

Commercial Materials in Modern Navajo Rugs

*For Mother + Dad,
much love,*

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The production of Navajo rugs is considerably more varied than is suggested by common descriptions of native women shearing their sheep, spinning their yarn and collecting local plants for their dyes. Sophisticated weavers buy handspun yarns from other Navajo women; traders provide weavers with specially dyed yarns for custom orders, and a host of other commercial materials find their way into modern rugs.¹ Commercially sold fibers and yarns are combined with homemade ones, resulting in rugs with a mixture of traditional and innovative materials the identification of which may bewilder collectors and museum curators alike.

The incorporation of trade goods into Navajo weaving is not a twentieth-century innovation.² The very notion of weaving weft-faced fabrics with four complete twined selvages on an upright loom with string and stick heddles was borrowed by Navajos from Pueblo Indians over three and a half centuries ago. Cotton, too, came from the Pueblos. Spaniards, Mexicans and later American settlers and traders introduced other raw materials to Navajo culture. Spanish sheep were brought to the Southwest, providing both wool and meat. Lumps of deep blue indigo dye were traded to the north from Mexico and used to color native cloth woven by Navajos and Pueblos. In addition to these imported raw materials, Navajos had access to a wide array of ready-made or partially processed materials such as bolts of fabric that were unraveled for wool yarn, skeins of three- and four-ply wool yarns, and spools of cotton string for warp.

This article addresses the fibers and yarns from nonnative sources that were used by Navajos predominantly during the last quarter of the twentieth century and the beginning of the twenty-first.³

Even though the types of available materials have multiplied, appropriate terms to describe them have not entered the common vocabulary of weavers, traders, scholars and collectors of Navajo rugs. When people in and around the Navajo Nation speak of "yarn" they usually mean commercially spun wool yarn rather than handspun wool yarn. The latter is generally called "wool," never "yarn." This vernacular terminology, not used in this article, naturally confuses buyers and other visitors who understand yarn to be any continuously twisted strand of fibers, whether handspun or commercially spun, whether wool, silk, cotton or acrylic (Emery 1966:12–13, 206). Other terms, such as processed, prespun and handspun wool, are easily misconstrued. The following descriptions are an attempt to clarify some of this tangled terminology.



1. Ganado Red rug by Genevieve Shirley, 1993. 71" x 49" (180.5 cm x 125 cm). The weaver used commercially cleaned and carded processed wool and then handspun the yarn for this rug with approximately fifty-six wefts per inch. Private collection. Photo by Jim Freeman.



2. Four-horned Churro ram and ewe, Tsaile, Arizona, 2002. Photograph by the author.

Raw Sheep's Fleece

Wool, the basic ingredient for modern Navajo rugs, was itself an import to Navajo country. The earliest wool sheep probably came in 1598 with Juan de Oñate's expedition to the Rio Grande Valley. These early sheep of the Churro breed were a hardy Andalusian stock with long, smooth and relatively greaseless wool, the perfect fiber for hand spinning in an arid land (Fig. 2). After decades of interbreeding with other introduced breeds, few purebred Churro sheep remained. From 1935 to 1967 the Southwestern Range and Sheep Breeding Laboratory at Fort Wingate, New Mexico attempted to improve Navajo sheep's commercial quality (Grandstaff 1942). In 1977 Lyle B. McNeal initiated the Navajo Sheep Project, established an old-style Churro flock and began distributing stock and wool to many Navajo families (McNeal 1986). During the past decade, the annual "Sheep Is Life" conference held on the Navajo Nation and the nonprofit Diné bí' íína' (Navajo Way of Life) have provided weavers with new commercial sources of sheep's wool. In addition, reservation stores such as the Two Grey Hills Trading Post supply weavers with natural-colored fleeces (Wilson 2002).

Processed Wool

Processed wool is commercially cleaned and carded sheep's wool formed into a continuous strand of loose fibers that are ready to be drawn and spun. Sliver, tops

and roving are terms often used to describe processed wool. In the industry, a sliver is "a loose, untwisted strand of fibers obtained after carding" produced as an early step in the spinning process (Tortora 1982:426). Tops is a specific type of sliver known as combed sliver (see below). From sliver, a roving of "continuous, soft, slightly twisted strand of fibers...comparable in size to a thin pencil" is created (Hollen and Saddler 1968:94). From the roving, commercial yarn is spun by machine.

The use of processed wool eliminates most of the time-consuming tasks of shearing, sorting, picking, cleaning and carding (Fig. 3). The sliver comes in long, thick strands approximately ten to fifteen centimeters in diameter, wound onto a large spool or wrapped into a large ball. In and around the Navajo Nation sliver is sold by the pound. To prepare it for use, a spinner unwinds a long length of the wool and splits the strand into thinner, more manageable pieces, usually about one to two centimeters in diameter. After drawing out the strand with her fingers to further attenuate the fibers, she must go through all of the motions of hand spinning on her traditional hand spindle (Jones 1946). As with hand-carded Navajo yarn, processed wool may be respun a number



3. Ella Rose Perry hand carding Churro sheep's wool, Crystal, Arizona, 1990. Photograph by the author.

of times until the desired thickness and degree of twist are achieved (Fig. 4). A popular material for making warp yarn, roving may be respun seven or more times to make the warp extremely smooth and strong.

The resulting yarn is most definitely handspun, but has not been hand carded. Processed wool wefts appear more even than the average hand-carded wool. The surface texture of most processed wools is soft to the touch, rarely hard like many kinkier hand-carded yarns. Harsh kemp fibers are rarely present. The colors are also unusually even. Because of their remarkably well-blended tones, which include an aniline-dyed black fiber, the grays are often the first to betray their commercial origins.

The most common type of processed wool used by Navajo spinners since the 1960s is tops or combed sliver, in which the fibers are aligned roughly parallel to each other and along the long axis of the roving. In the industry, tops is used to make worsted (as opposed to woolen) yarns (Hollen and Saddler 1968:94). When handspun, this wool produces a smooth, evenly textured yarn.

A relatively recent arrival on the reservation is a woolen type of sliver known as card sliver, in which the individual fibers spiral around the length of the strand and lie in every direction. From mills on the Eastern seaboard, the fine, yarnlike sliver was available during the 1980s in skeins rather than on spools at R. B. Burnham & Company Trading Post in Sanders, Arizona. This type of processed wool is much closer to hand-carded configurations and so provides a closer imitation of hand-carded wool with a crisper, more varied texture.

Commercially processed wool was used on the Navajo Reservation as early as 1903, when John Lorenzo Hubbell had 476 pounds in stock at his Ganado, Arizona trading post (Hubbell n.d.). Other traders continued the experiment. J. B. Moore, who owned a trading post at Crystal, New Mexico until 1911, sent Navajo wool to be used by most of his competent weavers to the East for scouring and preparation (Moore 1987:54). Moore's wife supervised the local dyeing of some of the wool. In the 1930s Bruce Bernard, a trader at Shiprock, New Mexico, had Navajo wool cleaned, carded and dyed at the Pendleton Mills in Oregon and then returned for use by local Navajo weavers (New Mexico Association on Indian Affairs 1932). In 1943 a short-lived wool-scouring project was carried out between Texas Technological University in Lubbock and the Fort Wingate Experimental Station in New Mexico (Erickson and Cain 1976:71). In 1950 the Navajo Tribal Council approved the construction and support of a wool-processing plant at Leupp, Arizona. Wool roving was produced from Navajo fleeces and distributed through reservation traders (Anderson 1951:90). By the mid-1950s the plant was no longer in operation. During the 1960s processed wool was available at the Navajo Arts and Crafts Guild (later Enterprise) through the influence of Councilman Ned Hatathli and the guild manager, Russell Lingruen (Lingruen 1979).



4. Mary Lee Begay spinning red processed wool at Hubbell Trading Post, Ganado, Arizona, 1981. Photograph by the author.

During the 1970s efforts continued to improve wool production and to sponsor wool processing. In 1971, at a time when national wool prices were dangerously low for sheep raisers, the Navajo Tribal Council established the Navajo Wool Grower's Marketing Industry, which provided government subsidization of wool prices. In 1974 the Overall Economic Development Program for the Navajo Nation approved the expenditure of \$697,000 to establish a wool-processing plant at Shiprock, and another \$25,000 for a wool-marketing study (Navajo Nation 1974:151). By March 1976 a central wool warehouse was dedicated in Shiprock, and satellite warehouses were established on the reservation at Chinle, Fort Defiance, Tuba City and Crownpoint, Arizona. Although the processing plant was never built, the Navajo Nation was directly involved in buying wool, and contracting out the scouring, dyeing and marketing of the wool to traders, weavers and others. A portion of the wool was sent to Universal Textile and Machinery, Inc., Johnsonville, South Carolina for scouring, combing and processing into tops and single yarns in seven colors. The Shiprock facility, the last of the tribally operated outlets, was closed in 1998.

Tierra Wools, a "weaver/spinner/grower owned company" in northern New Mexico, provides custom fiber scouring for "smaller flock fiber growers, small spinning mills, and textile artists," according to executive



5. Storm Pattern rug by Lillie Touchin, 1986. Predyed wool yarn produced by Brown Sheep Company in Nebraska. 53" x 34" (135 cm x 88.5 cm). Private collection. Photograph by Jim Freeman.



6. Yarn from Brown Sheep Company, some colored with vegetal dyes by Navajo specialists, R. B. Burnham & Company Trading Post, Sanders, Arizona, 1986. Photograph by Gloria F. Ross.

director Robin Collier (Collier in *Tierra Wools* 2002). Several well-established Navajo weavers have used the mill's services, which emphasize "organic and ecological fiber processing." In 2002, in cooperation with the non-profit Taos Center for Southwest Wool Traditions, Tierra Wools expected to provide an integrated organic fiber-processing facility, with fiber scouring, both worsted and woolen spinning and a natural dye house. Its aim is to produce affordable weaving yarn from local wool for weavers in the Southwest. A variety of other small-scale processing plants are located around the country and could be useful to Navajo weavers in the future.

White processed wool actually ranges from a creamy yellow-white to a stark bleached white. A full range of grays and browns, from a very light bluish gray to a charcoal gray-brown, is available. Several shades of red and a flat black are made. All colors other than white contain some aniline dye; using the natural-colored sheep's wool in industrial processing is not economically feasible. In the case of some grays and browns, natural white fibers have been blended with aniline-dyed black, gray or brown fibers to attain an extremely even heather tone.

Although available in colors, processed wool is often redyed with vegetal or aniline dyes after a Navajo artisan spins it. Because of the wool's well-scoured nature, dyes usually take evenly and thoroughly. Weavers in the Ganado area frequently top-dye an already bright aniline red roving with packets of "Cardinal Red" to obtain a much darker shade of red, known commonly as "Ganado Red" (Fig. 1). Top-dyeing over gray results in rich heather tones.



7. Wilde & Woolly rug yarn from John Wilde & Brother, Inc., R. B. Burnham & Company Trading Post, Sanders, Arizona, 1990. Photograph by the author.

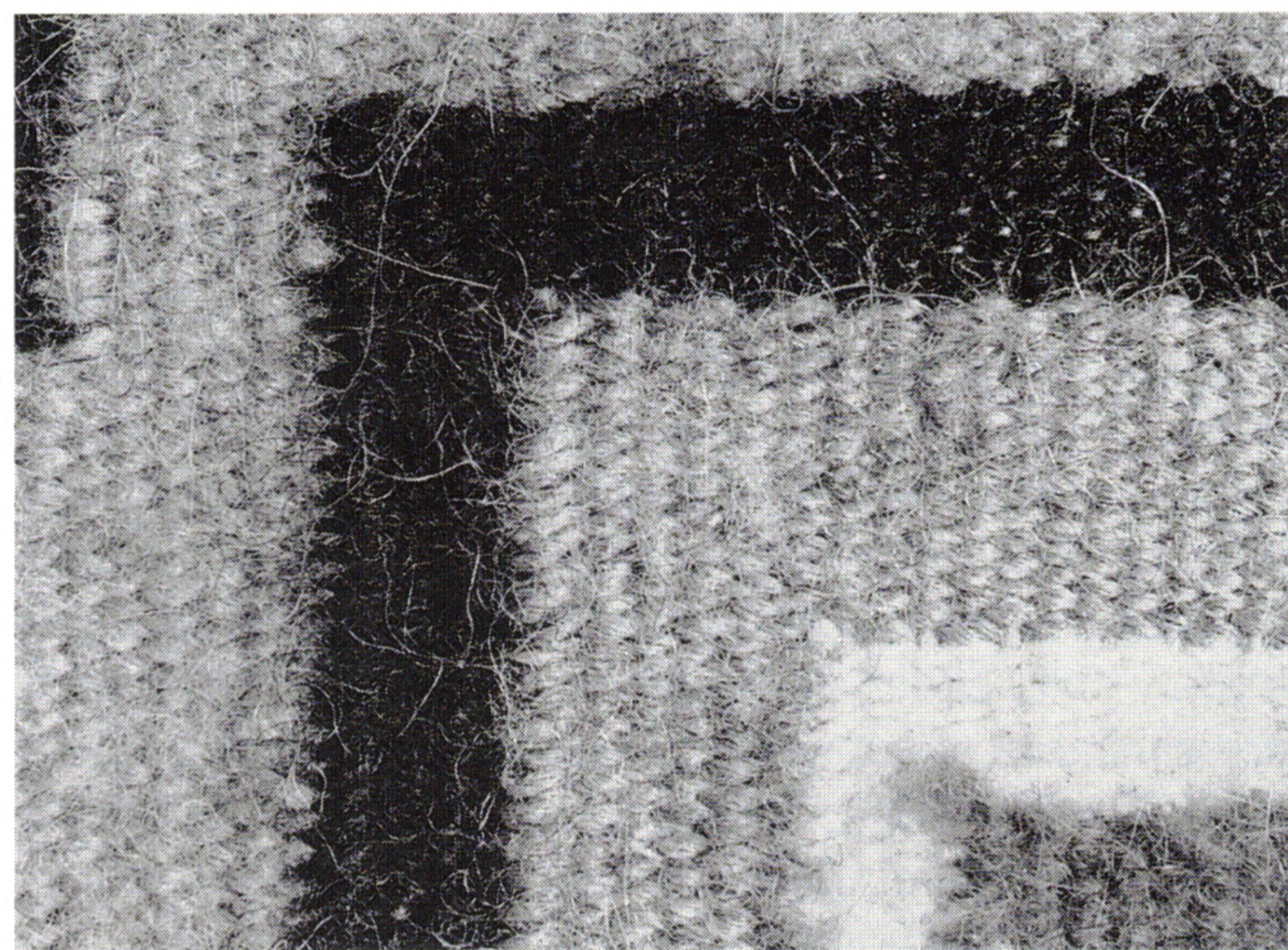
During the late 1970s and early 1980s processed wools were especially popular. Until recently, weavers purchased them from the Shiprock wool program or from numerous trading posts and suppliers. Their main advantage over the ready-made yarns that were then available was that spinners could determine the specific thickness and weight of the yarn, matching it to their prospective rug projects. Now processed wool has much competition from commercial yarns, and its use has declined, almost disappearing since the late 1980s. Babbitt Brothers in Flagstaff, Arizona, the major wholesaler and distributor of tops for twenty years, curtailed the business in 1985 when other materials replaced the high demand for tops. The Burnham trading post continued to supply white tops obtained directly from the South Carolina mill (Burnham 1986).

Single Yarns

Mimicking handspun yarns, some commercial yarns are composed of a single, loosely twisted strand of wool.⁴ In the past, such yarns were available only in a limited selection of sizes; but single yarns presently range from thick, heavy ones — like Icelandic “Lopi” brand yarns, providing eight to ten wefts per inch when



8. Storm Pattern rug by Rebecca Tso, 1991. Wilde & Woolly yarn dyed with vegetal and synthetic colors. 61" x 43" (155 cm x 109.5 cm). Private collection. Photograph by Jim Freeman.



9. Two Grey Hills wall hanging by James Sherman, 1977. 33" x 23" (84 cm x 59 cm). Sherman was one of several dozen known male weavers in the Navajo Nation. He and his female relatives used both hand carding and other sources for their wool yarns. His slightly nubby brown wool was hand carded and handspun, while the gray wool was commercially cleaned, blended and carded, and then probably also handspun. (Detail: smooth texture of both handspun and processed wools.) Courtesy of the Textile Museum, Washington, D.C. Gift of Robert E. Butler. Cat. No. 1982.23.2.

woven in a Navajo weft-faced rug — to extremely fine, wiry yarn in imitation of handspun types used in Two Grey Hills tapestries with ninety or more wefts per inch (Fig. 9).⁵

Reservation traders have frequently called single yarns “prespun wool” to contrast with “yarn,” by which they mean commercial four-ply knitting worsted, and with “wool,” which suggests hand-carded, handspun wool yarn.

The availability of commercial single yarns, like that of processed wool, goes back at least to the start of the twentieth century. Woven specimens containing a densely spun yarn with a high percentage of very coarse kemp wool are preserved from this period. During the period between 1900 and 1970, Navajos employed few if any commercial single yarns.

In the late 1970s the Navajo Wool Growers Marketing Industry contracted with Universal Textile and Machinery and had a large quantity of Navajo sheep wool cleaned, carded and spun to its specifications. Another batch of Navajo wool was sent to Brown Sheep Company in Mitchell, Nebraska for processing in the early 1980s. The single yarns from each of these projects were wholesaled to stores and distributed directly to weavers.

During the mid-1980s Brown Sheep Company, established in the fall of 1980, was by far the largest supplier to the Navajos through the Shiprock wool program and numerous trading posts on and off the reservation (Figs. 5, 6). Of Brown's annual production, a thousand pounds of yarn per day in 1986, approximately one-third was going to the Navajo market. Although Navajo wool was experimentally used in 1984, wool is regularly bought from Nebraska, northern Colorado and eastern Wyoming and is ninety percent from mixed-sheep breeds. It is sent to South Carolina for washing, combing and carding, and returned to Nebraska as tops. Brown's mill then spins the wool and dyes it. The yarns most commonly sent to the Navajo Nation come in two weights: a medium-weight “worsted” and a finer “sports weight.” The company also makes a one hundred percent wool single-warp yarn and a warp of seventy-five percent wool and twenty-five percent mohair. In addition to natural white and grays, the company offers approximately sixty skein-dyed aniline colors, many of which are similar to shades traditionally obtained with vegetal dyes (Brown 1986). Today, Brown Sheep Company's wool yarns are marketed through about thirty trading posts and outlets around the Navajo Nation.

During the 1980s, R. B. Burnham & Company Trading Post was Brown's largest customer on the reservation, distributing to approximately thirty other stores that in turn sold to Navajo weavers. In 1984 and again in 1985 Burnham's post purchased more than 116,000 skeins, representing approximately half of the commercial wool yarn available on the reservation (Burnham 1986). By 1990, despite the yarn's continu-

ing popularity elsewhere, Burnham no longer carried yarns from the Nebraska mill and avoided purchasing rugs containing them, ostensibly because the yarn's soft, limp texture could not compete with an emerging yarn milled in the East.

Around 1984 John Wilde & Brother, Inc., a mill in Manayunk, a neighborhood of Philadelphia, Pennsylvania, began selling to Burnham, giving him exclusive marketing rights for Wilde yarns across the Navajo Nation. In 1984 fourth-generation trader R. Bruce Burnham spent \$24,000 on skeins of yarn and, by 1994, \$180,000. Over the course of several years, Burnham and Wilde's president, Russell Fawley, developed the Wilde & Woolly yarn brand with a coarse carpet wool especially adapted to Navajo weavers' needs (Fig. 7). Raw wool is imported from New Zealand and the United Kingdom and transformed into a single yarn with a woolen (tight spiral) spin, wiry texture and prominent undyed kemp fibers, readily identified in many Navajo rugs woven in the past two decades. Among the various synthetic dyed and natural-colored shades, one of the signal Wilde & Woolly colors is a unique tan with peachy orange, cream and brown flecks and streaks (Fig. 8). Burnham and Fawley also developed a distinctive three-ply carpet yarn, which is described in the next section.

In addition to selling directly to weavers and wholesaling commercial yarns to other stores, Burnham has provided white and gray yarns, first from Brown's mill and subsequently from Wilde's, to expert Navajo dyers who then produced an impressive array of colors from plants and other materials. A ledger is kept on how much yarn goes out to each person and the quantity of specific colors that is returned. Dyers are paid by the skein. According to Burnham, some women can dye up to twelve hundred skeins in a single week, though a standard dye lot contains ten four-ounce skeins. This yarn is provided to weavers for rug commissions and sold through Burnham's post.

Burnham has experimented with other materials, too. Of once-promising nature was the worsted sliver, actually more like a single yarn, introduced in 1986 in four weights and eight or nine colors. For a brief period, a very fine British single yarn that could make tapestries with 145 wefts per inch was offered through Burnham's. And both Australian and New Zealand wools and milling systems were examined with an eye toward utility to the Navajos. In 2001 Burnham was exploring the possibilities of a Mexican woolen mill in Oaxaca providing warp yarn of blended mohair, a Canadian mill for Churro sheep's wool warp and weft yarns, and even a far north source for imported musk ox fibers to blend with wool (Burnham 2001).

Tierra Wools has been developing a line of single yarns, as well as two- and three-ply yarns, from certified organic Churro and Rambouillet fleeces. As yet, only a few Navajo weavers have taken advantage of this source of materials.

Weavers who do not want to make their own yarn or use machine-made products can obtain a limited amount of handspun single yarn from others. A number of the best Navajo weavers routinely commission family members to spin particular types of yarn for them. Payment may be in cash or trade. Handspun weft yarn in large quantities is a rare commodity, but it is common to see a few balls of handspun warp yarn for sale in many trading posts.

Multiple-Ply Wool Yarns

Compound yarns made up of more than one strand of wool twisted together are technically termed plied, and are often described according to how many strands are combined (Emery 1966:10). For example, three-ply yarns are composed of three separately spun strands that have been twisted together for added strength, weight or texture. Navajo spinners produce handspun, hand-plied yarns exclusively for the heavy cords that are twined along the ends and sides of a rug. All other Navajo-produced handspun yarns used in Navajo blankets and rugs are single yarns (that is, not plied at all).

Multiple-ply yarns of outside manufacture are not new to Navajos, as Wheat established (1977:422–423). By the 1890s the use of four-ply Germantown yarns in a wide array of strong aniline colors prompted the name “eye dazzler” to describe the brightly patterned textiles often made exclusively with commercial yarns. Although discouraged by many traders and collectors, the use of bright, commercially plied yarns continued into the twentieth century in certain rug styles.

Drawing on the heritage of the three- and four-ply yarns milled in Germantown, Pennsylvania more than a century before, Burnham and Fawley established their “Germantown renaissance” line of single- and three-ply carpet-grade yarns with several dozen intense synthetic colors (Fig. 12). In addition to the bold, solid colors, one yarn has two white plies and one black ply that are twisted together for a speckled effect, mimicking the original spot-dyed Germantown yarns marketed by Marshall Field & Company of Chicago in the early twentieth century under the name of “Partridge.” Today, Navajo weavers use these yarns to produce brilliant rugs reminiscent of earlier Germantown eye dazzlers (Bahti 2001:17).

In the Teec Nos Pos and Shiprock areas of the northern reservation, a number of posts owned by the Foutz and Kennedy families stock multiple-ply wool yarns in a rainbow of colors from the Canadian mill of William Condon and Sons, established in 1931 on Prince Edward Island. Condon’s offers two-ply fine- and medium-weight yarns, plus heavier three- and five-ply yarns, and has always been a popular supplier to Hispanic weavers in the Rio Grande Valley. According to Kathy Foutz, such commercial yarns have been popular in Teec Nos Pos rugs since World War II (Hannon 1999:30). In contrast, the colorful Germantown renaissance yarns supplied by Burnham to Jed Foutz’s

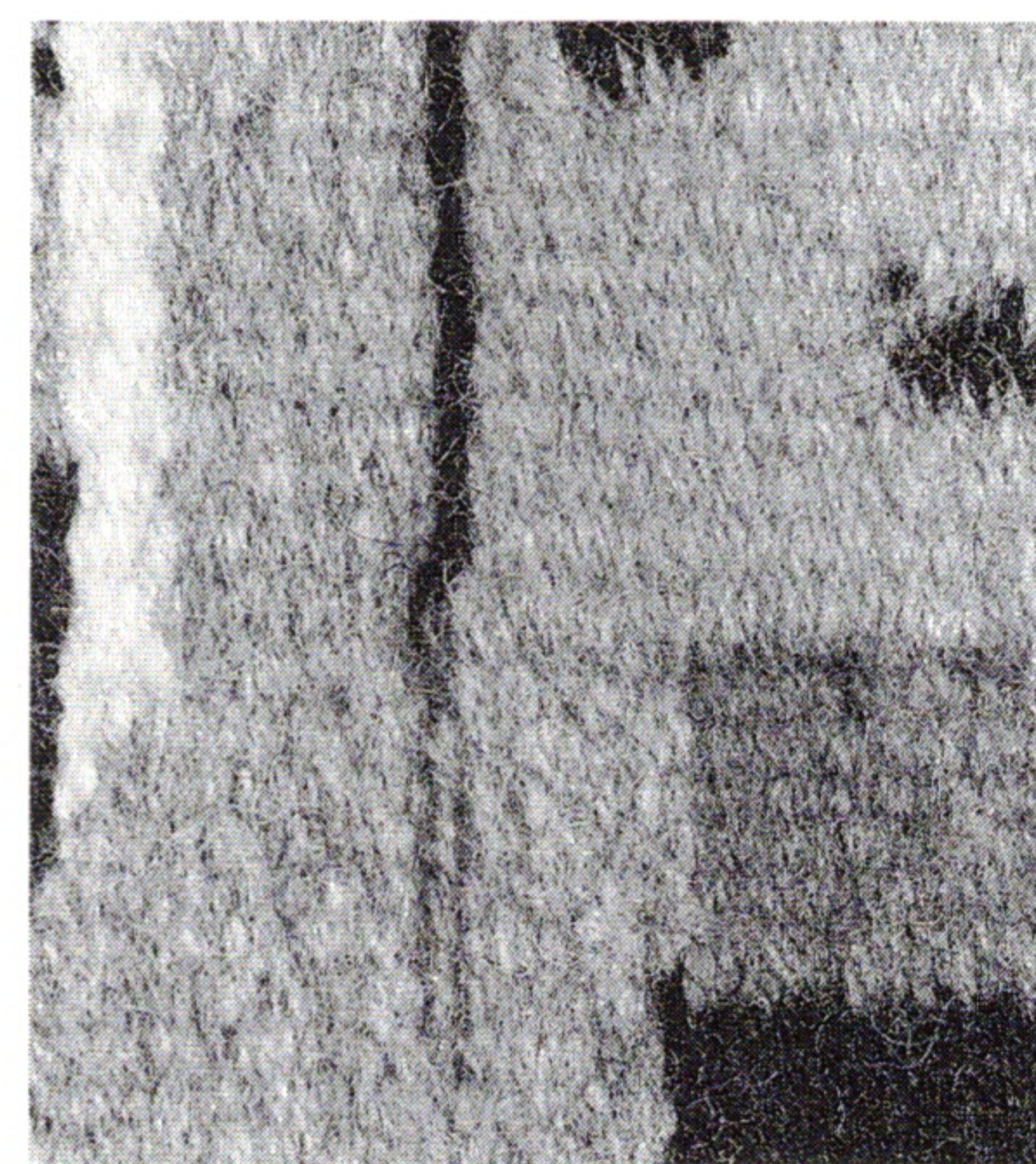
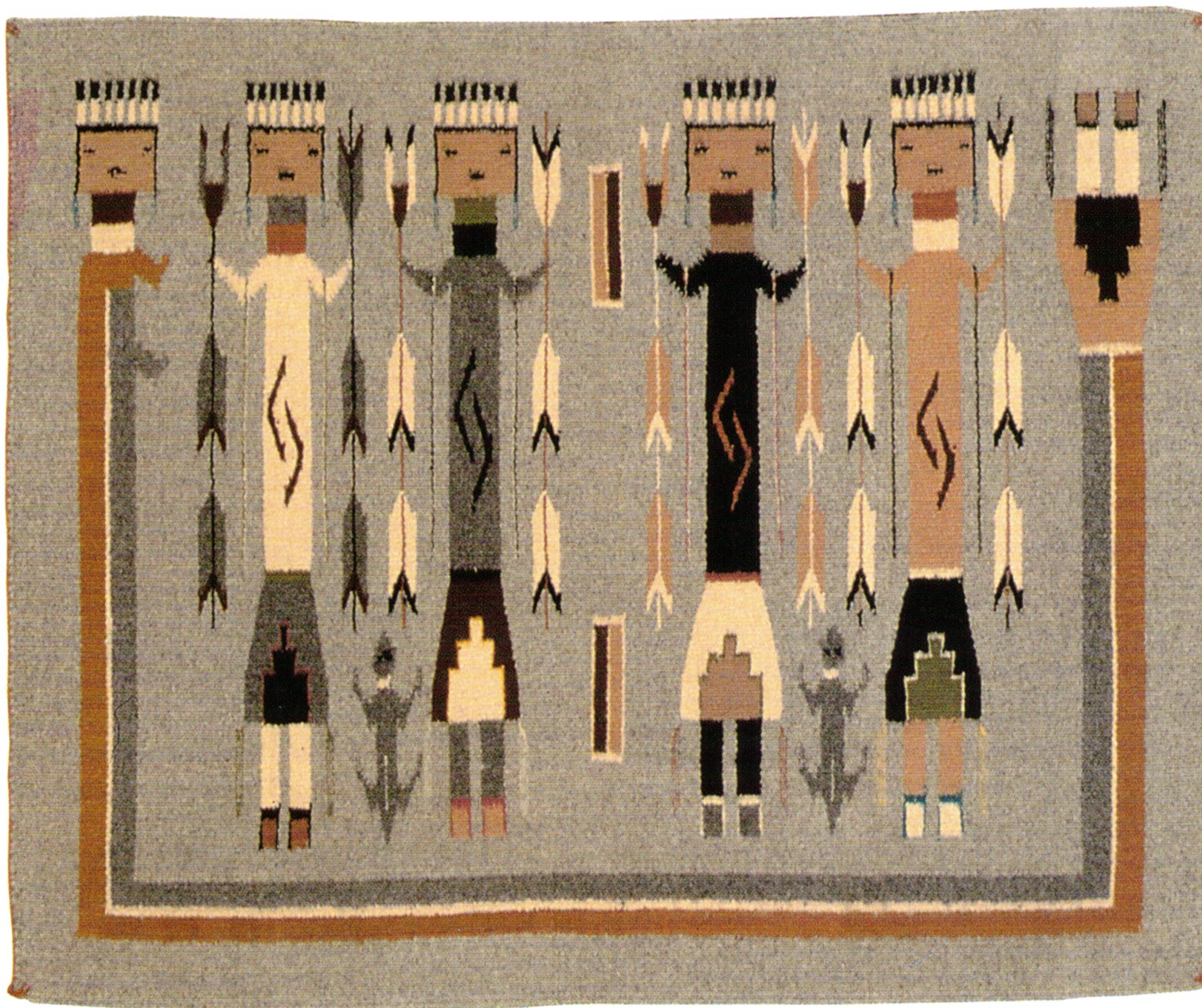


10. Bessie Sellers, Cedar Ridge, Arizona, 1980. Sellers is respinning a four-ply knitted worsted on her traditional spindle, to tighten its twist and make it firmer for rug weaving. Photograph by the author.

Shiprock Trading Company did not sell well during the 1990s in this area (Burnham 2001), the weavers preferring Condon’s more “traditional” multiple-ply yarns.

Prior to Burnham’s efforts with the Wilde mill, and in areas other than the northern Navajo Nation, the plied-wool yarns most commonly available to Navajos have been softer four-ply knitting worsteds from Coats & Clark (especially their “Red Heart” brand, New York), Lion (New York), Orchard (New York), Maypole (Portland, Oregon), and American Thread Company (“Dawn” brand, Stamford, Connecticut and New York). These are generally sold in four-ounce skeins, and over thirty colors can be counted on some suppliers’ shelves. Knitting worsteds, despite their name, are soft and lightweight; without further treatment, they will not pack well into a woven rug. A weaver must tighten the yarn’s twist by respinning the yarn on a hand spindle to make it denser before use (Fig. 10). For warp yarns, the respinning may be repeated, just as with hand-carded or processed wool warp, until a very strong, smooth cord is produced.

A number of modern rug styles allow for the relatively consistent use of commercial multiple-ply yarns as weft.⁶ Retwisted commercial yarns are typically found in rugs known for their bright colors: the Teec Nos Pos regional styles, rugs with *ye’ii* and *ye’ii bicheii* figures (Fig. 11), some novelty pictorials, and rugs from the 1970s woven in the raised outline technique. In warp-faced belts, four-ply commercial yarn has been the standard since the nineteenth century among both Pueblo and Navajo weavers. On the other hand, though increasing amounts of both processed wool and single yarn appear in rugs from Ganado, Wide Ruins, Pine Springs, Burntwater, Crystal and Two Grey Hills, commercial plied yarns are not favorably accepted in these rugs by traders, arts and crafts show judges and collectors.



11. *Ye'ii* rug by Daisy Barton, c.1977. 35" x 29" (89.0 cm x 74.0 cm). Pictorial rugs with *ye'ii* figures and other Navajo religious imagery commonly contain four-ply commercial yarns, as this one does. The *ye'ii* figures represent Navajo holy people, frequently depicted in traditional sandpaintings. (Detail: wefts shown vertically to correspond to full view.) Courtesy of the Textile Museum, Washington, D.C. Gift of Robert E. Butler. Cat. No. 1982.23.3.

For extremely fine tapestry-grade textiles, plied yarns are often split apart so that a fine single strand can be used for weft (Fig. 13). These are often difficult to identify in a finished product. While splitting plies is a time-consuming process for the weaver, it is relatively easy when compared with the skill and concentration involved in hand spinning a superfine yarn. Although extremely fine handspun yarns are still produced by some weavers, the practice of splitting plied yarns has gained popularity among weavers who make Two Grey Hills tapestries, superfine *ye'ii bicheii* pictorials and miniature rugs measuring only a few square inches.

While most of the yarns mentioned above are used as weft, spools of tightly twisted, creamy colored four-ply

wool yarn are especially designed for warp and have been carried by some trading posts, commonly obtained through the Shiprock wool program. A synthetic fiber has been used in another plied-warp yarn. Extremely strong and smooth, this yarn has a bluish white cast and can be identified by its shiny cellophanelike appearance under magnification. Other multiple-ply warp yarns appear in Navajo weaving from time to time, some of them from major mills that also cater to Anglo and Hispanic hand weavers. For instance, Weaving Southwest in Taos, New Mexico, a favored supplier to many tapestry weavers, carries Swedish six- and nine-ply unbleached cotton warp (the latter is three strands of three plies re-plied); unbleached linen in two-, three-, four- and five-ply weights; wool worsted warp in two-, three- and four-ply; and a coarse wool warp in two- and four-ply, plus the Maysville cotton carpet warp mentioned below.

Cotton String

Commercial cotton string has been available to Navajo weavers since the 1860s (Wheat 2003). Although dealers commonly discourage its use and pay lower prices for rugs with string warps, white cotton four-ply carpet warp on large spools from both the Belding Lily Company in Shelby, North Carolina and the Maysville Cotton Mill in Kentucky (supplying rug weavers with cotton warp since 1879) is still available in some reservation stores today. Many small rugs and samplers of lesser quality contain cotton warps. In addition, from the late nineteenth century to the present day, a commercial, olive green, six-ply cotton string appears in Hopi and some Navajo warp-faced belts.



12. Modern three-ply Germantown yarns, in four colors including a black/white speckled variety, from John Wilde & Brother, Inc., R. B. Burnham Company Trading Post, Sanders, Arizona, 2002. Photograph by Bobbie Gibel.

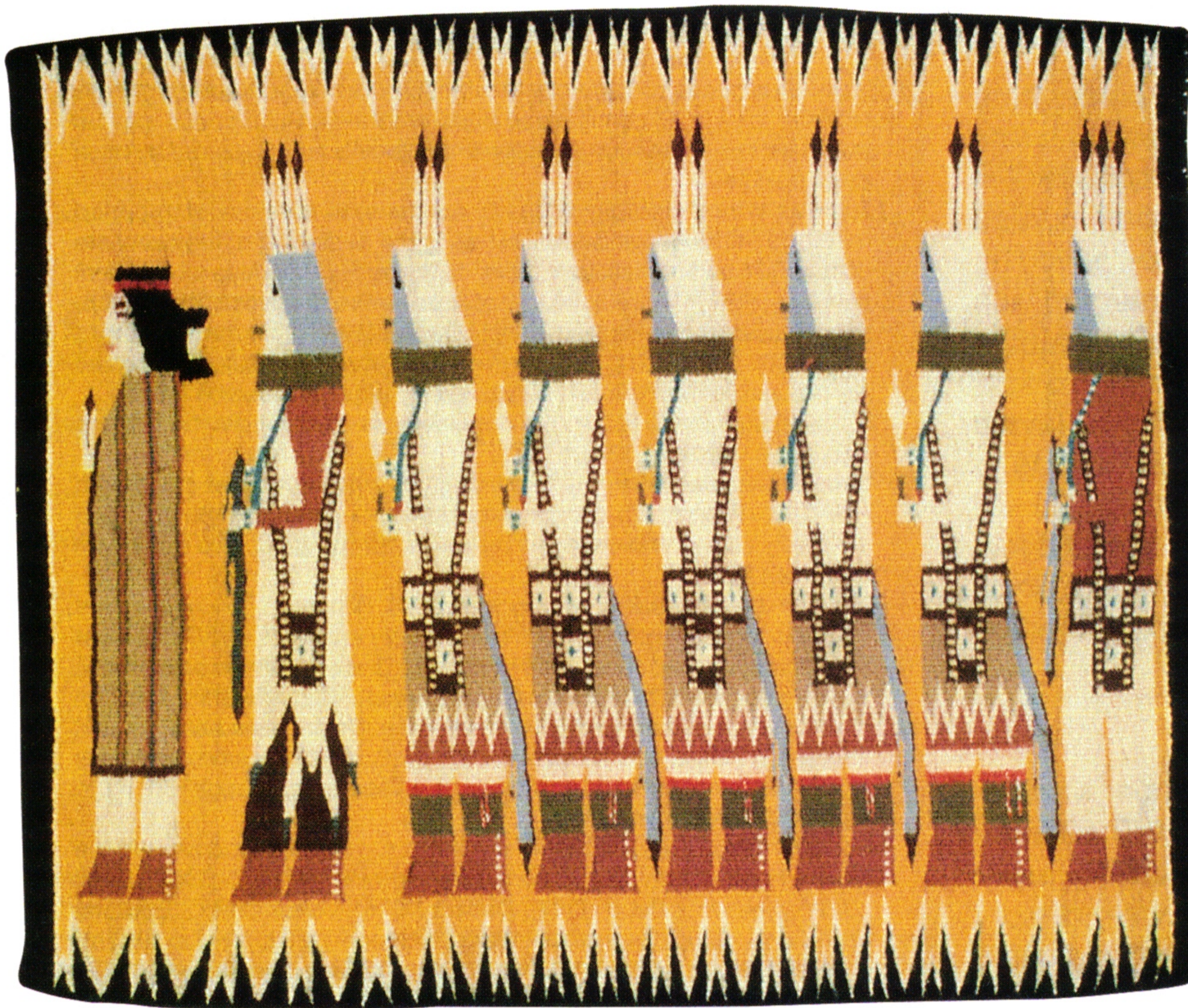
Cotton and wool possess contrasting qualities that explain the weavers' attraction to cotton and the traders' and collectors' preference for wool (Bogle 1979a, 1979b). First, cotton string is ready to use as warp yarn straight from the spool, and its twist does not have to be tightened as does that of wool yarn. This timesaving aspect of cotton string is complemented by the fact that cotton does not stretch like wool, and so there are fewer tension problems on the loom for beginning weavers. It is easier to make a straight-sided rug with string warps, but cotton is also less forgiving when mistakes are made. Commercial tests show that dry or wet, cotton is stronger than wool, so warp breakage is decreased. But then, cotton has much less resistance to abrasion. It is weaker in the long run, because warp threads must withstand constant beating and scraping during the weaving process and further wear in a completed rug. Cotton is not as flexible a foundation material as wool and often produces a rather stiff rug. Finally, despite its longstanding history in the Southwest as a native fiber, cotton does not have the traditional and authentic connotations associated with Navajo sheep's wool.

Synthetic Fibers

Synthetic knitting worsted is a common item in trading posts. Primarily for knitting, crocheting and other handicraft projects, weavers also retwist it for both warp and weft. The most popular type is one hundred percent acrylic, though acrylic/nylon and rayon/cotton blends are also available. All three are generally four-ply yarns.

Despite the complaints of rug buyers, the comparatively low cost of synthetics (less than half the price of wool) increases the appeal of these "counterfeits," as Hermann Coffey, the longtime auctioneer for the Crownpoint Weavers Association, used to call all commercial yarns. The shiny appearance, intense colors and cool feel of most synthetic yarns are clues to their presence. However, recent improvements in manufacturing processes make it increasingly difficult to detect synthetics without magnification or analytical tests.

Synthetic materials often appear as small color accents in rugs made predominantly of wool yarns. Like other commercial yarns, they also appear frequently in beginners' rugs, where more expensive yarns might be wasted. In the late 1960s Glenmae Tsoie, a weaver from St. Michaels, Arizona who worked as a craft demonstrator at the Navajo Tribal Museum in Window Rock, Arizona, did some experimental weaving with synthetic yarn. Martin Link, then director of the museum, bought a quantity of shimmery synthetic yarns, probably an acrylic/nylon blend, and presented them to Tsoie with instructions that she weave them into the most atypical, nontraditional Navajo design that she could imagine. The result was a surprising Mondrian-like geometric arrangement of blocks, in which she insisted on inserting at least one square of her own hand-carded, handspun sheep's wool (Fig. 14). Several rugs were made in this style, now in the collections at the Navajo Nation Museum, Window Rock, Arizona; the University of Colorado Museum in Boulder; and the Museum of Northern Arizona, Flagstaff.



13. *Ye'ii bicheii* wall hanging by Della Woody Begay, 1977. 17" x 14" (43 cm x 36 cm). Superfine tapestries are characterized by thread counts of more than ninety wefts per inch, which this weaver often achieves. The commercial camel brown-colored wool yarn that appears as wider stripes on the left of the detail was originally a four-ply yarn that has been split apart so that separate strands could be used as fine wefts. The yellow and white yarns, visible in the center of the detail, are probably hand carded and handspun, while the red brown and green may be split commercial acrylic yarns. (Detail: wefts shown vertically to correspond to orientation of full view). Courtesy of the Textile Museum, Washington, D.C. Gift of Robert E. Butler. Cat. No. 1982.23.4.



14. Glenmae Tsosie weaving with acrylic/nylon yarns, Window Rock, Arizona, 1970. Photograph by Martin Link.

Another experiment at about the same time involved unspun sliver of synthetic fibers, which is rare on the reservation, though weaving supply stores sell it in other parts of the country. In the mid-1960s Lingruen obtained a sample of unspun synthetic fiber, which he gave to weaver Bertha Shaw, who experimented with native dyes on the synthetic fibers and obtained a subtle palette of colors. She spun and wove them into several handsome rugs that are now part of the Navajo Nation Museum's permanent collection. According to Shaw, the fibers were extremely difficult to handle, for they did not take the dyes well, were stiff to spin and had to be cut with scissors rather than broken by hand (Shaw 1979). As far as I know, few others have experimented with unspun synthetic fibers.

Other Fibers

Although imported silk is found in a number of nineteenth-century Navajo blankets (Wheat 1977:423), no recent work has been done with this fiber. Similarly, as far as I know, linen has not been used in twentieth-century Navajo rugs. Occasional use of alpaca, llama and hemp (Muskett 2003) fibers has been noted.

Conclusions

One of the more pressing issues for both individual and institutional collectors is whether the value of a rug depends on the materials incorporated into it. Discussions of the relative merits of hand-processed versus commercial materials go unabated among weavers, traders, dealers, gallery owners, arts and crafts fair judges, museum curators and private collectors. It is natural for curators and collectors to value highly a large hand-carded, handspun, hand-woven rug that has taken a great deal of time, energy and skill to produce. However, the purist's approach — favoring exclusively hand-processed materials — is hardly practical or logical today. Native textiles, like the products of other vital crafts, should be judged on aesthetic, technical and cultural features, not just on the absence or presence of certain materials. While it is indeed difficult to identify accurately the source of every yarn in a modern rug, it is hoped that the preceding descriptions provide some information on which readers may make their own observations. Trade materials, as we have seen, are not new to Navajo weaving and are probably here to stay. They have, in fact, become a genuine part of the tradition of weaving. Moreover, they are key to the continuation of the craft, as they give prospective weavers the option of weaving without the time-consuming basic preparation. As trader Burnham notes, the new and emerging commercial yarns are empowering to weavers today (2002). Navajo weaving has vitality in part because of the weavers' abilities to incorporate and adapt varied materials and designs into their rugs.

Footnotes

¹ Nonnative goods obtained by Navajos through sale, trade or gift are referred to here as commercial, trade or foreign. Such goods may be raw materials or products partially or completely manufactured by hand or by machine.

² Joe Ben Wheat carefully documented the extensive use of imported materials in the native Southwest up to the beginning of the twentieth century. His earliest scholarly paper on the subject provides an excellent summary (1977). The University of Arizona Press expects the posthumous publication of his manuscript, *Blanket Weaving in the Southwest*, in fall 2003 (Wheat 2003). Kate Peck Kent also succinctly summarized Navajo textile history, much of it based on Wheat's research (1985).

³ Information in this article that is not otherwise cited is from the author's field notes (Hedlund 1978–2003).

⁴ Irene Emery discussed the terminology of simple yarns of one strand (1966:13). Among the various alternatives — single, single yarn and single-ply yarn — she preferred the use of "single yarn." This is the term employed here.

⁵ The term tapestry has several current uses. Almost all Navajo rugs are woven in tapestry weave, which is technically known as weft-faced plain weave with discontinuous weft patterning (the exceptions being those woven with twill or two-faced weaves instead). This reference does not indicate any particular quality of the weaving. On the other hand, around the Navajo Nation and in many trading posts, it has become customary to use the term "tapestry" to indicate the fine quality of rugs with more than ninety wefts per inch.

⁶ For descriptions and history of the basic rug styles found around the Navajo Nation today, see *Arizona Highways* (1974), Bahti (1966), Bahti (2001), Bobb and Bobb (1984), Dederer (1975), Dutton (1961), Erickson and Cain (1976), Getzwiller (1984), Hedlund (1992, 1997a, 1997b), James (1976), Kent (1961), Lamb (1992), McManis and Jeffries (1997), Maxwell (1963) and Tanner (1968).

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