THE STUDY OF 19TH CENTURY SOUTHWESTERN TEXTILES

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ABSTRACT

Identification of the cultural and temporal origins of museum artifacts is an important enterprise because it establishes a baseline for unknown objects and, most importantly, allows for an integral understanding of the physical, contextual and conceptual realms of material culture. The research of Joe Ben Wheat has aimed at establishing a key for the identification of early southwestern textiles through the analysis of well-documented specimens and comparisons of their physical traits with historic records. This paper provides an overview of the study of southwestern weaving, describes the research methodology developed by Wheat for investigation of nineteenth century textile history, briefly discusses his research results, and closes with suggestions for further avenues of study.

INTRODUCTION

Thousands of Pueblo, Navajo and Hispanic textiles are owned by museums in the U.S. and other countries. Some are proudly displayed to the public, while others are secreted away for safekeeping, for an occasional special program, or for eventual research. A small number of southwestern blankets and rugs are well-documented, but most exist without any significant accompanying data or identity. This means, therefore, that the majority have never been identified or assigned attributed dates by a specialist. Even the basic distinctions between the fabrics of the three predominant Southwest textile traditions--Navajo, Pueblo and Spanish American--have gone unrecognized or been readily confused on catalogue cards and exhibit labels. In fact, more than one older catalogue entry sparely reads, "Old Indian Blanket."

Such collections nevertheless represent a rich resource for research. In 1972, Dr. Joe Ben Wheat initiated a project to clarify the record for southwestern weaving. His main objectives were to study and photograph as many fully documented textiles in public collections across the nation as possible, and to compare their physical traits with historic written records, in order to establish a key for their identification.

With a systematic approach that reflects his background in archaeology, Wheat developed a chronology based upon materials, techniques, design styles and historical correlations for nineteenth century textiles woven in the Southwest. Many earlier assumptions regarding native weaving have been challenged. Today, a much clearer picture of the evolution of southwestern textile production can be drawn because of Wheat's pioneering work. Curators and other researchers now have a standard set of criteria to use in evaluating and identifying Native American and Hispanic fabrics (cf. Wheat 1976a, 1976b, 1977, 1979a, 1981, 1984, n.d.; Fisher and Wheat 1979).

As Wheat constructed his historical model, he assiduously retained an interest in human interactions as they affected and were affected by the southwestern textile tradition. Questions concerning the role of the individual in textile design, weavers' access to commercial materials through

early trading with Indian, Mexican, Spanish and Anglo contacts, family involvement in production, and other people-oriented topics were raised. Ideas concerning these matters were often used to frame the next set of questions for investigation--thus interpretation of the human dimension, not simply the mechanical notation of materials and the impersonal composition of a chronology, became central to the research.

Rather than compiling a report of research *products*, this paper documents the *process* of conducting a multifaceted research project with material culture. It provides a brief overview of the study of southwestern weaving, describes the research methodology developed by Wheat, traces the avenues for investigation that he followed, and closes with a discussion of the implications of such a study for further interpretation and analysis. There has been no attempt to record fully Wheat's research findings, as those will be published by him in a separate volume (Wheat n.d.).[1]

Previous Research

Reports on southwestern weaving before Wheat's research was initiated are represented by primary sources as well as early chronological reconstructions and interpretations. Original observations by early visitors to the Southwest form a baseline for any subsequent research into fabric production of the period prior to the twentieth century. Further descriptions of the native textile industry were formulated by both amateur and professional anthropologists who came to the Southwest in the late 1800s and early 1900s. During the first half of the twentieth century, a number of writers, notably George Wharton James, Charles Avery Amsden, Harry Percival Mera and Frederic Douglas, attempted to organize and interpret information about the textile traditions of the Southwest. Undoubtedly there are many unpublished records concerned with this subject. Mentioned here, however, are only those that are published and available to a general readership.

Spanish chroniclers of the eighteenth century provide the earliest firsthand glimpses of these traditions (cited in Wheat 1977: Bailey and Haggard 1942; Troncoso 1788; Hackett 1937; Hill 1940). Several Anglo observers recorded the southwestern scene of the mid-nineteenth century, including commentary on textile production and use (Bartlett 1854; Gregg 1844). Later in the century, Matilda Coxe Stevenson and Frank Cushing, ethnologists for the Bureau of American Ethnology, documented textile production at Zuni Pueblo (Stevenson 1904, 1987). Washington Matthews, a major in the U.S. Army Medical Corps and an amateur ethnologist, made a description of the tools and handwoven fabrics of the Navajo (1884) and reported on native dyes and design styles (1893, 1900, 1904). George Pepper (1902, 1903), drawing from Matthews' observations as well as his own, also documented the processes of preparing materials, dyeing and weaving. Also in 1903, U.S. Hollister published *The Navaho and His Blanket* based upon observations made on his southwestern travels during the last decades of the nineteenth century.

George Wharton James published *Indian Blankets and Their Makers* in 1914. Although it has been considered an important early reference on Navajo weaving, recent studies have revealed inconsistencies in James' methodology and have cast certain doubts on his reliability (see K. Bennett [1979] for a critical review).

In 1934 Charles Amsden published *Navaho Weaving: Its Technic and History*, based on work begun in 1929 in museums and private collections and regarded for a number of decades as the definitive reference on the subject. Still considered a classic study of its time, Amsden's book, however, is flawed by inattention to detail, incomplete observations, and retention of undocumented lore from earlier days (see Wheat n.d.; Wheat 1977:427). Nevertheless, Amsden formulated one of the first systems for categorizing southwestern weaving utilizing stylistic and physical traits. In his scheme, textiles were arranged according to functional types, material configurations and design development.

H.P. Mera, Curator of the Laboratory of Anthropology in Santa Fe, made some of the most reliable observations regarding early textile styles and categories. His pamphlet series (1938-40) and *Navajo Textile Arts* (1948; revised by Moss and Moss in 1975) outlines the basic functional and stylistic types and chronological sequences for historic Navajo weaving. His catalogue of the Alfred I. Barton collection (1949; revised as Mera and Wheat 1978) further illustrates his classification scheme. He also accomplished significant work on Pueblo textiles (1943) and Hispanic fabrics (Mera and Kent 1987). Further, E. Boyd (1974) analyzed and studied early Spanish-American fabrics; her contriutions to the understanding of that weaving tradition should not be underestimated.

Frederic Douglas of the Denver Art Museum compiled some very insightful information regarding material culture, including the particulars of Navajo and Pueblo weaving. Published in the form of the Denver Art Museum *Indian Leaflet Series* (1930-55) and *Material Culture Notes* (1937-53), his technical research provides a cornerstone to Wheat's more recent investigations. Indeed, it was the collection amassed largely by Douglas that Wheat initially analyzed as part of his pilot project. Other original works from this period focused upon contemporary Navajo weaving rather than that of earlier periods (Spier 1924; Reichard 1934, 1936, 1939; Bryan and Young 1940; Hollowell 1948). Because each included careful documentation of weaving and dyeing practices, by analogy they too have bearing upon the understanding of nineteenth century fabric construction.

The descriptive classification schemes established by Amsden, Mera and Douglas for dating and identifying nineteenth century blankets have continued in use into recent decades and, until Wheat's work, had remained relatively unchanged. During the 1960s a number of writers, especially spurred on by the Indian arts and crafts boom, directed their attention to historic weaving, with particular emphasis on the Navajo. Often relying on unverified museum records and older published sources, publications of this period often involved little new data collection or original analysis, but rather were designed with a popular rather than technical focus. Still, useful guidelines with which to categorize and interpret southwestern weaving are contained in a variety of commendable sources (cf. Kent 1961; Dutton 1961; Maxwell 1963; Tanner 1968; Kahlenberg and Berlant 1972; Brody 1976; Berlant and Kahlenberg 1977; Rodee 1977, 1981).

THE SOUTHWEST TEXTILE SURVEY

Background

Joe Ben Wheat's training and experience as an archaeologist working specifically with prehistoric cultures of the Southwest served him well in pursuing a research project focused upon historic and ethnographic material culture. Studying under Alfred L. Kroeber and Robert Lowie, he earned a B.A. in anthropology at the University of California, Berkeley, in 1937. Graduate work under Emil Haury and Edward H. Spicer at the University of Arizona resulted in M.A. (1949) and Ph.D. (1953) degrees. Both universities emphasized, among other things, the skills and tools required to make systematic analyses of material culture. Wheat's major publications, including a number of significant monographs (1954, 1955, 1972, 1979), affirm the relevance of material culture studies to archaeology specifically and to anthropology more generally.

Wheat arrived at the University of Colorado Museum (UCM) in 1953 as Curator of Anthropology, and retired as Curator Emeritus in 1986. In the intervening years he built up the ethnographic holdings from less than one hundred specimens to a collection of over 15,000 pieces with worldwide coverage.[2] In the process of expanding the UCM anthropological collections, Wheat became aware of the need for more precise technological and chronological information about Southwest textiles. He proceeded to acquire as many well-documented specimens as possible through

solicitation of donations and by select purchases. By the 1980s the textiles at UCM numbered close to five hundred and, today, they represent an extremely significant assemblage for study. Wheat, however, had already recognized a decade earlier that no one institution could possibly hold the entire key to understanding the development of the southwestern textile traditions. A broader data base drawn from the collections at many institutions was needed.

Research Strategy

Wheat designed the textile survey in response to the need for a better chronological framework and for a greater understanding of the nature of south-western weaving. His original research goals were (1) to determine whether textiles of the Southwest contain particular physical characteristics that lend themselves to identifying cultural and temporal origins, and (2) if so, to establish which of those characteristics were associated with what cultures and time periods. In order to construct this key for identification, Wheat's objective became the study of as many well-documented textiles as possible, and the subsequent comparison of their recorded features with ethnohistoric materials.

A first-hand examination of literally thousands of textiles became possible through a sabbatical year survey of selected museum collections in 1972. Through the *Museum Directory* of the American Association of Museums, Wheat contacted all institutions that listed Southwest weaving among their holdings. More than forty museums answered his request for further information. A ten-month itinerary, including the U.S., Canada, England, and Sweden, was established on the basis of this preliminary survey.[3]

From September 1972 to June 1973, Wheat visited approximately fifty museums and a few private collections, viewed over 3500 textiles from the native Southwest, and closely analyzed and photographed about 2000 of those fabrics. Pieces selected for close examination were chosen because they were accompanied by documentary evidence of their cultural origins or subsequent ownership. Over the next decade, data from this early work were extended through the analysis of other textiles and through further archival work. And in the early 1980s, the identification of a series of significant dyes was accomplished.

The following sections detail the four major thrusts of Wheat's data gathering process: the review of collection records, the description of the textiles, ethnohistorical research, and the identification of dyes.

Review of Collection Records

Basic documentation for the collections that Wheat surveyed was encountered in museum files: accession ledgers, catalogue cards, donor and accession files, and various other records maintained routinely by museums. Accompanying information included notes about original manufacture, initial acquisition by a collector, and other associations with specific persons, places, dates or events. Correspondence by early collectors was occasionally helpful in reconstructing latest possible dates for manufacture and special circumstances surrounding acquisition. Annotations on museum catalogue records by earlier scholars--Amsden and Mera, for instance --were occasionally revealing. Sometimes a number on a textile indicated a previous owner and yielded important associations, such as those textiles collected and numbered by George Heye at the turn of the century but found in museums other than his own Museum of the American Indian.

Documentation generally refers to written information (Pitt 1972:14) although some scholars use the term to cover any type of recorded evidence. Photographs, occasionally from the original collector, were another documentary medium that provided additional context and corroboration for written evidence. For example

in the collections of the National Gallery of Art, there is a photograph of George Catlin, the well-known painter of the West, with one Navajo and two Rio Grande sarapes collected by him on a 1854 trip through Arizona and New Mexico. Certain collection histories led Wheat to other archival sources for further investigation (see the section on ethnohistoric research, below).

According to the survey, the textile with the earliest known date is a blanket, now in the collection of the University of Colorado Museum, that was collected near Vera Cruz, Mexico, in 1847 by a Major Randall when he served in the Mexican War. Other complete blankets have been documented to subsequent decades, but only archaeological fragments and a very few whole textiles remain to represent earlier years. Perhaps one of the most poignant stories associated with an archaeological textile assemblage with associated historic documentation is that of the Massacre Cave fabrics from Canyon del Muerto. These were found in 1903 with the remains of a number of Navajo women, children and old men who had been killed by Spanish soldiers in 1804 (Wheat 1977: 427-427).

Well-known names have surfaced in the search for documented textiles: John Wesley Powell, the famous explorer of the Grand Canyon and first director of the Smithsonian's Bureau of American Ethnology, collected Navajo blankets and mantas in the mid-1870s.[4] Although some of these are in extremely poor physical condition, they are nevertheless extremely important because of their documentation. The noted writer and collector, Charles F. Lummis, acquired a variety of blankets in the 1880s. These, along with similar examples from a number of other collections, provide a baseline for understanding weaving of this decade.

Several textiles included in the study were associated with important historic events. For instance, a Navajo sarape, known as the "Chief White Antelope" blanket (named after its original Arapahoe owner), was acquired by an Army officer at the 1864 Sand Creek Massacre in Colorado. Now in the collections of the School of American Research in Santa Fe, this blanket, along with others in Wheat's survey, has provided the material and stylistic basis upon which other visually similar textiles have been identified and dated.

The reliability and accuracy of collection histories must be considered seriously, and Wheat's study provides numerous examples of the necessity to cross-check collection histories against independent information sources. The vagaries of memory, problems in consistent record-keeping, family rivalries, and other potentially biasing phenomena, can hinder the accuracy of collection-related stories. Wheat sought to identify and, when possible, to reconcile, any contradictions between collection histories and the physical evidence. For example, it was originally supposed that William Nicholson Grier collected a series of blankets between 1846 and 1861 before he left his post in New Mexico (Wheat 1977:431). However, certain materials and designs in these blankets did not appear in other documented textiles now in the records until about ten years later. Finally, Wheat' subsequent search of the U.S. military archives showed that Grier returned to the Southwest as commanding officer of Fort Union during 1869-70, thus documentating the collection more accurately to the late 1860s.

Describing the Textiles

The central objective of the survey was to provide systematic and objective descriptions of the textiles with verifiable documentation in such a manner that their physical features could be compared to each other and against the historic record. Ultimately, the goal was to be able to compare these known textiles with others lacking documentation. The process of attributing cultural and temporal data to unknown materials relies, therefore, upon an accurate physical description with which to begin.

The research conducted by Wheat draws attention to one of the most fundamental functions of museums--the longterm preservation and curation of objects. No matter that the museums involved had not previously sponsored extensive research projects on these particular items among their numerous holdings, nor that popular exhibitions or publications on southwestern textiles had not yet been sponsored at each of these institutions. Practically speaking, collections cannot and should not be in perpetual use. In fact, it is perfectly appropriate to allow a group of objects to 'lie fallow' until an interested specialist arrives (and often there is no alternative). For Wheat's project, the original specimens were there in the museums, awaiting study, just as many other diverse cultural materials are held by museums in anticipation of appropriate research projects.

Physical examination. Descriptive data for each textile were recorded on a standardized form in order to ensure comparability of information from different textiles and different institutions (see Figure 1). Features included the overall dimensions of the fabric, structure of the weave, side and end selvage finishes, corner details, presence and frequency of lazy lines, yarn construction (type of fibers, commercial vs. hand-production, texture, color, spin/ply configuration and count), and any other structural aspects that were noted during examination.

University of Colorado Museum TEXTILES

Type: Catalogue No.

Culture: Owner:

Weave:

Selvage:

Corner Finish:

Dimensions: Thread Count:

Length: inches; cm. Warp: per inch (2.5 cm.)

Width: inches; cm. Weft: per inch (2.5 cm.)

Lazy Lines:

Fiber	Type of Yarn	Spin	Plied	Ply	Color	Dye

Description:

Date of Manufacture: Date of Collection:

History/Remarks:

Photo: Analysis by: Date:

Figure 1. Textile Analysis Form.

Because it was not apparent at the outset which traits might emerge as important diagnostics, the physical aspects of each museum specimen were analyzed as thoroughly as possible through time, it became evident that certain features were extremely important in identifying textiles, while others appeared less useful. Corner finishes, for example, were recognized as important diagnostics as the study progressed. Consequently more space on the analysis sheet was allotted to their description during the course of the study.[5]

An analyst's perceptions of textiles and their character develop throughout the course of any study. Thus, for the collections that were examined earlier on the study tour, an analytical framework had not yet been established. According to Wheat, it took two to three months just to learn what he was looking for--to discern significant differences and to identify important features of the textiles from different time periods. Basic techniques such as selecting the proper magnification device for a specific task--hand lens, pocket scope or magnifying visor, for example--became important in expediting the investigation.

Museum records could not be relied upon and first-hand inspection became extremely important to the accuracy of the enterprise. For instance, many weft counts (threads per inch) recorded in museum files and in publications proved to be wrong because earlier investigators had failed to count the weft threads on both faces of the fabric. Descriptions of colors--the varied shades of red, for example--differed from one catalogue entry to another. Even the identification of wool versus cotton was often unreliable and so had to be ascertained for each specimen by direct inspection.

Photographic recording. Approximately three thousand Kodachrome slides of the analyzed textiles were made. Photographs were taken in many different settings and under widely divergent conditions. Yet, because of the system developed by Wheat, results were relatively uniform and provided an excellent means of comparing textiles from widely separated collections.[6] These slides were later used as mnemonic devices in reviewing analyses, as sortable records for making stylistic comparisons, and ultimately as prospective illustrations for publication.

Ethnohistorical Research

In addition to the documentation accompanying individual specimens in museum collections, many other historical sources are available for the study of nineteenth century weaving. Despite certain limitations, ethnohistoric evidence has at times confirmed the physical evidence, sometimes contradicted anecdotal information or erroneous collection "documentation," and generally provided a new dimension to the understanding of the textile tradition of the Southwest.

Federal, state and private archives were utilized in Wheat's search for relevant information. In all, almost a year of research time was devoted to archival work during the 1970s. In 1975 Wheat worked in the U.S. National Archives in Washington, making notes from those documents not available on microfilm, and selecting fifty reels of microfilmed documents that would later be transcribed and further studied. Particularly interesting were materials pertaining to the U.S. Indian Service (now known as the Bureau of Indian Affairs), including correspondence received from the Indian Agents in the field (Record Group 75, M234) and files on other Indian concerns in New Mexico (Record Group 75, T21). The New Mexico State Records Center and Archives, which contain the Spanish and Mexican and Territorial Archives of New Mexico (MANM 1821-46; SANM 1621-1821), as well as U.S. Census reports and the Archives of the Archdiocese of Santa Fe, were also fruitful sources for information. Guides to the contents of these archives have been published (Twitchell 1914; Calendar 1621-1821, Calendar 1821-46).

Wheat studied ledgers and trade invoices of Spanish and Mexican traders dating from the seventeenth century through the 1860s, and the ledgers, invoices, letters, annuity records and other documents pertaining to the Indian traders of the last half of the nineteenth century. The documents of private trading concerns such as Hubbell Trading Post (University of Arizona Special Collections) and the American Fur Company proved to be rich resources, as did the Business Archives at the University of Texas at Austin.

These ethnohistoric records yielded information concerning the quantities and types of tools and raw materials provided to the Navajo through barter and purchase with Mexican, Hispanic and Anglo traders and through their annuity provisions from the U.S. government. For instance, the purchases made by the Navajo Agent for the Navajo Indians are recorded in the U.S. National Archives, providing a fascinating annual accounting of dyestuffs, yarns and fabrics that were available in the 1860s, '70s and '80s. Breed names and numbers of sheep sent to the Southwest are documented. some of the resources, types and amounts of bayeta fabrics are indicated. As well, the amounts, types and colors of commercial yarns supplied to the Navajo are recorded.

Another productive avenue was to seek records of certain government employees who collected early textiles that have since found their way into museum collections. Frank Hamilton Cushing, Washington Matthews, James and Matilda Coxe Stevenson, John Russel Bartlett, Samuel Woodhouse--all were connected to the government in some way and all collected southwestern materials with associated documentation. Many of their records, including objects lists, are housed in the National Anthropological Archives and with the registration records of the Smithsonian Institution (Nancy Parezo, personal communication, 1988).

Certain collectors such as John Wesley Powell were well-known figures in the American West, others like Thomas Ewing, a government contractor who lived in Tucson in the 1870s, required some sleuthwork to identify more fully. A large sarape in the University of Colorado Museum collections has the initials "TE" woven prominently into its center and may have been woven for Thomas Ewing. Its materials and style attest to a date in the early 1870s. In fact, this blanket contains every color and type of commercial yarn known to have been distributed to the Navajo on December 25, 1870 according to the annuity records; this particular combination of yarns was not previously nor subsequently issued (Joe Ben Wheat, personal communication, 1981).

Pitt (1972) has cautioned against relying too heavily on documentary sources without some cross-verification. Fully cognizant of this, Wheat has sought to qualify ambiguous information and to reconcile potential discrepancies in the records. Traders in the Mexican territory, for instance, were required to pay duty on imported goods, thus their recordkeeping was not always reliable:". . . there was, apparently, considerable falsification of these documents, with joint connivance of trader and customs inspector, especially in the early years of the trade" (Wheat n.d. 121-122). While "hundreds of pounds of cotton, silk, and wool yarns appear as standard items in these invoices" (ibid.), the figures can represent minimum amounts only.

Dye Testing

Materials scientists and other special analysts can play an important role in museum research. While the physical examination of documented textiles and the archival search for corroborating information could be accomplished without outside help, certain aspects of the survey such as dye testing required collaboration with specialists. Their help proved to be an invaluable key to identifying textiles of certain time periods.

Following Wheat's museum survey and initial analyses, it became apparent that

absolute identification of certain dyed yarns, especially the reds, might be useful. Wheat explored various methods to test dyes, but had little success until Max Saltzman, Research Specialist in the Institute of Geophysics, University of California at Los Angeles, became involved. In the mid-1970s Saltzman determined the colorants in fifty-five historic Hispanic blankets for the Museum of International Folk Art (Saltzman and Fisher 1979). As a consequence, standard spectrophotometric curves in the ultraviolet and visible light range were established for a number of southwestern dyestuffs.

In 1978, Saltzman conducted a pilot study for Wheat in which ten samples from the University of Colorado Museum collection were tested using solution spectrophotometry. In addition to the expected presence of cochineal and/or aniline dyes in most late nineteenth century fabrics, the red insect dye, lac, was discovered in the trade cloth of a Navajo war shirt and in the raveled yarns of a classic blanket, both from the early nineteenth century. While cochineal (*Dactylopius coccus*, formerly known as *Coccus cacti*) comes from the New World, and lac (*Laccifer lacca*, formerly known as *Coccus lacca*) is from India. A third insect dye, kermes (*Kermes* sp.) from the Mediterranean basin, has not been detected in southwestern fabrics to date.

Once the utility of such dye testing was confirmed, samples from a carefully selected series of documented textiles were requested from a number of museums. Although all museums ultimately complied with the request, because the sampling required the removal of a minute quantity of colored fiber from each textile, it was necessary in certain cases to receive full approval from some of the museums' governing boards before samples were taken. Spectrophotometric analysis was conducted by Dr. David Wenger, then of the University of Colorado Health Services Center in Denver. From 1981 through 1983, tests were performed on nearly five hundred samples.

Analysis of the Data

Wheat's identification scheme and chronology for southwestern weaving was established through a comparison of data from the historical and material sources described above. The detailed compilation of individual textile histories, design styles, materials, and dyes for documented textiles was followed by the comparison of these features, singly and in combination, across cultures and through time.

Known dates for specific textiles were tabulated and cross-referenced with the occurrences of various physical features: weave structures, selvage techniques, corner finishes, lazy lines, fibers, colors, dyes, yarns, twists and plies, and so forth. Data on aspects of design--motifs, layout, color schemes--as well as technical traits were graphed. Individual as well as group tables were made for the various functional and stylistic types such as ponchos, sarapes, chief blankets, wedgeweaves, two-piece dresses and saddle blankets. Documented pieces were highlighted through-out the tables as a means of building a temporal framework around the noted physical characteristics.

Identifying a textile from its materials or weave or design alone would be difficult and likely inaccurate because it is the series of related diagnostic features that are significant in assessing any given textile. Although Wheat's entire identification scheme cannot be presented here, a brief description of some of the results will indicate the nature and utility of his findings.

Styles. Differences in design and style have long been acknowledged as important criteria in the identification of southwestern textiles. Through the large visual data base compiled by Wheat, finer distinctions in the treatment of woven patterns by Pueblo, Navajo and Hispanic weavers were recognized. The occurrence of specific motifs, such as crosses, terraced diamonds or 8-pointed stars, often are linked with certain regions and time periods. The

rhythm of certain striped or banded patterns, the layout of bordered designs, and a variety of other aesthetic cues may contribute to the identification or dating of a textile.

At the same time, the fickle nature of design must be acknowledged: more than materials or techniques, graphic designs can be shared between cultural groups and can recur in different time periods. Thus designs should often be employed as corroborating, rather than definitive, features of analysis. The multifaceted nature of Wheat's research reinforces the necessity of considering all features in an integrated manner rather than relying upon one criterion such as design alone (Wheat 1976c).

Construction. Important distinctions between Pueblo, Navajo and Hispanic selvage systems were suspected in the early stages of the research, but the real value of such data was demonstrated when they were charted out and correlated with the documentary evidence. The nature of the corner finishes, the presence or absence of lazy lines, the proportion of warp to weft counts (i.e. the spacing of the yarns and consequent density of the fabric), and many other construction features also had to be put into perspective against historic information and other evidence before being used to identify unknown textiles.

> . . . research has shown that there were fairly consistent differences in various technical features which usually enable the student to distinguish between textiles woven by Navajo, Pueblo, and Spanish weavers. Spanish blankets were usually woven in two pieces which were then sewn together, or which had doubled warps at the center, while Pueblo and Navajo textiles were always of one piece. Indian weavers used single-ply warps, while the Spanish used two-ply warps. The ends of Spanish blankets had warps which extended beyond the web and which were tied into fringes or tied off with various kinds of knots, while Indian blankets had selvage cords along both ends and sides. Among the Pueblo weavers these generally consisted of three cords of two plies each, only loosely joined at the corners, while the Navajo usually used two cords of three plies each to form the selvages and joined them tightly at the corners. Sometimes Spanish blankets have pseudo-selvage cords added by repairers, but they are not original. Navajo blankets were frequently woven a small area at a time, leaving diagonal "lazy lines" in the web, while such lines are rarely found in Pueblo weaving.
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> Spanish and Navajo blankets of all kinds are usually woven in tapestry weave, including the tapestry twills of the Navajo, while the Pueblos preferred plain weave or plain twills both diagonal and diamond. (Mera and Wheat 1978:6).

Materials. Raw materials and types of yarn proved to be important diagnostics. Physical changes such as the differing textures, contrasting diameters and varied grease contents of handspun wools were correlated with archival information about the introduction of different sheep breeds into the Southwest, ranging from the Andalusian *churro* to the Spanish *merino*, French *rambouillet* and others.

> As the wool changed over the years, the character of the yarns spun from them changed also, from the naturally worsted yarns of churro wool to the coarse, greasy woolen yarns from the mixed breeds. It is usually possible to determine, by an examination of the native spun yarns in a blanket, its approximate place in time, an approximation that may be refined by observing other features such as the associated raveled or commercial yarns, the dyes, and the designs (Wheat n.d.:43).

The analysis of raveled yarns has yielded particularly important information for dating textiles. Once thought to be a relatively simple suite of yarns from imported cloths, the varied nature of raveled materials was revealed by Wheat both through technical analysis and through archival research. Raveled yarns may be either s-spun or z-spun, woolen or worsted in texture and structure, colored with natural (plant or animal) or synthetic (aniline) dyes. They were used singly and in groups, and also in cut strips with both warps and wefts still present. Further differences were discerned when the red dyes used on many raveled yarns were tested and proved significantly to be lac, cochineal, or anilines. Trade records attest to many foreign sources and many types of fabric that were involved in the Southwest market.

The analysis of commercial multiple-ply yarns, not raveled, proved to aid in establishing temporal sequences, again, especially when correlated with archival data. Textural differences between the early Zephyr, rare Saxony and more common Germantown yarns occurred at specific times. Even more obvious, a change from 3-ply to 4-ply Germantown yarns was noted in textiles of the 1860s and 1870s.

> Throughout the Spanish period, commercial yarns were standard items of commerce in New Mexico. Wool and silk yarns from Europe and China, and from Mexico itself reached New Mexico through the annual supply trains and the trade fairs. After 1821, the supply of yarns increasingly came across the Santa Fe Trail. Saxony yarns, a fine 3-ply spun from Saxony Merino sheep, dyed with indigo, cochineal, madder, and other commercial dyes of the day, was one of the main yarns imported, and while it was commonly used in Spanish-America weaving for decorative detail, it does not seem to have been much used by the Navajo until late Classic times, that is, from about 1845 to 1865. During the period, it was employed fairly often, and a number of blankets were made entirely from Saxony. After the commercialization of aniline dyes in 1856, another commercial yarn made its appearance among the Navajo. This was "Early Germantown" yarn, like Saxony, of three plies, but dyed with aniline dyes in a wide variety of colors. Most of these yarns are either very dull yellows, greens, browns, and lavenders, or highly saturated orange-reds, blues, and yellows, but of little luster. They were in use by 1864 and continued in use until about 1875, when they were increasingly displaced by 4-ply "Germantown" yarns of the same character. (Wheat 1977:422-423).

Dyes. The results of the dye tests, even though restricted primarily to the red portion of the spectrum, were extremely gratifying. Not only were unexpected dyes like lac revealed, but previously unidentified combinations of dyes (notably, cochineal and lac used together in varying proportions) were discovered. Most importantly, certain dyes correlated quite well with specific time periods and with yarn configurations and design styles:

> . . . lac was the most common red dye from the late 1700s to the early 1860s when lac was almost completely replaced by cochineal. Lac has an overwhelming association with fine-threaded, S-spun yarns raveled from worsted cloths, more than 95 percent of all early raveled yarn falling in this category. The shift from worsted yarns to woolen yarns beginning about 1860 corresponds to the shift from lac to cochineal dye. Except for small amounts of locally woven bayeta, and perhaps some from Mexico or Spain, all early bayeta was a worsted cloth dyed with lac (Wheat n.d.:72).

BEYOND THE MATERIAL

The southwestern textile tradition, systematically identified and described by Wheat, is intimately entwined with the ethnographic cultures of the Pueblo, Navajo and Hispanic peoples. As Schlereth (1985:23) reminds us, it is the culture not the material that should be the ultimate focus of our material culture endeavors. Throughout his writing, Wheat makes reference to the weaver, not just the weaving--discovering the "identity of the weavers" (Mera and Wheat 1978) has been the ultimate goal.

The implications of Wheat's research for an understanding of cultural processes, more broadly speaking, are many, but it must be acknowledged that this work is still in the developmental and exploratory stages. Wheat's own analytical work in this area has focused upon southwestern trade relations and the nature of the development of Pueblo, Navajo and Hispanic weaving (Wheat 1979b).

To date, studies building on Wheat's foundation have predominantly emphasized external relations between weavers and the market, and have remained relatively close to their data. The Museum of International Folk Art project (Fisher 1979) to document the Hispanic textile tradition of New Mexico and Colorado has been one of the most significant institutional endeavors to uncover and disseminate new information. In her contribution to *Ethnic and Tourist Arts: Cultural Expressions from the Fourth World*, Kent compared "the differing reactions to acculturation shown by Pueblo and Navajo weavers" in an essay that goes beyond the facile comparison of cultural types (1976:98). She also made several

major synthetic contributions to the scholarship of Southwest textile prehistory and history, drawing on her own extensive and systematic examination of museum textiles coupled with her understanding of Wheat's research results (Kent 1983a, 1983b, 1985). More recently, Whitaker, a former student of Wheat, has endeavored "to outline implicit Navajo values and behaviors" (1986:-xxx) through an examination of foreign contributions to the Navajo design repertoire and an application of symmetry analysis.

Once basic materials analysis and culture history are established, the interpretation of the descriptive data in light of anthropological theories at other levels of abstraction becomes possible. A wide array of provocative topics is waiting to be addressed in the future. Certainly the mechanisms for and operational relationships between internal change and external influences in the nineteenth century are not yet fully explicated. Too, the articulation of aesthetic concerns with economic motivations could be explored productively (cf. Schneider 1987). Studies of twentieth century weaving practices and perspectives will provide rich comparisons for work on the nineteenth century (cf. Hedlund 1983, 1988). Topics such as the relationship between religious texts, contexts and woven iconography; gender roles and the division of labor; and technological evolution and task specialization should be fair game for theoretically-oriented, processual studies based upon material and archival records.

CONCLUSION

Through Wheat's methodological research, the basic tools for understanding southwestern textiles of the nineteenth century now exist for future application. Wheat and other scholars will continue to refine and extend the identification process according to new data recovered from museum collections and from archives. Today, many museums around the nation maintain copies of Wheat's original handwritten analysis sheets concerning their collections. They are regularly referred to by staff members and visiting scholars. With established criteria by which certain decisions regarding provenience can be made, curators and collectors may now correct their records, update identifications, and critically review collection histories, paving the way for future scholars.[7]

This paper has traced the several influences that led to Wheat's southwestern textile study--from the earliest recordings of observations by travelers in the Southwest to more recent categorizations of the weaving by museum curators and other writers, to Wheat's own scholarly background as an archaeologist, and to his interest in cultural distinctions and historical sequence. The design of Wheat's multi-faceted survey was shaped by these influences. As the basic temporal and historical outline of the native southwestern weaving tradition may now be better understood, opportunities to investigate other social, cultural and symbolic themes concerning native fabric production and use are, in turn, shaped by what has gone before.

The search for empirical keys with which to unlock the subtleties of museum materials and to correlate them with temporal and cultural origins has resulted in the conservative construction of a "framework of facts" (Pitt 1972:46) that brings together many data sources. The process relies on a complex of features, not a simple set of diagnostics. Underscored throughout this work is the importance of systematically examining all available evidence from both material and documentary sources. In sum, Joe Ben Wheat's southwestern textile project has demonstrated the utility of combining collections and archival information for a better understanding of material culture.

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NOTES

1. The author studied as an undergraduate (1973-74) with Wheat and was subsequently employed by the University of Colorado Museum as Wheat's graduate research assistant (1978-82) and as Curator of Anthropology (1982-84); her doctoral committee was chaired by Wheat.

2. The UCM archaeological collections, established largely by Earl Morris in the early part of this century, have also been expanded considerably under Wheat's tenure.

3. Wheat's itinerary for the 1972-73 research trip was as follows:

September--Kansas City and St. Louis, Missouri; Springfield and Chicago, Illinois; Beloit and Milwaukee, Wisconsin; Bloomfield Hills, Michigan.

October--Rochester, New York; Hanover, New Hampshire; Andover, North Andover, Salem, Belmont and Cambridge, Massachusetts.

November--Stockholm, Sweden; London, England; Cambridge, Massachusetts; Bristol, Rhode Island.

Mid-November through January--New York City.

February--Philadelphia, Pennsylvania; Washington, DC.

March--Winston-Salem, North Carolina; Coral Gables and Gainesville, Florida.

April--Dragoon, Tucson, and Phoenix, Arizona; San Diego and Los Angeles, California.

May--Seattle, Washington; Pendleton, Oregon; Pocatello, Idaho; Flagstaff, Arizona.

Mid-May through June--Santa Fe, New Mexico.

Subsequently, collections were also studied in Boston; Washington, DC; Canyon and Lubbock, Texas; Colorado Springs, Colorado; Cheyenne and Sheridan, Wyoming; Berkeley, California; Spokane, Washington; and Calgary, Alberta.

4. Several museums hold specimens collected by Major Powell. This is due, in part, to the active trading of scientific specimens between museums and anthropologists in the late nineteenth and early twentieth centuries (Parezo 1987).

5. In contrast, "History"--for the recording of documentation--was an important entry conceptually, but because many textiles had either little pertinent documentation or so much that it would be recorded elsewhere, this category was reduced to a minimum on the analysis form.

6. An efficient and portable photographic system became a very important element of the research project, and required some advance experimentation. Wheat required that the system be self-contained, with no need for borrowed lighting or other museum equipment. He selected a 35mm Nikon camera, a high resolution Micro Nikor lens (producing 110 lines/mm in the image), a dedicated automatic 64 color slide film. Several published textile collections were surveyed and the dimensions of approximately one hundred textiles were compared and plotted in order to establish the appropriate size for a photographic stand to support each textile. The sizes ultimately clustered into several basic groups for which a stand was specially designed. The portable stand was constructed from a standard telescoping light stand, with folding wooden appendages attached to the top, from which the textiles could be suspended. White muslin was hung from the stand and provided a neutral backdrop for each textile. Color and grey scale cards and a measuring rod (centimeters and inches) were attached to

the stand. While carefully metered, photographs of critical textiles were also bracketed to obtain an optimum exposure.

7. An intriguing by-product of Wheat's scholarly work has been the interest shown in the research results by private collectors, gallery owners and others who buy and sell historic textiles. The complex mechanisms of proving authenticity through dating, sourcing and otherwise identifying have attracted a wide and supportive audience.

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