attire set by Queen Victoria after the death of her husband, Prince Albert, in 1861. Courtaulds became the largest English manufacturer of the crimped, stiff, black silk mourning crêpe identified as "crape." When the popularity for crape waned in the mid-1880s, so too did Courtaulds's fortunes.[23] Around the turn of the century, the business was reorganized, and a new generation of managers nudged the firm toward viscose. Within a few short years, Courtaulds had a viscose facility at Coventry in the Midlands and was planning a factory in the United States.[24] By late 1910, the American Viscose Company was up and running in Marcus Hook, Pennsylvania, an industrial port on the Delaware River between Wilmington and Philadelphia.[25] To the south, the river provided access to the coastal shipping lanes along the East Coast. Upstream sat Philadelphia, the textile capital of America, with dozens of knitting mills and weaving mills, all potential customers for viscose yarns.

During the 1920s, the artificial silk industry grew rapidly on both sides of the Atlantic Ocean and spread to Japan. Coming out of World War I, the European chemical and textile industries took a long hard look at artificial fibers and woke up to the tremendous potential. They realized that, with economies of scale, man-made textiles could reach a

broad swath of the population. The booming ready-to-wear industries in manufacturing centers like Berlin in Germany and Leeds, London, and Manchester in England were always keen to reduce costs and lower prices. The stage was set for a new high-tech industry. Artificial fiber manufactories "grew like mushrooms" on the Continent, and the European textile industry clamored to experiment with the new materials.[26] In 1924, the American makers of artificial silk agreed to give their shiny filament a new name—rayon—to set the product apart from natural silk.[27] Over time, the term *rayon* was adopted around the world as a synonym for cellulose textiles. In 1926, observers noted that the French silk industry was producing the "finest woven fabrics of rayon in the world," mixing natural fibers and man-made materials to achieve blended effects "considered more beautiful than pure silk constructions by some members of the cutting-up trade" in the New York garment district.[28]

In the United States, one important firm to invest in man-made fibers was a chemical manufacturer downriver from the viscose plant at Marcus Hook. During the 1910s, the Wilmington explosives maker, E. I. du Pont de Nemours & Company, started diversifying its product portfolio with lines like artificial leather, plastics, and paints. In 1920, DuPont opened its first man-made fiber plant in Buffalo, New York, through a partnership with a French textile cartel, Comptoir des Textiles Artificiels. American Viscose remained the dominant rayon producer in the United States, but the man-made fiber business expanded as other companies erected plants on American soil.[29] By 1931, one trade publication, the *American Silk Journal*, estimated that, globally, 84 percent of all rayon was made by the viscose process. By this time, the United States accounted for 29 percent of global rayon production.[30]

Rayon making was a complex business that relied on deep technical expertise and an astute awareness of fashion trends. Laboratory workers in the rayon industry, like their counterparts in the dye industry, spent much of their time making incremental improvements to the material. These tweaks were done in response to the needs of textile mills, garment cutters, retailers, and consumers. A brief look at three DuPont rayon developments of the 1920s and 1930s demonstrates the symbiotic relationship between chemical research and the fashion marketplace.

First, let's look at shininess. As the rayon industry tried to penetrate the market for ladies' dress fabrics, the inherent brilliance of the material, so desirable in lingerie, proved to be a liability. In 1926, one trade journal contrasted the "particular richness of sheen and bloom" of real silk to the "harsh brilliance" of rayon, equating silk "to a well-dressed woman, and rayon to an over-dressed woman."[31] In response to the criticism, rayon manufacturers puzzled over how to reduce the ray in the rayon. Because the luster was caused by light reflecting against the surface of the smooth extruded filaments, DuPont researchers determined that the problem was a matter of optics rather than chemistry. The trick was not to eliminate the gloss—some luster was required if rayon fabrics were to resemble silk—but to control the reflection of light, and hence, the sheen. The effort to "de-luster" rayon filament was successful so that by the mid-1930s, DuPont rayon plants had the ability to fine-tune the degree of luster, producing a range of gloss from bright to dull.[32]

Next, let's consider spun rayon, an innovation that allowed textile mills to make artificial fabrics that behaved like cotton, silk, linen, and wool. Spun rayon, also known as staple fiber yarn, was a European development that attracted considerable attention in Germany during World War I, when the textile industry was cut off from imports of natural fibers. By the mid-1930s, continental Europe, led by Germany and Italy, was the

locus of spun rayon production with Japan fast catching up.[33] In 1931, DuPont was the only American manufacturer, and after yarn importers and other domestic producers joined the fray, it still maintained a heady dominance.[34] What is spun rayon, and why does it matter to our discussion of technology and fashion? To answer, we must briefly examine the production process. First, the DuPont rayon plant cut the long, mechanically extruded viscose filament into small pieces, creating a material called cut staple. Next, the spinning mills used the cut staple to spin yarns that had the characteristics of natural fibers. These yarns were bulky, fluffy, and soft, much like wool or cotton.[35] Spun rayon offered endless design opportunities at the next production stage, in the weaving mill. The designer could specify spun rayon to create woven fabrics that were intentionally soft and pliable, or purposefully rough and coarse. Early fabrics made from DuPont's spun rayon went into resort wear for the Palm Beach leisure set and into sportwear collections by the Paris couture houses.[36] But textile mills serving the mass market soon began using spun rayon to weave the dressier crepe fabrics relished by the cutters of Seventh Avenue. Between 1931 and 1934, the bulk of spun rayon consumed in the United States went into crepes with printed decorations for ladies' apparel. By 1936, the uses of spun rayon were expanding to include suitings and wool-rayon blends, fabrics that draped softly across the body when sewn up as clothing.[37]

Finally, we can look at the influence of depression-era glamour on rayon fabrics. In the interwar years, women wore formal apparel to parties, concerts, nightclubs, plays, and restaurants. The demand for affordable, ready-made evening attire—dresses, gowns, capes, and cloaks—was met by a rayon cloth called "transparent velvet." DuPont collaborated with firms like Sidney Blumenthal & Co., Inc., a silk broadcloth mill, to design the new fabric. Dressmakers in Paris and New York created the first garments, and upmarket Fifth Avenue shops introduced them to consumers.[38] High-tech velvets gained more attention when Eleanor Roosevelt wore a gown of Blumenthal's Crystelle line in DuPont acetate to the 1933 inaugural ceremonies. Hollywood costume designers, in their relentless pursuit of photogenic looks for the silver screen, began to dress movie stars in the new velvets.[39] The success of transparent velvet, combined with further technical improvements to crepes and other rayon fabrics, was a wake-up call for Seventh Avenue. The New York garment industry began to embrace rayon as a technology for creating affordable everyday luxuries. By the late 1930s, rayon fabrics, blessed with good draping qualities and an affinity for bright colors, were all the rage, replacing silk fabrics in ladies' good dresses. All around Seventh Avenue, the cutting-up trade crowed: "rayons are our best sellers."[40] By 1937, a woman could buy two rayon dresses for less than half the price that her mother paid for one ready-made dress 20 years before.[41]

Exactly how did rayon manufacturers facilitate the acceptance of man-made fibers? We can learn a good deal from DuPont and a marketing activity called fabric development. Located in the company's fiber sales offices in the New York Textile District close to Seventh Avenue, the DuPont Fabric Development Service was managed by a textile specialist named Alexis Sommaripa. Trained at the Harvard Business School and the Lowell Textile School, this Russian émigré had worked as an efficiency engineer at an Alabama textile mill before joining DuPont in 1925.[42] Sommaripa was an expert in statistical analysis, consumer behavior, and textile design. Among his early DuPont projects was a quantitative market survey, conducted jointly with American Viscose and the National Retail Dry Goods Association, on sales of rayon lingerie with attention to consumers' preferences for softness, aesthetics, coolness, hygiene, and economy.[43] By

1929, Sommaripa was managing the Fabric Development Service, a mediation bureau with the remit to connect the firm's rayon factories to the rest of the supply chain—to converters, textile mills, garment manufacturers, and retailers. The aim was to canvas the market, gather trend data, help the laboratories improve the material, develop better fabrics, and convince the trade to adopt DuPont materials. The office set new standards for customer service, shaping DuPont's fiber business, and fabric development in the industry writ large, for years to come. As passionate about freedom as he was about fabrics, Sommaripa died on the Western Front in 1945, while serving as a civilian member of the Psychological Warfare Branch of the US Army.[44] His legacy, as we shall see, was influential into the postwar era.

Test-Tube Fibers and the Midcentury Textile Revolution

When the Great Depression started in October 1929, rayon was still a novelty textile mainly deemed suitable for automobile upholstery, household draperies, men's socks, and ladies' lingerie. By the time World War II broke out in Europe in September 1939, the tables had turned, and Dame Fashion smiled favorably on man-made textiles. Rayon was the preferred fabric for stylish dresses, whether the frocks were sewn at home or purchased readymade from a catalogue or a retail shop. The well-off woman with a wardrobe of specialty dresses for different occasions could chose "Sunday afternoon gowns, street dresses, cruise garments, etc." in various fabrics. But the pennywise shopper who only had "money enough to *buy one garment*" usually selected a dress that showed the "most value for the money, *most frequently a rayon*."[45] Just as Woolworth stores provided budget-conscious chinaware consumers with "beauty for dime," the dress shops that sold rayon ready-to-wear offered access to Hollywood glamour for a few dollars. "The day of the 'Sunday dress' has gone, thanks largely to rayon," wrote one trade journal in 1939, "and every day has become Sunday-dress day."[46]

The cellulose age not only helped to democratize fashion, but it also emboldened scientists to concoct new fibers from almost anything. The hunt for better materials split into two groups. In the first instance, researchers turned to nature and explored if something could be done with soybeans, peanuts, or milk.[47] European researchers developed casein fibers from milk during the 1920s and 1930s, and Americans took notice. In December 1938, chemists at the US Department of Agriculture patented a casein fiber similar to Lanital, an Italian product, and in the fall of 1941, Aralac, Inc., a division of the National Dairy Products Corporation, introduced a protein fiber made from skimmed milk.[48] In the second instance, DuPont chemists sidestepped plants and animals entirely, and using resources from the mineral kingdom, worked to synthesize materials from coal, air, and water. Breakthroughs emerged from DuPont's central research facility in Wilmington in the 1930s, when organic chemists in the field of polymer science created versatile new materials. One end result—announced to the press on October 27, 1938, and widely publicized at the world's fairs in San Francisco (1939) and New York (1939–1940)—was the world's first synthetic fiber: nylon.[49] Inspired by DuPont's success, a polymer chemist at the Calico Printers' Association, a textile firm in Manchester, England, developed polyester, another synthetic fiber. Nylon was principally used by the American military during the war, and polyester was classified as top secret by the British authorities until the return of peace, when Imperial Chemical Industries commercialized as it as Terylene. These two test-tube fibers launched the synthetics age.

In the postwar years, DuPont came to dominate synthetics globally due to its first-mover advantages in nylon, which included a strong patent position.[50] Nylon became the company's most profitable product, and seeking to repeat the hat trick, DuPont invested heavily in fiber development. The firm obtained the American rights for polyester from the British patent holders, producing and marketing this fiber under the trade name Dacron. DuPont also pressed ahead with laboratory research that resulted in Orlon acrylic, a washable, moth-proof synthetic wool. Another innovation was Lycra spandex, the ultimate stretch fiber.[51] Andrew E. Buchanan Jr., a manager for DuPont fibers, paid tribute to corporate science when he jokingly noted that humans could now make a "better fiber by design than a sheep produces inadvertently."[52]

But science alone could not ensure success in the competitive postwar business environment. The economic and social context of the synthetics age was dramatically different from the rayon era. Europe lay in shambles, its major industries in ruins. The United States experienced losses, but the industrial heartland was unscathed. In the 1950s and 1960s, Americans enjoyed a rising standard of living that was unparalleled elsewhere. With affluence came a greater awareness of individuality in everything from politics to personal style. Stereotypes about cookie-cutter suburbs aside, postwar America was the incubator of the culture of diversity. Firms like DuPont looked for ways to capitalize on this enormous, multifaceted market. The firm continued the practice, established by the Fabric Development Service, of working closely with customers to secure feedback on the products and to scope out emerging market trends. DuPont also invested in prestige building, national advertising, and consumer research.

The rayon age stretched well into the 1950s, but inch by inch, synthetics made inroads, pushing aside cellulose and natural fibers alike. Firms like DuPont, the Chemstrand Corporation (a joint venture between American Viscose and the Monsanto Chemical Company), and the Celanese Corporation of America were aggressive in their efforts to put synthetics in the public eye.[53] But the fiber makers couldn't achieve recognition in the fashion world on their own. Test-tube fibers needed the endorsement of the global tastemakers. Back in the interwar years, the American rayon makers, emulating their counterparts in silk, established commercial ties to fashion trendsetters on both sides of the Atlantic Ocean. But World War II, and the generational shift that followed, severed those aesthetic lifelines.

DuPont established prestige for test-tube textiles by connecting to the newly revitalized Paris couture houses. With great fanfare, the couturier Christian Dior, renowned for his New Look of 1947, visited Wilmington on November 9, 1953, to meet with DuPont executives, tour the laboratories, and discuss the use of synthetics in his collections.[54] Dior was astounded by nylon, signaling his personal approval by installing curtains made from this material in his Paris apartment. His recent New York collection included a Dacron polyester ladies' suit with a full pleated skirt, and he predicted a bright future for "les mélanges des fibres," or blended fabrics.[55] One inhouse DuPont history indicated that the firm subsequently rolled out the red carpet for the young couturier Hubert de Givenchy, fashion editors from *Vogue* and *Harper's Bazaar*, and leading retail executives to stimulate further interest in synthetics and style.[56]

DuPont had its satisfaction in early 1954, when important French couturiers featured synthetics in their spring-summer models. That February, Givenchy introduced DuPont synthetics to Paris with shirtdresses in French fabrics created from Orlon-silk blends.[57] During the major shows in March, the venerable couturiers Christian Dior and Gabrielle "Coco" Chanel both featured models made from DuPont fibers, particularly nylon[58]

Figure 3.2 This black-and-white striped afternoon dress, made from a crisp, wrinkled plissé of 100 percent DuPont nylon, was shown by Coco Chanel in March 1954, at her first Paris showing in 16 years. Courtesy, Hagley Museum and Library, Wilmington, DE, USA.

(Figure 3.2). The American chemical giant was soon collaborating with other designers in the Chambre syndicale de la couture parisienne, a trade group for the exclusive dressmakers, to produce DuPont Paris collections. Within a few short years, DuPont established relationships with major knitwear designers in Italy, and a new group of couturiers in New York, including the Paris-born Pauline Trigère. In the 1960s, the firm worked with American ready-to-wear designers and manufacturers in New York, Los Angeles, and Dallas and with apparel makers in Florence, London, Milan, and Paris. A new international office in Geneva helped to coordinate collaborations, promotions, and advertising campaigns in Europe.

In the United States, fashion promotion fell under the purview of Jane Stewart Denton, a publicist at the DuPont offices in the Empire State Building in New York, who had served as the press liaison on style matters since joining the firm in 1933.[59] Starting in 1939, Denton was involved in promoting new products, including nylon. In 1954, she initiated DuPont's coverage of the postwar French couture collections to publicize the use of fabrics made with DuPont fibers. Under her auspices, the New York office flew the DuPont Paris collection to major cities around the United States, where department

stores, fashion retailers, and country clubs enlisted stylish young socialites to model the couture outfits in charity fashion shows.[60] The New York office added the couture models to the large library of reference materials, including fabric swatches, that it maintained for use by textile and fashion designers. The couture models were also shown in special DuPont runway shows for the press, textile mills, and garment cutters. These fashion events were held in New York, mainly, and in two regional fashion hubs, Dallas and Los Angeles. The DuPont Paris designs reached a broader audience when Denton and her staff circulated photographs to countless local newspapers, which published them in the women's pages.

The postwar fiber industry bombarded the American public with promotions that touted the practicality and stylishness of synthetics. Print advertisements appeared in family magazines like *Saturday Evening Post*; in homemakers' favorites such as *Good Housekeeping*; specialty publications like *The Bride's Magazine*; and fashion glossies like *Harper's Bazaar*, *Seventeen*, and *Vogue*. Large American corporations took advantage of the newest advertising medium, television, and sponsored TV shows such as the *Celanese Theatre* and *The United States Steel Hour*. DuPont underwrote the *Cavalcade of America* and the *DuPont Show of the Month*, which featured commercials for its products. With fibers, DuPont targeted teenaged Baby Boomers by supporting the nation's favorite dance show, *American Bandstand* with Dick Clark (1929–2012), and housewives by offering the weekly drama series, *The DuPont Show with June Allyson*. A petite blonde actress from Broadway and Hollywood, June Allyson (1917–2006) introduced each episode wearing test-tube outfit designed by one of the New York couturiers, suggesting that, in the nylon age, the girl-next-door could wrap herself in affordable synthetic elegance.[61]

The DuPont advertising blitz was backed by an impressive program of market research. The textile fibers department built on the statistical surveys undertaken by Alexis Sommaripa before the war, but considerably expanded the surveillance. Intelligence came from multiple sources, including an internal corporate marketing unit, advertising agencies, media experts, and motivational research consultants. A massive amount of data was assembled. In 1959, the DuPont market research division alone compiled close to 70 reports analyzing the attitudes of retailers and consumers toward different textiles, from men's knitted underwear to nylon sheets.[62] In any given year, internal reports were supplemented with studies by external authorities like Ernest Dichter, one of the founding fathers of motivational research and the principal at the renowned consulting firm, the Institute for Motivational Research. In 1962, one textile fibers manager, Arthur M. Saunders, described DuPont's approach to market research. Put succinctly, the company had transformed the "relatively simple 'art' of selling fabric" into the "complicated 'science' of marketing."[63]

Over the course of the 1960s, the synthetics age moved from adolescence to early adulthood. By the decade's end, the American textile industry produced more fabrics from synthetic fibers than from natural fibers. Europe was slower to adopt test-tube textiles, but this changed as the British, French, German, and Italian industries rebuilt their manufacturing sectors and as an emerging cohort of ready-to-wear designers acknowledged the suitability of synthetics to casual living.[64] As the largest fiber maker in the world's largest economy, DuPont was instrumental in reorienting fashion around contemporary values. By 1969, the frilly nylon dresses shown by Coco Chanel and Christian Dior back in 1954 seemed fussy, formal, and outmoded. The new look of the time was casual, comfortable, and convenient, as exemplified by the designs of Daniel

Figure 3.3 The Daniel Hechter sportswear collection for DuPont, introduced in June of 1969, embodied the new trend toward casual styling and made good use of synthetic fabrics dyed with synthetic colors. Courtesy, Hagley Museum and Library, Wilmington, DE, USA.

Hechter, a young ready-to-wear guru based in Paris. "Sportswear," he declared, "is the only fashion that is up-to-date in the twentieth century."[65] The Daniel Hechter sportswear collection for DuPont, introduced at a New York fashion show for the trade on June 24, 1969, consisted of ten ensembles, all made from jerseys and other knitted fabrics in Antron nylon, Dacron-wool blends, and Orlon acrylic. One youthful outfit consisted of a tailored jacket with oversized pockets, wide argyle flared trousers, and a big matching scarf, all in 100 percent Orlon acrylic fiber (Figure 3.3). The dyes and the fibers were all synthetic, and the style reflected the lifestyle trends of the moment.[66] If William Henry Perkin or Alexis Sommaripa had been alive, they would likey have delighted in the outcome.

Toward a New History of Technology and Fashion

Some contemporary observers believed that the dramatic improvement in American material life could be soley attributed to the chemical research laboratories of the Second Industrial Revolution. In 1933, the popular magazine, *Collier's,* noted that rayon,

"a chemical invention, has done much to wipe out social distinction reflected in women's clothing." The editors argued that chemistry "made attractive fabrics cheap and women of all economic classes began to wear the same kind of clothes." In their minds, the fashion makeover occurred by happenstance, with little or no attention to economy and culture by the chemical industry. "The chemists who were experimenting with cellulose were not," they wrote, "thinking about social conditions."[67]

Collier's editors embraced a heroic view of invention, in which scientific discovery trumped design and marketing in the advancement of living standards. But there was more to mauve millinery and Lycra leotards than breakthroughs by lab workers in white coats. This chapter on visibly invisible technologies—dyes, shade cards, man-made textiles, and test-tube fibers—has looked deep into the fashion-industrial complex to highlight human agency at different nodes in the supply chain. The analysis began with a biographical vignette of the scientist William Henry Perkin to explore the work of one celebrated inventor before segueing into a discussion of influential fashion intermediaries who have been long been missing from fashion history. As we saw, mediators like Margaret Hayden Rorke, Alexis Sommaripa, and Jane Stewart Denton thought long and hard about society and culture as they connected industry to the marketplace. Through their work, chemical innovations had consequences for the ateliers of Paris and the garment cutters of Seventh Avenue. "Class distinctions labeled in Chardonnet's time by clothes have disappeared in an America where the average stenographer is now as well dressed as her employer's wife and daughters," noted the *Rayon Textile Monthly* in 1939.[68] In their view, man-made fibers had "become one of the greatest democratizing influences in American life."[69] This sea change would have been impossible without interventions all along the supply chain. Technology, aided by intermediaries aware of evolving tastes and business circumstances, held sway in the fashion-industrial complex, and ultimately, enabled the democratization of fashion.

Notes

1 On the "fashion-industrial complex," see Blaszczyk, *Producing Fashion*, chap. 1, and Blaszczyk, "Hidden Spaces," in *Handbook of Fashion Studies*, 181–96. On "fashion intermediaries," see Blaszczyk, *Imagining Consumers*, and Blaszczyk, *Color Revolution*.
2 Unless otherwise noted, this discussion of The Colorful World of William Henry Perkin draws on Blaszczyk, *Color Revolution*, chap. 1. Also see Travis, "Perkin's Mauve"; Engel, *Farben*; and Engel, "Coloring the World," in *Bright Modernity*, 37–53.
3 C. F. Cross, "Research in the Field of Cellulose," *Rayon* 2 (April 30, 1926): 8.
4 John A. Collins, "American Rayon and the Tariff," *Rayon* 1 (Oct. 27, 1925): 14.
5 Cross, "Research."
6 Anthony S. Travis, "Perkin, Sir William Henry"; Jack Morrell, "Perkin, William Henry," and idem, "Perkin, Arthur George," in *Oxford Dictionary of National Biography*, at oxforddnb.com (accessed July 10, 2023).
7 George Rice, "New Fabrics from Pulp of Wood, Paper and Cotton," part 6, *Rayon* 3 (Sept. 30, 1926): 12–13 (quotation, 12).
8 Ibid.
9 Ibid.
10 Unless otherwise noted, this discussion of The Carte de Nuance as a Design Tool draws on Blaszczyk, *Color Revolution*; Blaszczyk and Spiekermann, ed., *Bright Modernity*; and Blaszczyk and Wubs, ed., *Fashion Forecasters*.
11 Coupe échantillon, Echantillon des colouers, des métaux et des lustres en usage Vers 1805, Inv. MNC 2 517–4, Envoi de M. Baumgartner, directeur de la Manufacture impériele de Vienne, 1838, and Coupe énchantillon de forme calice, Enchantillon des couleurs, des métaux et des

lustres en usage 1804, Inv. MCN 470–70, Envoi de M. Baumgartner, directeur de la Manufacture impériale de Vienne, 1806, Musée national de Céramique-Sèvres, Sèvres, France.
12 Marnas, Bonnet & Fils, carte de nuance, saison d'automne, 1882, catalogue no. 40411, Musée des Tissus et des Arts décoratifs, Lyon, France.
13 Badische Anilin- & Soda-Fabrik, *Alizarinfarben auf Baumwollstoff gedruckt* (Ludwigshafen am Rhein, Germany: BASF, n.d.), catalogue no. 291055, Textilmuseum, St. Gallen, Switzerland.
14 On the Paris office, see *Golden Book of the Wanamaker Stores* (Philadelphia: John Wanamaker, 1911), 195–202.
15 J. L. Brandeis & Sons, advertisement, *Sunday World-Herald* (Omaha, NE), July 15, 1906.
16 F. L. Lewton, Curator, Division of Crafts and Industries, Memorandum for filing with acc. 55517: Hamilton Print Works, Aug. 24, 1945, Textile Collection, Cultural and Community Life, Smithsonian National Museum of American History, Washington, DC [hereafter cited as TC-NMAH].
17 James McCreery & Co., advertisement for "Dress Goods," *New York Times*, Sept. 21, 1891 [hereafter cited as *NYT*].
18 Mrs. John W. Bishop, "Latest Fashions," *Ladies' Home Journal* 7 (March 1890): 15.
19 "The New Autumn Colors," *Ladies' Home Journal* 9 (Sept. 1892): 20.
20 Untitled clipping from *Paterson* (NJ) *Morning Call*, Nov. 1, 1919, in Scrapbook: Publicity Clippings, 1915–1923, acc. 2188: Records of the Inter-Society Color Council, Hagley Museum and Library, Wilmington, DE [hereafter cited as HML].
21 Victoria Moss, "How Margaret Thatcher Turned Her Handbag into a Weapon," *Vogue* (London), Nov. 27, 2020, at https://www.vogue.co.uk/ (accessed July 10, 2023).
22 Unless otherwise noted, this discussion of The Rayon Age draws on Blaszczyk, *Synthetics Revolution*, chap. 1.
23 Tate, "Viscose Village," 29–31.
24 Coleman, *Courtaulds*, vol. II, chaps. 2–5.
25 "New Large Plant Turns Out Product," *Harrisburg* (PA) *Telegraph*, Dec. 24, 1910; "Makes Silk from Wood Pulp," *Evening Journal* (Wilmington, DE), Dec. 24, 1910.
26 "Editorial," *Rayon* 1 (Nov. 9, 1925): 5.
27 "Justified Pride in Rayon," *Rayon Textile Monthly* 18 (April 1937): 42 [hereafter cited as *RTM*].
28 "French Look for Big Strides in Rayon Chemistry," *Rayon* 2 (March 15, 1926): 18.
29 Francis A. Adams, "Rayon Comes of Age," *Rayon and Synthetic Yarn Journal* 12 (July 1931): 19–24 [hereafter cited as *R&SYJ*].
30 "International Relations in the Rayon Industry," *American Silk Journal* 50 (April 1931): 64–65.
31 "Canadian Viewpoint on Rayon," *Rayon* 3 (Sept. 15, 1926): 20–27, 34 (22, quotations).
32 A. Stuart Hunter, "Measuring the Luster of Rayon Yarns," *RTM* 17 (Sept. 1936): 111–12.
33 Erich Schuelke, "Spun Rayon Becomes of Wide Interest in American Textile Markets," *R&SYJ* 14 (Aug. 1933): 7–8, 11; "Rayon Staple Fiber and Spun Rayon Yarns," *Rayon and Melliand Textile Monthly* 16 (Sept. 1935): 35–36, 119.
34 E. C. Harrington, "DuPont Spun Rayon," *DuPont Magazine* (Feb. 1931): 18 [hereafter cited as *DM*]; Schuelke, "Spun Rayon," 8.
35 F. Bonnet, "The Manufacture and Uses of Cut Rayon Staple," *RTM* 18 (June 1937): 32–36; and "Terminology of Rayon Staple Fiber and Spun Rayon," *RTM* 18 (July 1937): 42.
36 "DuPont Launches Four New Fabrics in Spun Rayon Group for Palm Beach Wear," *Women's Wear Daily*, Nov. 28, 1930 [hereafter cited as *WWD*]; Harrington, "DuPont Spun Rayon."
37 Alexis Sommaripa, "Progress in Spun Rayon Fabrics Here and Abroad," *RTM* 17 (Sept. 1936): 34–35, 37.
38 R. H. Fisher, "Fashion's New Vehicle," *DM* 22 (Feb. 1928): 8.
39 "Velvet Worn by Mrs. Roosevelt Shown to Public," *WWD*, March 6, 1933; American Glanzstoff Corporation, advertisement showing stars from Columbia Pictures in Blumenthal synthetic velvets, *R&SYJ* 14 (Nov. 1933): 16.
40 Francis A. Adams, "Changes in Retail Distribution," *RTM* 18 (April 1937): 37.
41 General Electric, advertisement, "Mary Has Two New Dresses," *RTM* 18 (June 1937): 8–9.

42 Alexis Sommaripa, biography, Feb. 7, 1940, in box 62, acc. 1410: Papers of the Public Affairs Department, E. I. du Pont Nemours and Company, HML.
43 Alexis Sommaripa, "Beauty … Softness … Economy," *DM* 21 (June 1927): 7; "Rayon Underwear Shows Sales Gain," *NYT*, Aug. 8, 1927.
44 "Sommaripa Dies While in Service Abroad," *WWD*, May 3, 1945.
45 "Progress and Future Trends in Women's Rayon Dresses," *RTM* 20 (Sept. 1939): 43–44 (43, quotations).
46 Blaszczyk, *Imagining Consumers*, chap. 3 ("beauty"); "DuPont Rayon Exhibit at New York World's Fair Depicts Man's Textile Triumph," *RTM* 20 (May 1939): 32–33 (32, "Sunday dress").
47 "Properties of Synthetic Fibers," *Textile World* (Sept. 1943): 108–20, and H. R. Drackett, "By-Passing the Sheep," *Scientific American* (May 1944) (soybeans), clippings in Aralac Research Files, TC-NMAH.
48 "The Production of Textile Fiber by U.S. Casein Patent," *RTM* 20 (Jan. 1939): 62; *The Story of Aralac: The Wonder Protein Fibre* (New York: Aralac, Inc., n.d.), and *The Cow, The Milkmaid, and the Chemist* (New York: Aralac, Inc., n.d.) (1941 introduction), both in Aralac Research Files, TC-NMAH.
49 "'NYLON' Selected as Name for First All-Chemical Yarn," *RTM* 19 (Nov. 1938): 30 (announcement); "DuPont Shows Nylon at Frisco Fair," *RTM* 20 (April 1939): 99; "DuPont Rayon Exhibit at New York World's Fair," 32–33.
50 Unless otherwise noted, this discussion of Test-Tube Fibers and the Midcentury Textile Revolution draws on Blaszczyk, "Styling Synthetics" and Blaszczyk, *Synthetics Revolution*.
51 O'Connor, *Lycra*, and O'Connor, "The Body and the Brand."
52 Andrew E. Buchanan Jr., "Textile Progress from Fundamental Research," paper presented at the Twentieth Annual Meeting of the Textile Research Institute, New York, Dec. 2, 1949, 5, box 81, acc. 1771: Records of the Textile Fibers Department, E. I. du Pont de Nemours and Company, HML [hereafter cited as TF-HML].
53 See, for example, "Big-Scale Promotion Plans for Fall," *WWD*, April 5, 1960.
54 Eleanor Parrish, "Famed Parisian Stylist Dior to Visit Wilmington Monday," *News Journal* (Wilmington), Nov. 7, 1953; "Confers with DuPont Officials," *News Journal* (Wilmington), Nov. 9, 1953.
55 Eleanor Parrish, "French Designer Dior Sees Big Role for Fibre Blends," *Morning News* (Wilmington), Nov. 10, 1953.
56 Donald F. Holmes, "The History of the Textile Fibers Department," rev. ed., 1982, 19, box 81, TF-HML.
57 Eleanor Parrish, "DuPont Man-Made Fibers in New Givenchy Collection," *Morning News* (Wilmington), Feb. 5, 1954.
58 Jane Stewart Denton, "Report from Paris," *DM* 48 (June 1954): 22–23.
59 DuPont Company, Press release on Jane Stewart Denton, Oct. 13, 1959, in vol. 618: Pioneers, acc. 500: Charles Rutledge Scrapbooks, HML; "Mrs. Denton Retiring from DuPont PR Unit," *Daily Item* (Port Chester, NY), Jan. 22, 1968.
60 Madera Spencer, "Gowns from Paris' and America's Top Designers to be Featured in March of Dimes Fashion-Show," *Montgomery Advertiser-Alabama Journal*, Jan. 5, 1958.
61 DuPont Company, advertisement, "2 Network TV Shows," *WWD,* Dec. 15, 1959.
62 These reports are in TF-HML.
63 Arthur M. Saunders, "Selling Becomes Marketing under the Impact of the Man-Made Fibers," *American Fabrics* 57 (summer 1962): 88–89 (88, quotations).
64 Blaszczyk, *Fashionability*, chaps. 5–8.
65 DuPont Company, press release on Daniel Hechter knitted sportwear, June 12, 1969 ("Sportswear"), new box 43, 1984.259: Textile Fibers Product Information Photographs, Audiovisual Collections and Digital Initiatives Department, HML [hereafter cited as TFPIP-HML].
66 Ibid.; "Hechter Working on DuPont Line," *WWD* (Feb. 24, 1969); DuPont Company, three photographs of knitwear designs by Daniel Hechter, 1969, new box 43, TFPIP-HML.
67 "Invention Sets the Pace," *Collier's*, cited in "Rayon Dominates Style," *R&SYJ* 14 (Feb. 1933): 28.
68 "DuPont Rayon Exhibit at New York World's Fair," 32.
69 Ibid.

Selected Bibliography

Blaszczyk, Regina Lee. *The Color Revolution*. Cambridge, MA: The MIT Press, 2012.

Blaszczyk, Regina Lee. *Fashionability: Abraham Moon and the Creation of British Cloth for the Global Market*. Manchester: Manchester University Press, 2017. DOI: 10.7765/9781526157089

Blaszczyk, Regina Lee. "The Hidden Spaces of the Fashion Business." In *The Handbook of Fashion Studies*, edited by Amy de la Haye et al, 181–196. London: Berg, 2013.

Blaszczyk, Regina Lee. *Imagining Consumers: Design and Innovation from Wedgwood to Corning*. Baltimore: Johns Hopkins University Press, 2000. DOI: 10.1353/book.72312

Blaszczyk, Regina Lee, ed. *Producing Fashion: Commerce, Culture, and Consumers*. Philadelphia: University of Pennsylvania Press, 2008. DOI: 10.9783/9780812206050

Blaszczyk, Regina Lee. "Styling Synthetics: DuPont's Marketing of Fabrics and Fashions in Postwar America," *Business History Review* 80 (autumn 2006): 485–528.

Blaszczyk, Regina Lee. *The Synthetics Revolution*. Cambridge, MA: The MIT Press, 2025.

Blaszczyk, Regina Lee, and Uwe Spiekermann, ed. *Bright Modernity: Color, Commerce, and Consumer Culture*. Cham, Switzerland: Palgrave Macmillan, 2017.

Blaszczyk, Regina Lee, and Ben Wubs, ed. *The Fashion Forecasters: A Hidden History of Color and Trend Prediction*. London: Bloomsbury Academic, 2018. DOI: 10.5040/9781350017191

Coleman, D.C. *Courtaulds: An Economic and Social History*, vol. II: *Rayon*. London: Oxford University Press, 1969.

Engel, Alexander. "Coloring the World: Marketing German Dyestuffs in the Late Nineteenth and Early Twentieth Centuries." In *Bright Modernity: Color, Commerce, and Consumer Culture*, edited by Regina Lee Blaszczyk and Uwe Spiekermann, 37–53. Cham, Switzerland: Palgrave Macmillan, 2017.

Engel, Alexander. *Farben der Globalisierung: Die Entstehung moderner Märkte für Farbstoffe, 1500–1900*. Frankfurt and New York: Campus Verlag, 2009.

O'Connor, Kaori. "The Body and the Brand: How Lycra Shaped America." In *Producing Fashion: Commerce, Culture, and Consumers*, edited by Regina Lee Blaszczyk, 207–227. Philadelphia: University of Pennsylvania Press, 2008. DOI: 10.9783/9780812206050

O'Connor, Kaori. *Lycra: How a Fiber Shaped America*. New York: Routledge, 2011. DOI: 10.4324.9780203829905

Tate, Christine. "Viscose Village: Model Industrial Workers' Housing in Marcus Hook, Delaware County, Pennsylvania." Ph.D. diss., University of Pennsylvania, 2002.

Travis, Anthony S. "Perkin's Mauve: Ancestor of the Organic Chemical Industry," *Technology and Culture* 31 (Jan. 1990): 51–82. DOI: 10.2307/3105760