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Dacron polyester: The fall from grace of a miracle fabric

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DACRON POLYESTER: THE FALL FROM GRACE OF A MIRACLE FABRIC

"I do love having new clothes . . . but old clothes are beastly. . . . We always throw away old clothes. Ending is better than mending . . . ending is better than mending . . . ending is better. . . ." a soothing voice of an instructor indoctrinating young children as they sleep in Aldous Huxley's *Brave New World.*

STEPHEN DEMEO

In 1951, a prominent clothes manufacturer introduced in *The New York Times* a revolutionary summer suit made of 100 percent polyester, a new synthetic fiber developed by Du Pont. Headlining the advertisement was the phrase, 'Miracles *can* happen'. The ad claimed that the suit was wrinkle resistant, damage resistant, economical, cool, and comfortable (see figure 1). Moreover, it was described as a wear-resistant, luxurious fabric that could pay for itself since it would 'far outlast other clothes of comparable quality' (*New York Times,* 1951c, p. 15). The synthetic suit, which drew considerable interest, was revolutionary because it promised to save the consumer money and time spent caring for clothes. In this regard, it was an answer to a collective wish for 'liberation from domestic slavery' (Brunnschweiler and Hearle, 1993, p. 182).

The wish for superior apparel is captured nicely in the movie *The Man in the White Suit* (1951). In this film, Sidney Stratton, a chemist at a textile mill, invents a new synthetic substance that when woven into a fabric resists dirt and wear. Daphne, the daughter of the mill's owner, in a discussion with Sidney remarks about the potential impact that this 'indestructible' fabric can have on society:

> Don't you understand what this means, millions of people all over the world living lives of drudgery fighting an endless losing

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Figure 1. The 'miraculous' 100 percent Dacron polyester suit.

> battle against shabbiness and dirt. You've won that battle for them. You've set them free. The whole world is going to bless you.

It is in a utopian context such as this that polyester was delivered to the consumer. While both fibers, real and imaginary, promised so much to those who care for their garments, both failed in the long run to supplant existing, less innovative technologies. In *The Man in the White Suit,* the indestructible fabric was suppressed by management and labor for fear of permanently upsetting consumer demand for new clothes. In the early 1980s, 100 percent polyester garments were suddenly ignored by many American consumers after three decades of popularity. Once thought of as a technological miracle, today 100 percent polyester is considered to be a sign of bad taste and cheapness (Callahan, 1993). To understand the dramatic change in polyester's image is to understand how a technology is shaped and reshaped by culture over time. Taking the rise and fall of 100 percent Dacron polyester apparel in the United States as the subject of this essay, I will discuss how it was introduced, developed, and marketed, the reasons for its fall from grace in lieu of its superior wrinkle-resistant and durable qualities, and finally, I will report on the future prospects of a new form of Dacron polyester. For those interested in the chemical nature of polyester, a discussion can be found in the notes of this essay.[1]

■ DACRON POLYESTER: ITS INTRODUCTION, DEVELOPMENT AND MARKETING

In a 1951 *New York Times* article, Du Pont forecast a new and significant outerwear fabric. According to a Dr. Larson, a Du Pont scientist, 'resilience is the keynote of Dacron' even in 'moist or wet conditions' (New York Times, 1951b, p. 50). The following excerpt underscores this point:

> Dr. Larson displayed a suit of the fiber that had received sixty-seven days of wear last summer without pressing. To keep

> it clean the owner went swimming in it twice and at thirty-two days of wear, it was washed in a home washing machine. Without pressing, it was again worn daily as a business suit.

Later in the same year, it was reported that 4000 suits were manufactured in a 55/45 Dacron and Wool blend for $79.50, with model suits demonstrated at the Waldorf-Astoria Hotel in New York City. A 100 percent Dacron suit soon followed a few months later selling at an expensive price of $95.00. These prices clearly indicate that retailers of Du Pont's fabric were not marketing these suits to the average consumer, but rather to an affluent clientele who bought in a high-end market.

In the early 1950s, Du Pont produced more fiber than it could sell (Brunnschweiler & Hearle, 1993). The lack of sales was not due to consumer disinterest; quite the contrary, trade interest was high. The main reason involved the companies who bought the fiber from Du Pont. Processing, dyeing, and finishing difficulties arose with this new synthetic which ultimately delayed the delivery of a finished product to the consumer. While many of these problems were overcome in the latter part of the 1950s, the problem of availability was addressed when an industry wide effort was made to create a council to effectively market Dacron and other synthetic textiles. Evidence of supply and demand problems, as well as consumer interest in this expensive fabric, can be gathered from a 1953 newspaper article reporting that retailers sold over two million dollars worth of Dacron suits, several stores were sold out of the product, and that one company was selling these summer suits in winter months at regular prices (New York Times, 1953a). Later in 1953, a synthetic suit became even more affordable to purchase when a Dacron and Rayon blend suit was advertised for $42.50 (New York Times, 1953b). Competitively priced shirts made of 100 percent Dacron were made available the following year, once again Dacron being advertised as a miraculous fabric (New York Times, 1954). In 1955, Du Pont produced a new 'dull' Dacron yarn which was

developed into a 'tricot knit' fabric for children's dress wear and women's undergarments. In a *New York Times* article, Irving Cohen, the vice president of Burlington Mills whose company knitted the yarn, described the new Dacron as having seven favorable qualities: (1) it was 'ideally suited to the demand for apparel that can be easily laundered,' (2) 'has practically no moisture absorbency,' (3) 'the lack of absorbency did not affect the comfort of garments made of knitted Dacron,' (4) 'dries in a half-hour or less,' (5) 'is wrinkle-resistant and requires no ironing,' (6) 'unlike nylon tricot it retains its whiteness after repeated washings,' and (7) 'by tests have proven to be warm in winter and cool in summer' (New York Times, 1955, p. 37). Although it seems as if the perfect fabric had been made, improvements to the fabric were still sought. In 1956, Burlington announced that a new 'wash-and-wear' shirt made of textured Dacron was available, offering the consumer 'long life, comfort, and good crease-releasing properties' (New York Times, 1956, p. 49). This product was warmly received by the consumer and added momentum to the acceptance and popularity of polyester (Callahan, 1993). In 1967, double-knit polyester apparel was marketed and became popular up until the mid 1970s (Brunnschweiler & Hearle, 1993). Through the '60s, '70s and early '80s, polyester produced for apparel increased until its apex in 1981. In that year approximately 4.2 billion pounds of polyester was sold for apparel (Haynes, 1985). Throughout these years, polyester also was openly embraced by fashion designers. Ray Scott, vice president of a leading manufacturer of men's clothes, said that, 'Polyester was a mainstay of this company all through the '70s and early '80s' (Bertrand, 1991, p. 12).

One of the main reasons for the success of 100 percent polyester apparel was its superior qualities. It was clearly more durable and wrinkle-resistant than pure cotton or wool. Furthermore, as time passed and consumption increased, apparel made of Dacron went from a luxury item to being an inexpensive, affordable commodity. In this way polyester became available to all classes of society.

According to Samuel Winchester, the associate editor of the book *Polyester: 50 Years of Achievement,* the practical and frugal mindset of Americans during the 1950s when polyester was first produced contributed to the acceptance of polyester fabrics:

> In the early Fifties, we weren't that far away from the hard times of the Thirties and the shortages of World War II. . . . The mindset of the typical consumer was longevity and good wear performance, so it [polyester] really had a rapid acceptance. (quoted in Callahan, 1993, p. 20)

Consumer's preference for polyester over natural fabrics also was influenced by the availability of the home washing machine. Since washing was done more regularly at the home instead of at Laundromats, clothes that would dry quickly and would not require ironing became popular. While these factors influenced the social acceptance of polyester, other influences began to emerge and adversely effect how polyester was perceived in the eyes and mind of the consumer.

■ THE REJECTION OF 100 PERCENT POLYESTER

In the late 1970s and early '80s, American consumers turned against 100 percent polyester apparel in favor of cotton and blends. This was evident in terms of production. The volume of polyester dipped dramatically from 4.2 billion pounds sold in 1981 to 3.2 billion pounds sold the next year (Haynes, 1985). Today, while polyester is used in blends with natural fibers, 100 percent polyester is still scorned by consumers, many of whom find it sticky and uncomfortable (*The Stuff of Dreams,* 1993; Callahan, 1993; Underwood, 1991). Moreover, 100 percent polyester has become the butt of numerous jokes about bad taste.[2] Interestingly, the distaste for polyester seems to be an American phenomena. In 1987, Joseph Murray, the chairman of the Polyester Fashion Council remarked:

> The rest of the world seems to have learned the benefits of polyester, and really hasn't had to fight the image battle that we have here in the U.S. For example, it is the fastest growing fiber in Asia. (quoted in Pogoda, 1987, p. 8)

The causes of polyester's downfall are multifold. Efforts from the cotton industry as well as psychological and social influences have contributed to the demise of 100 percent polyester apparel in the United States.

■ THE COTTON INDUSTRY'S REACTION TO POLYESTER

As more and more people bought polyester, less natural fabrics were purchased. This ultimately effected the revenues of the largest supplier of natural fabrics, the American cotton grower. In the early 1970s when cotton farmers complained of diminishing profits, the cotton industry responded in a formidable way to wrest back the share of the market that polyester captured.[3] At this time, The Fiber Economic Bureau estimated that the percent of cotton used in apparel hit an all time low of 34 percent (Underwood, 1991). Urged on by the farmers, the cotton industry in 1970 created Cotton Inc., a marketing and research company whose goal was to create demand for cotton world wide. This goal was to be accomplished by creating a highly recognized logo (see figure 2), conducting consumer research, formulating marketing strategies in the United States and internationally, creating television advertisements, promoting liaisons with mills and manufacturers, distributing information and transferring technology, and by performing product and process research (Cotton Inc., 1992). Figure 2 shows a recent magazine advertisement from Cotton Inc. describing a photography contest. In the bottom right hand corner the cotton logo can be seen.

In promoting cotton, Cotton Inc. did not and does not rely on negative advertising against polyester products, but rather, accents the comfort, absorbency and 'naturalness' of cotton. Their efforts to reposition cotton as the most popular fabric fiber in the United

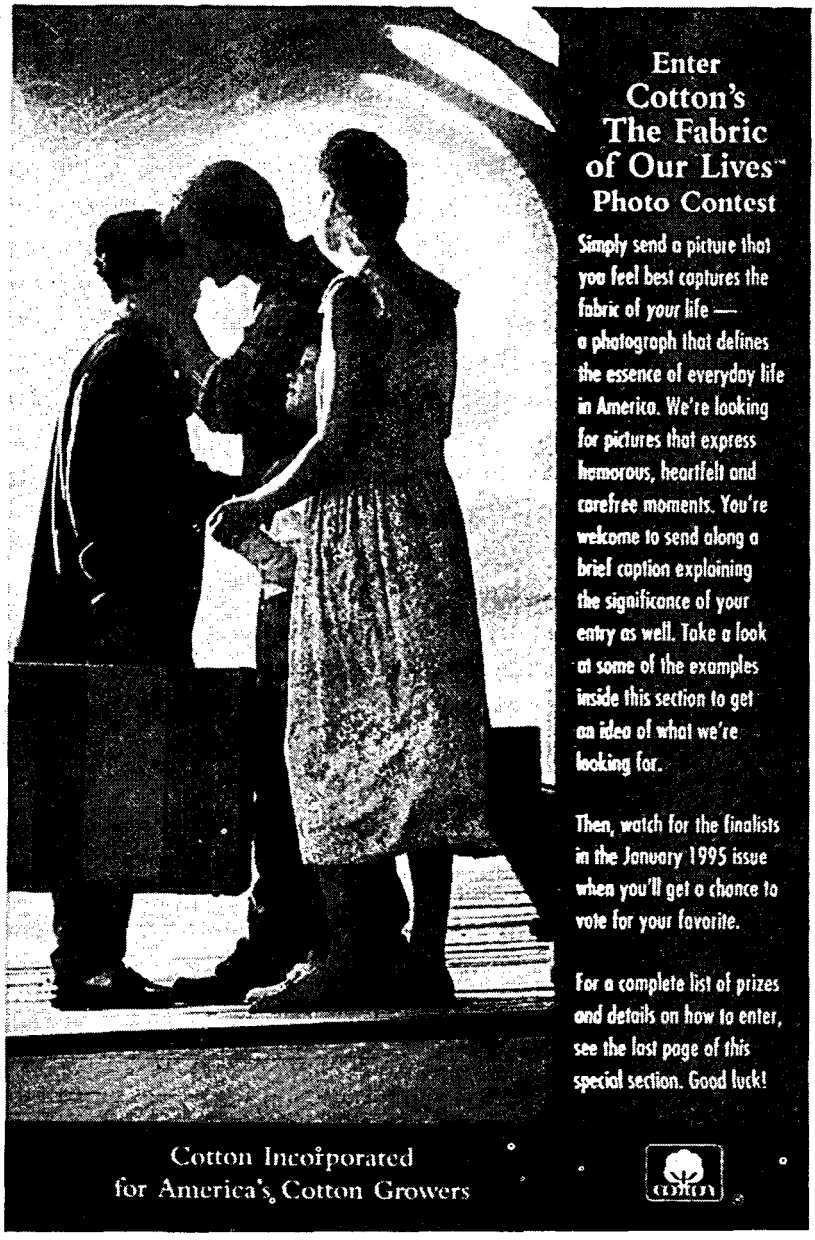

Figure 2. Actively engaged in a photography contest, Americans recast cotton as a fundamental ingredient to a good, clean lifestyle. (Reader's Digest, Aug. 1994)

States was successful. In 1989, 52 percent of apparel sold in the United States was made with cotton (Underwood, 1991) and by 1992, 73 percent of Americans recognized the cotton seal (Cotton Inc., 1992). The high percentage associated with the cotton seal indicates that the trademark is one of the most recognized in the United States. Today, an annual budget of $43 million is spent on research, marketing and administration. It cannot be determined how much credit, if any, can be given to Cotton Inc. for turning consumers from polyester to cotton, although the consumer awareness of the cotton logo is considered an important indication of advertising effectiveness. Does Cotton Inc. then ignore what polyester producers are doing in the apparel industry? Evidently not, since in 1990 Cotton Inc. complained to the National Advertising division of the Council of Better Business bureaus over an advertisement for polyester. Cotton Inc. contended that the advertisement constituted misrepresentations and should be discontinued. The ad described the polyester as 'supernatural' and therefore, implied that the synthetic fiber was natural (Maycumber, 1990). Thus, Cotton Inc. keeps a watchful eye not only on their own markets, but also on the developments and marketing of polyester fibers and fabrics.

In the shadow of polyester, cotton researchers have pursued their own Holy Grail of apparel: an all cotton shirt that is nonshrinking, durable, and wrinkle-resistant. While unsuccessful for the last three decades, in 1993 cotton manufacturers have produced cotton shirts and pants that need little or no ironing. The new wrinkle-resistant 100 percent cotton shirts, selling between $66 and $77, wrinkle to a similar extent as current polyester-cotton blends (Pollack, 1993). While improvements are expected, the impact of these shirts are not certain. Some executives in the garment industry believe that wrinkle-resistant cotton 'may have a negligible impact on the American shirt market because people who are willing to spend more to wear all-cotton shirts tend to have them laundered anyway and do not care about ironing' (Ibid. p. D4). Others believe that it will be the 'ultimate product' and the 'eighth

wonder of the world' (Ibid., pp. D1, D4). At any rate, this new technology will challenge polyester and polyester blends for a share in the competitive garment market.[4]

■ PSYCHOLOGICAL INFLUENCES

The beginning of the end for polyester started when Du Pont and British patents expired in the early 1960s and more companies began to mass produce polyester apparel (Brunnschweiler & Hearle, 1993). With profit margins under pressure, producers aimed for a high-volume market. Eventually, competitive pricing pushed the once luxury fabric too far—polyester became a bargain-basement commodity that was sold at discount stores throughout the United States. As the price dropped, so too did the quality; fuzz or pilling often would occur with the slightest of wear (Callahan, 1993), while 'static cling' was a common annoyance. As one of the cheapest fabrics available, polyester became associated with the bottom of the market, 'the lowest-priced catalogues, the lowest-priced retailers and lowest-priced possible brand names' (Underwood, 1991, p. 16). To wear garments made of 100 percent polyester was to represent a socioeconomic position, namely, the bottom rung of the social ladder. This argument is reasonable if one believes, as many do, that what one wears is a complex fashion statement that describes attitudes and moods, defines character or self-concept, and communicates power, status, and sexual availability. In this regard, Leary contends that:

> Fashion is the immediately recognizable public statement of identification. It is the label on your package. (quoted in Nash, 1993, p. 52)

Likewise, R. U. Sirius, editor of *Mondo 2000* magazine, believes that,

> The semiotics of identity is a primary activity for young people in an information culture. Not only what you wear, but what you

> do to your body, binds you to a particular tribe. You are what you symbolize. (quoted in Nash, 1993, p. 64)

If clothes are not just materials to keep one warm and protected, but rather, are considered to 'make the man,' then one can understand why polyester has been called 'the fabric for the loser' (Callahan, 1993, p. 20). Those out-of-fashion individuals who wear polyester are thought of as cheap, ordinary, not valued, unexceptional, and inferior by others who dress in-fashion. Consumers, acting on the stereotype principles of 'expensive = good' and 'inexpensive = bad,' rejected polyester in part not because of its utility, but because of its bargain-basement price and the psychological status that this position connotes.

Another psychological reason for polyester's decline is the image it conjures in the mind of the consumer, namely, the 100

Figure 3. Polyester leisure suit as icon of bad taste

percent double-knit leisure suit (see figure 3). Originally designed in early 1970s for men's wear, the leisure suit usually consisted of color coordinated slacks and a jacket, and 'conformed to the tailored construction of serious suits but took on a sportswear styling' (Donehoo, 1975, p. 249). Like jeans, it underscored the popularity for casual apparel and was designed to replace or at least to challenge the rigid, traditional attire of the businessman.

Due to its highly identifiable appearance, its break from the classic business suit, the fact that it often was manufactured in bright colors, and the association to the now out-dated disco movement (popularized by the movie *Saturday Night Fever,* 1977, starring John Travolta), the leisure suit has become a logo, a sign representing the maligned status of polyester (Callahan, 1993; *The Stuff of Dreams,* 1993; Underwood, 1991; Eklund, 1985). In a survey by Celanese Fibers, the second largest manufacturer of polyester fiber, 25% of the consumers surveyed associated polyester with leisure suits and stretch pants (Haynes, 1985). It is precisely the image of the leisure suit, encoded in the consumer's cognition as symbolic knowledge, that strongly influences the type of new apparel that is purchased. This powerful sign has thwarted previous marketing efforts made in the mid 1980's to alter the consumer's negative perception of polyester (Pogoda, 1987; Underwood, 1991), as well as necessitated the spending of millions by such companies as du Pont on more recent advertising campaigns (Bertrand, 1991).

■ SOCIAL INFLUENCES

The clothes we wear are continually being reexamined and redefined in a social context. With the abundance of fashion shows, fashion magazines, and famous fashion models hyping and often dictating new trends in apparel, fashion can be regarded as a social phenomenon which is entwined with the concept of change. This is important because keeping current with changes in fashion opposes the rationale for buying clothes for the sake of durability. Clothes made of 100 percent polyester, while appreciated in food

or industrial-work environments, for example, can be a social-status liability for others mainly because these long lasting fabrics can go quickly out of style. With the advent of television and other communication technologies in the latter half of this century, fashion and its changing trends have become extremely influential on members of society.

In the late 1970s a more traditional fashion trend came into being and durable clothes made of polyester were no longer popular to wear. In 1976 and 1977, the fashion industry turned away from the polyester leisure suit and the colorful 'peacock period', and returned to traditional fabrics, tailoring and styling (Elkins, 1977, p. 214). This also meant that cotton fabrics were again popular with consumers:

> In men's wear, the look was 'Country Squire.' It was casual but classy, coordinated but unstudied and polished, stressing fine tailoring and quality. The fabrics had much to do with this traditional look. Natural fibers in such classic fabric as Harris and bird's-eye tweeds, corduroy, flannel, and twill were most often used. Luxury cashmere and camel hair were back. Real cotton shirtings of oxford cloth and broadcloth in patterns of tattersall and classic stripes were strong, and silk and challis in small traditional patterns were the fabrics for the newly narrowed ties. (Elkins, 1978, p. 208)

Fashion can have a strong influence on society if people have the money to continually purchase clothes. To a certain extent this was the case. In the 1950s and '60s, when technological changes such as automation produced more wealth for American companies (Wilson, 1992), the middle class's increasing income made new commodities such as clothes more affordable. The American mind-set was changing from a more utilitarian perspective to one concerned with status and image. Thus resiliency, as embodied by 100 percent polyester garments, was no longer a priority for consumers.

Changes at the work place also contributed to greater leisure time for Americans (Strung, 1972). Consumers, willing to spend their surplus income on family activities, often purchased leisure commodities such as trailers and camping equipment for trips into the 'great outdoors'. In 1971, it was estimated that 32 million people packed up tents, coolers, and bug spray and went camping in the United States (Strung, 1972). The 'back to nature' movement, as it was called, increased people's awareness of their environment and the threat to it by pollution.[5] Interest in things 'natural' such as 'all natural cereals', 'earth shoes', 'home made yogurt', foods without preservatives, as well as cotton apparel, also captured the attention of consumers. In turn, things perceived to be artificial were ignored and even scorned. Liberation from domestic slavery was no longer solely dependent on a 'better widget' such as polyester, but was redirected to nature. 'Mother Nature', often in white with arms open, was there to save an overwrought domestic from household drudgery. According to Winchester, the 'back to nature' movement 'drove the final nail into polyester's coffin' (quoted in Callahan, 1993, p. 20).

The rise of 'active leisure' had another consequence for consumer apparel. Natural fabrics such as cotton appealed to those who participated in outdoor activities because of the fabric's ability to absorb perspiration. 100 percent polyester apparel was not the fabric of choice when entering the Natural, that is, when hiking, camping, and playing outdoors, because polyester neither wicked nor absorbed moisture as effectively as cotton fabrics. As Americans were getting more sweaty, the prevention of sweat became a multi-million dollar industry. A large variety of deodorants with antiperspirant formulations became available. The marketing message of these products was clear: sweat had to be controlled since it signified bad odor, uncleanliness, nervousness, manual work, poverty, and a lack of femininity. An indictment of sweat by society was also an indictment of polyester. Blamed for sweat build-up, a new, unflattering view of 100 percent polyester apparel was constructed by consumers. It was not 'cool' to sweat, the 'dry look' was in.

■ A NEW POLYESTER

In 1990, Du Pont introduced into the United States a new polyester fiber referred to as microfiber or microdeniers (Bertrand, 1991). It is the same material as Dacron (PET), only thinner,[6] and is sold under the trade names MicroSpun, Trevira, and Micromattique (Underwood, 1991). The thinness of the fiber allows it to be spun into different synthetic fabrics, mimicking such natural fabrics as cotton, silk, satin, and others. In a touch test conducted by the Polyester Fashion Council, fashion editors could not differentiate between natural fabrics and fabrics made of microfiber. When woven, microfiber is soft, retains its shape, drapes well, breathes, and resists wrinkling (Ibid.). Furthermore, two of the greatest advantages of using microfiber over silk, for instance, are microfiber fabrics are less expensive than silk and do not require dry cleaning. To distinguish microfiber from the standard polyester, Hoechst Celanese and Du Pont are currently marketing this fiber only to high-end retailers who sell luxury apparel. Print trade advertisements have used the phrase, 'Where Luxury Begins', to sell microfiber fabrics (Bertrand, 1991). In tests, many consumers have responded very favorably to apparel made of the new fiber. In a blind mall-intercept study conducted by Du Pont, five thousand female consumers were asked to rate several fabrics. The majority of respondents rated Micromattique the highest, preferring it over other natural fabrics (Bertrand, 1991). Additional optimism comes from fashion designers and forecasters. One fashion forecaster, the Donegar Group, believes that microfiber is the first generation of 'high-tech "test-tube" textiles', adding that 'a decade from now, we'll all have wardrobes made out of fabrics that don't even exist today' (quoted in Callahan, 1993, p. 20). Still, according to one fashion model, to wear the new polyester takes an open mind:

> Well, it is so soft, it's yummy. And I think that we're maybe a little bit more open to experimentation than most people, who tend to think, 'Ugh, polyester, no way'. I mean, we know that

> its not that same polyester that, you know, we knew back in the '70s that was stiff and uncomfortable and scratchy. (*The Stuff of Dreams,* 1993)

Only time will tell how well microfiber polyester will be accepted by the public: will the thin fiber be too delicate, and will the fabric provide enough moisture absorbency and breatheability for consumers' tastes? Ultimately, success will be measured in dollars and by how much of the apparel market is regained from the cotton industry. It is probable that microfiber will not be advertised in terms of durability, since durability in a fabric is not a primary desire of many consumers. Instead, evidence suggests that comfort, status, and fashion are more important to the modern consumer of apparel.

■ CONCLUSION

Often utopian or transformative inventions, alone, are thought to potentially liberate individuals from a physically demanding world. What is expensive, slow, weak, heavy, uncomfortable, etc. can be altered to what is cheaper, faster, stronger, lighter, and more comfortable by simply introducing a technology at the right point in a linear path to progress. The case of 100 percent polyester apparel challenges this way of thinking. As shown, competitive, psychological, and social influences have affected how this transformative invention was accepted by society. The formation and advertising of Cotton Inc., marketing polyester at very low prices, the invention of a memorable image in the leisure suit, the impact of fashion in a more wealthy and information based society, and lastly, the influence of the 'back-to-nature' movement, contributed to the fall from grace of 100 percent polyester apparel and the reemergence of less durable natural fabrics. This fall is an especially interesting one since 100 percent polyester apparel is still innovative today; it still out-performs other fabrics currently on the market in terms of wrinkle resistance and durability.

The story of polyester suggests a social rather than a linear

concept of progress. The technical aspects of polyester were socially dependent, meaning that polyester was altered and re-altered in order to make its physical properties appeal to consumers. In the 1950s polyester suits and shirts were purchased mainly because long-lasting apparel met the psychological and material needs of a thrift-minded clientele growing up in the shadow of the shortages and recycling programs of World War II. Improvements such as 'double-knit' weaves extended and increased demand for polyester up to the 1970s, but in the latter part of that decade and in the early 1980s, consumers were no longer attracted to polyester's properties, specifically its durability. The inability of polyester manufacturers to keep pace with social changes resulted in a nose dive in production and a stigmatization of 100 percent polyester apparel. Attempts to realign polyester's technical qualities with consumers' needs continues today with the introduction of apparel made with microfiber. An understanding of the attitudes of the American consumer during the later part of this century allows one to understand how polyester was initially accepted and then rejected. In this way, it is evident that the social construction of polyester has its own rationale and therefore is neither governed by logic nor characterized by a linear concept of progress.

Today, the miracle that is 100 percent polyester goes unappreciated, collecting dust in thrift stores across America. Consumers no longer pray for liberation because they no longer value durability and wrinkle-resistance; instead, comfort and status are premiums. Consumer consciousness has shifted to different venues of desire—what was once believed to be utopian has become stigmatized.

Hope for redemption is placed on the new polyester. If microfiber is to be successful on a larger scale, it will mean that the perception of polyester will have to change; the socioeconomic icon of the leisure suit, ingrained for 20 years, will have to be reinvented. Even if this is possible the future holds no guarantee for success. Will the benefits of microfiber be ignored like earlier versions of polyester or will it become permanently woven into the American fabric?

■ NOTES

1 What is Polyester? Generally, there are three different categories of fibers that make up textile fabrics: natural fibers (e.g., cotton, wool, silk), modified natural fibers (i.e. rayon), and synthetic fibers (e.g., nylon, acrylic, and polyester). Synthetic fibers do not exist in nature, but are manufactured through an industrialized process which involves starting materials made from petroleum. Therefore, synthetics are referred to as petroleum-based fibers. Within each type of fiber, there are different varieties; for example the synthetic fiber polyester can refer to such different chemical substances as represented by the acronyms PET, PCDT or PEB. The following discussion will concern only PET polyester used in the manufacturing of apparel. Currently, PET accounts for the largest volume in polyester sales (McGraw-Hill, 1992), and is the most wide spread synthetic fiber used in the manufacturing of fabrics (Seymour & Carraher, 1990). Like other synthetics, PET is synthesized, melted, poured through small holes into fibers, and eventually woven into fabric in textile factories, and made into shirts and blouses, trousers, suits, and dresses.

PET was synthesized and patented by J. R. Whinfield and J. T. Dickson in 1941 in the laboratories of The Calico Printers Association Limited. Its discovery was based on the earlier work of W. H. Carothers who synthesized nylon. Soon after PET was synthesized, the rights to the discovery in the United States were sold to E. I. du Pont de Nemours and Company who produced the polyester fiber in 1945. World wide rights (excluding the United States) went to Imperial Chemical Industries Limited who granted sublicences to other fiber manufacturers in a variety of countries. Initially, PET fiber was given the laboratory name 'Fiber V' and the trade name 'Amilar' by du Pont, but the name was later changed to 'Dacron' due to potential confusion with another commercial name that existed at the time (New York Times, 1951a). In England, I.C.I. marketed the synthetic fiber as Terylene.

PET is an acronym for polyethylene terephthalate, which is a white, waxy solid. PET is made up of groups of carbon (C), hydrogen (H), and oxygen (O) atoms arranged in a long chain (see figure 4).

The designation 'n' beside one of the parathenses indicates how many times the specific unit of atoms within the parentheses is repeated. There are usually 100 units repeated in a polyester chain (Brunnschweiler & Hearle, 1993), forming what is called a gigantic macromolecule. 'R' stands for a group of atoms which are attached at the end of the molecular chain. For example, when R = OH, the PET fiber is called Dacron, and when R = OCH_3 the PET fiber is called Terylene. In general terms, the prefix 'poly' in polyethylene terephthalate and polyester refers to the large class of molecules called polymers. The suffix 'ester' refers to a specific combination of carbon, hydrogen and oxygen atoms involved in the linkage between units.

The innovative nature of PET lies with its chemical structure. Because PET is a long chain molecule that does not have many side groups attached to it, it is rather a smooth and straight fiber in comparison to cotton fibers. The 'straightness' of the fiber prevents twisting or contortions to form. This helps the long molecular chains to achieve a high degree of order, that is, to align themselves with each other and form intermolecular bonds (Seymour & Kauffman, 1993). This bonding prevents stretching of the fibers and misshaping of the fabric, and explains why PET fabrics do not crease easily when worn, need very little ironing to maintain their appearance, and are extremely wear resistant. If the intermolecular bonds break, as they often do in cotton shirts for example, the molecular chains shift and swell when washed, ultimately forming wrinkles (Pollack, 1993). The down side of wearing apparel made of PET is the lack of moisture absorbency. The aligning of the PET molecules and their inability to bond with water reduces the breathability and absorbency of the fabric.

In general, PET fabrics such as Dacron offers excellent resistance to most weather conditions, insects, molds and mildew, recovers well from bending and stretching, accepts permanent pleats, has a good weight/strength relationship, and is easily washed (Windholz, 1983; Goodman & Rhys, 1965). Lastly, producing PET is very economical and competetive with the manufacturing of natural fabrics (Doyle, 1969).

2 See the movie *Polyester* (1981) by John Waters, and the popular computer game, *Leisure Suit Larry the Lounge Lizard,* from Sierra Online Inc. A bar named 'Polly Esther's' which claims to be a '70s Fun Spot' has recently opened in New York City and the television show *Seinfeld* recently dramatized an episode involving changing the uniform of the Yankee baseball team from polyester to cotton.

3 Personal communication, Ira Livingston, Vice President of Cotton Inc., October 27, 1993.

4 In addition to shirts, 'no wrinkle' cotton pants are currently available in retail stores.

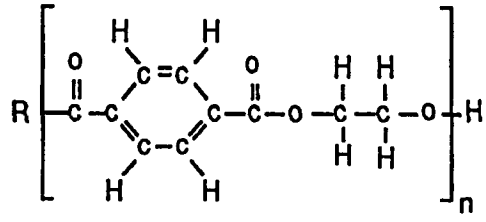

Figure 4. Polyethylene terephthalate

5 This was not the only 'back to nature' movement in American history. The return to nature as a place of leisure has long been ingrained in the American experience. For further reading on this subject see *The Machine in the Garden: Technology and the Pastoral Ideal in America* (1964) by Leo Marx.
6 Microfiber can be made thinner than a human hair (Haynes, 1991).

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