IDENTIFYING ACADEMIC SUBCULTURES WITHIN HIGHER EDUCATION RESEARCH: AN EXAMINATION OF SCHOLARS' CAREERS THROUGH AUTHOR COCITATION

by

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(ABSTRACT)

Sociologists ask a myriad of questions about their cultural environment, the relationships which are formed within it, and the social products of human interaction. In recent decades, sociologists have begun to ask these questions of the scientific research community. They have been interested in identifying the social and intellectual connections which bring together scholars and their ideas, forming subcultures within academic disciplines. The present study, which follows this line of sociological inquiry, employs author cocitation analysis to identify the distinct subcultures which characterize the field of higher education research. The cocitation patterns among the twenty-one most highly cited researchers in the field are examined through multidimensional scaling, cluster analysis, and an analysis of the authors' vitae which reveals the cognitive and social contexts of the authors' citation careers. A unique temporal factor is introduced, dividing the scholars' careers into time periods based on the dates of their cited articles, in order to evaluate the extent to which author's cognitive interests and relationships change over time.

The statistical analyses reveal that three dimensions and five clusters best characterize the author cocitation data. As a result of these quantitative analyses, and the more subjective analysis of the authors' vitae, five subcultures are identified within the field of higher education research: **Organizational Structure and Leadership in Academia, Impact of College Environment on Student Outcomes, Material and Nonmaterial Culture of Academia, Student Perceptions and Effective Teaching, and Hierarchy and Inequality in Education.** The temporal analysis reveals that six of the authors move from one subculture to another at some point during their careers; these subcultural shifts are explained through examination of the authors' changing research foci and career developments. The subcultures are compared on characteristics such as cluster stability, and the length and extent of influence of the subcultures on the larger culture of higher education. The unique contributions and the methodological limitations of this study are discussed, as are suggestions for further analysis of higher education research. Finally, the present methodology is reviewed in relation to its applicability to the exploration of other academic cultures, using several areas within sociology as illustrations.

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Perhaps one of the hardest things to explain about writing a dissertation--besides the title--is why at times it feels as though the process feels like the loneliest enterprise one has ever undertaken. Its true that so many people are there to give you support, understanding, love and scholarly attention. But, there are moments when it overwhelmingly feels as though it is all up to you--and it is! No one is there in the car with you as you drive to the office at 5:30 am to make yet another revision before classes start for the day; no one is with you in front of the computer when you just don't think you can rephrase that sentence or reformat that table or rethink that interpretation one more time; no one is with you when you read the note from a special child in your life who asks you to please come home this weekend. So many people are behind you, pulling for you and cheering you on, but no one (except the NCAA basketball finals or Weekend Edition on NPR) is there to get you through that last weekend of rewrites. They would be if they could, but they can't. The reason is that the whole point of this exercise is to train you to be a scholar who can stand on your own, to be the expert on this particular subject. Regardless of the thousands of hours of coaching and collaborating and teamwork which leads up to the final product, there is that moment at which your mentor pushes you out of the nest and says "You can do it, you must do it, you will do it! I'll never be out of reach, I'll always be there to steady you if you stumble, but it is your time to shine." Until you prove to him and to yourself that you can stand on

your own, even in the midst of those moments of feeling confused and alone, the project is not complete.

Alan Bayer was that mentor and friend who somehow knew exactly when to stand by my side and when to send me out to work on my own--it took lots of practice and many years--but he came up with a winning combination. There were more than a few moments when I was ready to bail out--literally--but he was always patient, understanding and confident in my abilities. I could see the wheels turning in his head as he'd come up with a new creative way to spur me on. When I wouldn't be in touch for weeks and weeks, he'd know just what to say when he heard my sheepish voice on the phone (I should thank his daughters for training him well!). I'll never be able to express the respect and deep emotion I have for this man who is the reason I am finally Dr. Mead. All I can say is that I hope I have made him as proud as he deserves to be.

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Lexington, the Allegheny Highlands, Agnes Scott, and those all around Virginia and beyond who always knew I could do this, even when I didn't. Thanks to my fellow graduate students (past, past past, past past past and present!) who struggled along with me whether near or very far. I missed you the most during those all nighters! Thanks to my former students and great friends in Blacksburg who kept me happy, smiling--and sometimes solvent--even in the worst of times. Thanks to the faculty and staff of the several departments for whom I have worked (or hung out!) at Virginia Tech--you didn't forget me after all these years and now you can say you knew me when. . . . Special thanks to the staff (and machines) at the Center for Survey Research--I know you will miss me terribly! What would I have done without you in those last days (weeks, months--years!)? To my colleagues, students and friends at Ferrum College and Radford University--thank you for your patience, understanding and encouragement throughout the latter portion of this process. And to my new found friends and family in Floyd--you know that my well-being over the last several years has depended on your acceptance and love. I look forward to coming home (for good!), being close and being a very special part of your lives for a long time to come.

I feel sure I have forgotten someone--but not really--you are all here in my heart and on these pages (whether or not you can understand a single word!). You deserve so much more than thanks. But knowing all of you, its probably enough for you to know that you each had a hand in lifting me to the heights of my ability. And even more rewarding--you can all breath a sigh of relief--I did it! The last revision is made, and the last question is answered--well no, I have one more: is it true, can I really sleep now?

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CHAPTER ONE

INTRODUCTION

Sociologists ask a myriad of questions about their cultural environment, the relationships which are formed within it, and the social products of human interaction. They examine the roles played by the social actors within particular institutions, the modes of communication, the means by which people are rewarded, the norms and values that guide their actions, and the nature of the organizations in which people interact. Sociologists inquire about the growth and stability of the social institutions which are formed through human interaction, and attempt to explain the priorities of the people within the institutions as well as the perpetuation of systems of stratification which characterize the institutions.

In recent decades, a growing number of sociological scholars have begun to ask these question of the cultural environment within which they, as professionals, are most directly immersed: the scientific research community. In studying the structure and process of scientific inquiry within academia, sociologists' questions are no different from those posed by their colleagues studying other institutions. They study patterns of interaction among scientists, how they gain status, the norms and values to which they adhere, how they are organized formally and informally, and the ideas and techniques which distinguish them as a cultural entity.

It is with these sociological questions that this present paper is concerned in an effort to identify the academic subcultures within a particular scientific research

discipline; that is, higher education research. To accomplish this goal, the present study employs an analysis of author cocitation, itself a manifestation of the communication system and the reward structure in academia. The product of this analysis is a literal and figurative mapping of the organizational structure of the field of higher education research, in terms of the ideas that are shared among the members of the identified subcultures and the social structural context in which they have developed their cognitive linkages.

Gaining a greater understanding of the subcultures within the field of higher education research through author cocitation is important in order to identify the priority issues for those involved in the perpetuation of the institution of higher education. This information is helpful in discovering which issues within higher education are receiving adequate scholarly attention and which are not. For instance, are issues related to the needs of college and university students, or to equal opportunity in education, as high a priority among researchers as are the financial needs or the needs of the administrators of higher education? Tracing the citation and cocitation patterns in particular academic subcultures can provide a scholar--beginning or experienced--with the paths by which to discover the works of those doing research on the issues considered most important to higher education. The present study, which identifies the academic subcultures within higher education research, is the initial step in this process.

By way of introducing this treatise, the first section of this chapter consists of a discussion of the sociological implications of studying the academic research community through the use of citation data. The second section outlines the entire

study by previewing each of the subsequent chapters.

THE SOCIOLOGICAL IMPLICATIONS OF STUDYING ACADEMIA THROUGH CITATION ANALYSIS

Prominent sociologists such as Robert Merton, Harriet Zuckerman, Nicholas Mullins, Stephen and Jonathan Cole, among others, have been interested in identifying the social and intellectual connections which bring together scholars and their ideas, forming subcultures within academic disciplines. Author cocitation analysis, which has been used to map relationships among leading scholars in a variety of academic areas, has added a quantitative dimension to previous qualitative sociometric analyses of scholars within an academic discipline.

"Science is a social enterprise, a culture or tradition and a set of social arrangements for developing, certifying and communicating knowledge" (Zuckerman, 1988:513). Within the tradition of scientific pursuits in academia, scholarly publication has become the means by which scholars claim their status in the scientific community and share the knowledge they generate. Making their work public in this sense is the basis of Merton's scientific norm of communism (communalism), which recognizes knowledge as the product of social collaboration through collective effort and the free sharing of ideas and findings (Merton, 1968). The publication of an author's work and its subsequent citation by others in the field are considered crucial indicants of the value of the researcher's contribution to the scientific community. Peer recognition through these means is important to the scholar in terms of affirming that his or her work matters to science (Merton,

1968).

As Pierce (1990) notes, citation is a social act. Citation practices reflect and impact upon social relationships within a community of scholars. Authors cite other published work for a variety of reasons: recognition of historically significant contributions to the field; acknowledgement of related research; affirmations, corrections or disclaimers of previous research; identification of crucial work done previously or being done currently in the field--to name a few (Budd, 1992; Garfield, 1965). Regardless of the nature of the citation, the author composing the citing work deems the cited reference to have had sufficient impact on his or her subject matter to be included. Zuckerman (1988) states that peer citations are critical measures of role performance; in addition, they are highly influential in determining reputations among peers in the field and even in prestigious academic appointments and have been found to be correlated with other indicators of research excellence (Zuckerman, 1988; Cole and Cole, 1973).

In addition to the advantages that the publication and citation of his or her works afford the individual scholar, the production and sharing of scientific knowledge are essential elements in the culture of the academic profession (Kuh and Whitt, 1988). Kuh and Whitt define culture as "the collective mutually shaping patterns of norms, values, practices, beliefs and assumptions that guide the behavior of individuals and groups" (Kuh and Whitt, 1988: iv). Each scholar is a part of the distinct independent cultures of 1) his or her own discipline, 2) the scholarly profession, and 3) the national network of scholarly institutions (Kuh and Whitt, 1988). In essence, the academic culture shapes and is shaped by

interactions of the scholars involved. Kuh and Whitt believe that it is the culture of his or her own discipline that is the primary source of identity of the scholar, shaping him or her over time from graduate school through retirement. The impact that this culture has on a scholar becomes even more definitive as the area of scholarship narrows in focus (Kuh and Whitt, 1988).

The culture of each academic discipline includes assumptions about what is to be known and how it is to be discovered, what tasks should be performed, the standards by which to measure an effective performance, patterns of publication, and social and political status (Kuh and Whitt, 1988). Disciplines are exclusive social institutions which require that members possess specialized knowledge gained at least in part through their interaction with others in the field (Pierce, 1990). The cultural values of a discipline and one's acceptance within the discipline are affirmed by interaction with local, national and international colleagues in the form of what Crane (1972) calls "invisible colleges." Academic disciplines further divide into subcultures, or regular interactions among people who share a sense of group solidarity, with similar problems and actions based on a collective understanding of their situation. These subcultures can emerge due to the physical proximity of scholars, shared tasks or ideas, or by accident (Van Maanen and Barley, 1985; Becher, 1989).

Early studies concerned with defining subcultures within scholarly communities examined social arrangements and patterns of communication among members through interview data and anecdotal information. More recently, cocitation analyses (i.e., how often particular scholars are cited together in the

literature) use quantitative techniques to define cognitive relationships among authors and demonstrate the spatial proximity of scholars in terms of such cultural characteristics as their ideological approaches, the particular problems addressed in their work, and their methodologies. To a large degree, spatial proximity maps derived from author cocitation analyses are bibliometric versions of classic sociometric analysis in sociology (Metz, 1990). White (1990a), the leading advocate of author cocitation analysis, points to the value of combining the earlier qualitative and later quantitative strategies in a single analysis, in which the social relationships of scholars and the cognitive proximity of their works are examined to better understand the nature of scientific communities.

"Scientists are social beings and science is a social activity and scientific understanding is an expression of that activity" (Whitley, 1974: 71). Whitley suggests that scientists' actions must be examined in the context of both their cognitive and social environments--environments which are ultimately connected but do not always have identical levels of cohesion or integration. An identifiable cognitive collective of researchers may not form a highly integrated social group--especially if there are many facets of applicability of the basic cognitive tenets or if the research area is in an early stage of coagulation. However, if one is able to distinguish one cognitive subculture from another by identifying certain problems and issues which belong primarily to each of the separate subcultures, then investigation of possible parallel connections within the social structure can offer further confirmation of the nature of different subcultures within the discipline. Characteristics which signal greater social cohesion among subculture members

include common membership in professional societies, attendance at the same professional meetings, publication in the same journals within a particular specialty, and collaboration or coauthorship. Identification of academic subcultures through the examination of both cognitive and social structural ties adds strength to the categorization of those subcultures in terms of reliability.

With the explosive growth of scientific knowledge, the social and cognitive structures which provide the context for this growth, and the movement of scientists within and between these structures, must be continually examined (Zuckerman, 1988). According to Cole and Zuckerman (1975: 139), "the emergence of new scientific specialties as cognitive and social entities seems to be a fact of the modern scientific life that is little understood." Zuckerman (1988) notes that previous research on the social organization of science has underemphasized the importance of the cognitive domain of science, while research on the sociology of scientific knowledge has slighted the social domain. Yet, that is not the case with more recent attempts to blend the two domains by examining the common orientation of authors as demonstrated by a convergence of citations to their work. These inquiries have focused on the research process as a social act performed within an organizational structure--examining its reward and evaluations systems and its channels of communication, mapping its organizational structures and identifying the cultural ethos (the norms and values) of the scientists within the academic subcultures (Cole and Zuckerman, 1975; Zuckerman, 1988; Merton, 1973). This type of blended analysis is critical for a sociological analysis of the cognitive structure of science and an understanding of the

fragmentation, cohesiveness or interconnectedness of the conceptual nature of an academic discipline (Cole and Zuckerman, 1975). Zuckerman (1988: 536, 539) suggests that in such a sociological analysis the following questions must be asked: "what can be learned, if anything, about specialties and the structure of science from the procedure of cocitation analysis? . . . how are [specialties] socially as well as cognitively organized? . . . how are these social and cognitive units linked together to form the larger structures of science?" This dissertation directly addresses these research questions.

OUTLINE OF THE PRESENT AUTHOR COCITATION ANALYSIS OF HIGHER EDUCATION RESEARCH

The present author cocitation analysis of higher education literature addresses these research questions posed by Zuckerman (1988) by demonstrating that, in this case example, authors who are frequently cocited form identifiable subcultures within the academic discipline of higher education research. Specifically, this study answers the following questions: How many distinct subcultures can be identified within the field of higher education? Which of the most highly cited authors in the field belong to which subcultures? Do these authors change subcultural affiliation over time, and if they do, why? What are the key scholarly issues addressed by the authors associated with each subculture (as revealed through their publications and institutional affiliations)? Do the subcultures differ in terms of their contribution of crucial research to the culture of higher education, and if so, in what ways? In answering these questions, the present

analysis identifies the current priorities of higher education research, laying the groundwork for future research to identify issues pertaining to the institutions of higher learning which have not yet received the fullest attention from the most prominent scholars within the discipline.

Chapter Two consists of a literature review of the research foundations of author cocitation analysis. It begins with a brief overview of early citation studies and reviews the importance of document cocitation analysis as a landmark development in the field. The primary focus of the second chapter is a summary of the key studies which have employed author cocitation analysis as a methodological tool. The summary addresses the topics to which this methodology has been applied, the criteria used in selection of subjects, the different techniques employed in the body of author cocitation research, and the results of these key studies.

Chapter Three embodies a detailed description of the methods employed in the present study. After a brief introduction, this chapter begins with a discussion of the utility and the limitations of citation analysis as a methodology. The next section outlines the selection process by which the twenty-one authors who are the subjects of this analysis were chosen. This chapter also covers the reasons for the introduction of the temporal factor in the analysis, how it is different from temporal factors used in previous analyses, and why that factor is important to the understanding of how each author's rich career contributes to the formation of the academic subcultures. The section which follows outlines the details of the quantitative analysis, including an explanation of the intricacies of the cocitation

matrix. It also presents a detailed explanation of the statistical procedures employed in the multidimensional scaling and cluster analyses of cocitation frequencies among the most prominent authors in the field. A final section in the methods chapter is a description of how an analysis of the researchers' curriculum vitae is used to examine the extent to which organizational memberships and other social relationships within the professional community provide the social context of the researchers' cognitive associations. This discussion explains the utility of combining the cocitation data and the analysis of the researchers' vitae in an attempt to offer a clearer picture of the convergence of the cognitive and social domains of the authors' careers. Such a combination of methods more fully illustrates the nature of the academic subcultures which define the field of higher education research.

Chapter Four presents the results of statistical analyses, supplemented by the background information provided in the authors' vitae. The first section presents the results of the multidimensional scaling, including the selection of the optimal number of dimensions, the interpretation of statistics associated with the optimal solution, and the definition of each of the resulting dimensions. The next section of this chapter consists of a discussion of the cluster analysis, beginning with the results of the selection process of the optimal number of clusters. This section concludes with a figure and description of the three-dimensional representation of the MDS solution and mapping of the cluster analysis. A determination of the characteristics of the clusters and the formal labeling of the clusters follows, showcasing the results of the combined cocitation data analysis

and analysis of the background information on the authors' vitae.

Chapter Five summarizes the ways in which this dissertation addresses the questions posed by Zuckerman (1988) regarding the utility of cocitation analysis in illuminating the culture of academic disciplines. In this concluding chapter, the results of the present study are discussed in terms of their contribution to understanding the organizational structure of the higher education research community through the identification of its academic subcultures, and the effect of the temporal factor on the formation of those subcultures. The subsequent section addresses the methodological limitations and suggested solutions brought to light in this analysis. Next, the chapter highlights the unique contribution made by the present study to author cocitation methodology and to scholarly research in general. It then outlines alternative avenues for methodological expansion which could be used in further study of cultural links within the discipline of higher education research. The concluding chapter ends with a discussion of the manner in which the methodology employed herein might be applied to other areas of sociological inquiry.

CHAPTER TWO

LITERATURE REVIEW

Research dedicated to the identification of subcultures within an academic discipline has become increasingly quantitative over time. This research has its roots in the early developments of bibliometrics, and more specifically, citation analysis--sociologically related techniques proposed initially by Price (1963) and Garfield (1964; 1979) among others. Cocitation analysis emerged from this early work with the advent of Henry Small's (1973, 1977) examination of the cognitive structure of a scientific field as revealed through relationships among published documents. More recently, Howard White (1981a, 1983) and others have introduced author cocitation analysis, in which citations to the career publications of a single author are compared to concomitant citations to another author's work in order to determine the cognitive structure within a discipline. Author cocitation analysis--which has been used to map relationships among those identified as leading scholars in such diverse fields as genetics, information science, and economics--has added a quantitative dimension to previous qualitative sociometric and historical analyses of scholars within an academic discipline. This review of literature briefly traces the historic evolution of cocitation analysis, and then summarizes the research in which author cocitation analysis has been used, describing the academic specialties which have been studied, the procedures for

selection of the authors (research subjects) in each study, and the methodology and results used.

EARLY CITATION STUDIES

Bibliometric procedures, or quantitative analyses of communication through scholarly publication (Pritchard, 1969), have been employed for over fifty years in the field of library and information science. A primary method of bibliometrics is citation analysis. As the sociology of science emerged, bibliometrics, and especially citation analysis, became a key method in the works of such scholars as Derek Price (1963) and Robert Merton (1973) who were interested in mapping change in science and in assessing the interaction of scholars within the scientific community. Citation analysis has been used to study the relative productivity of research organizations, academic departments, and research groups; to assess the relative impact of the various journals in a field; and to ascertain the relative eminence of individual scholars. Another focus of bibliometric studies has been attention to the formation, development and intertwining nature of specialty areas within a larger discipline (Bayer *et al.*, 1990).

Sayers (1983) points out that the first efforts at enumerating citations began in 1873 as a means to record legal precedents for lawyers. However, with the advent of citation indices published by the Institute for Scientific Information (*Science Citation Index*, beginning in 1963; *Social Science Citation Index*, beginning in 1973; *Arts and Humanities Citation Index*, beginning in 1978), citation analysis

emerged as a non-reactive, unobtrusive measure of communication between scholars within a discipline. These rich sources of citation data (recently made available electronically) include frequencies of citations to documents, senior authors, and journals, as well as other information.

Lane (1984) and Sayers (1983) note that bibliometric analysis has been used in recent decades to add an objective aspect to the analysis of scientific interrelationships which before had been the subject of historical classification schemes or more qualitative sociometric analyses using surveys, interviews and anecdotes delineating relationships among scientists in various disciplines (Cole and Cole, 1973; Mullins, 1973; Mullins, Hargens, Kecht, and Kick, 1977; Hagstrom, 1970; Crane, 1969, 1970, 1980). Enumeration of cited references to published works has been used by sociologists of science, and increasingly by those charged with evaluation of scholarly performance, to acclaim the pre-eminence of a particular author, to bolster the reputation of academic departments, and to evaluate the contribution of an entire educational institution to scholarship in various academic fields (Muffo *et al.*, 1987).

DOCUMENT COCITATION ANALYSIS

Cocitation is the frequency with which two pieces of scholarly literature are cited together in work published at a later date. Cocitation analysis is based on the premise that "the greater the number of times that a pair of documents are cited together, the more likely it is that they are related in context" (Bellardo, 1980:

231). While White (1990a) notes that other scholars made early contributions to the field of cocitation analysis during the 1950's and 1960's, the work of Henry Small (1973) is considered the cornerstone in the field of cocitation. Small introduces the use of document cocitation analysis to discern patterns of influence in the communication of scientific knowledge. Lane (1984: 5) states that document cocitation can be seen as "a measure of the degree of relationship or association between papers as perceived by the population of citing authors." Small (1973) shows that cocitation patterns can reveal changes in interrelationships among specialties which may denote the evolutionary development of a field. Subsequent works by Small and others apply document cocitation analysis to a variety of scientific disciplines, including biomedicine, physics, psychology, sociology, psychiatry, and information sciences. Sayers (1983) reports that the use of cocitation to accurately identify cognitive structures within a discipline has been validated through triangulation using various archival and survey methods.

AUTHOR COCITATION ANALYSIS

White (1981a, 1983), White and Griffith (1981a, 1981b, 1982), and more recent scholars follow Small's lead, but expand document cocitation analysis by examining linkages between cited references to the entire body of two authors' career publications (called "oeuvres") rather than single documents authored by two scholars. White (1990a:90) explains that these "studies involve a file of authors as units of analysis, and the variables are how often each has been cocited with every

other author in the file. The data are the overall magnitudes of citation and co-citation." Culnan *et al* (1990) provide a helpful synoptic description of author cocitation analysis. They explain that cocitation results when:

> a researcher cites a work of any author with the work of any other author in footnotes or endnotes. Authors whose works are repeatedly cited together in subsequent publications are seen as related. Such authors tend to cluster together when mapped [through the use of various statistical techniques] while authors who are rarely or never cited together do not (p. 454).

Discernible patterns of cognitive relationships which result from author cocitation analysis are especially meaningful because they are based on a cumulative view of hundreds of citers over an extended time period and not on a few citing authors' idiosyncratic visions of what literature might be linked to their own. Thus, it is the relationship between the two authors' publication careers--their complete set of career writings--that is the subject of an author cocitation analysis. The greater the frequency with which they are cited together in other scholars' work, the closer their cognitive relationship. This cognitive relationship could be based on close similarity or sharp opposition of ideas, or on common theory usage, methodology, or topics of study. The key point is that their linkage, no matter the reason it developed, is reflective of the intellectual cultural pattern within the discipline. In turn, these linkages and patterns of cultural interaction affect the advancement of knowledge in the scientific community (Bayer *et al.*, 1990).

White and Griffith (1981a) point out several advantages of using authors as the unit of analysis: data are easily extracted from citation indices by author name;

the names of prominent authors in a particular field can be fairly easily obtained through a variety of means; and a fairly short list of prominent authors will more parsimoniously characterize the breadth and depth of a field of study than will a longer list of key articles. White (1990a) further suggests that, in addition to providing more fertile ground for examining the cognitive structure of science, cocitation studies using the author as the unit of analysis uniquely allow researchers to take a systematic look at the social relationships which may develop among those producing scientific knowledge, adding to the definition of the culture of the discipline.

An interesting development in cocitation studies is that McCain, whose early work uses author cocitation analysis, is now expanding cocitation analysis to include the use of core journals (rather than authors' bodies of work) as the unit of analysis in her research. She examines journals linked by intercitations and then performs quantitative analyses on her data similar to those she used in her previous author cocitation work. Through these techniques she has been able to identify specialties and journal networks in the fields of genetics (McCain, 1991a) and economics (McCain, 1991b).

Fields Of Study To Which Author Cocitation Has Been Applied

The body of literature on author cocitation is not large, but it has yielded a wide range of research topics to which the spatial mapping technique of author cocitation analysis has been applied. The earliest studies by White and by White

and Griffith use this method to determine trends in the fields of science, technology and society (White and Griffith, 1982), information science (White and Griffith, 1981a), human judgement and decision making (White and Griffith, 1981b), and social indicators research (White, 1983). McCain uses the technique to trace developments in the two specialty areas within the field of genetics, specifically *Drosophila* genetics (McCain, 1986a; McCain, 1986b) and population genetics (McCain, 1989). She also analyzes another unrelated field, macroeconomics (McCain, 1983; McCain, 1984; McCain, 1986b), using author cocitation analysis. A number of other researchers have used author cocitation analysis in their particular fields of interest: clinical nutrition (Sayers, 1983); mathematics education (Lane, 1984); diffusions of innovations, technology transfer, knowledge generation, exchange and utilization research (Cottrill, 1987; Cottrill, *et al.*, 1989; Rogers and Cottrill, 1990); microeconomics and finances (Penan, 1989); management information systems and organization research (Culnan, 1986; Culnan, 1987; Culnan *et al.*, 1990); and communication (Paisley, 1990). Several specialty areas in sociology, including new causal theory, ethnomethodology (Hopkins, 1984) and marriage and the family (Bayer, *et al.* 1990) have also been subjected to author cocitation analysis. Table 2.1 summarizes this body of author cocitation research literature in terms of the specialty area studied, criteria for selection of key authors, methodology and results. Table 2.1 excludes those studies which have not resulted in spatial mapping of academic disciplines, but are solely technical pieces in which researchers have examined various fields of study to outline methodological strategies for author co-citation analysis: Knapp (1984) on sociology;

TABLE 2.1

Summary of Author Cocitation Literature

Author/Year	Specialty Studied	N	Years Spanned	How Subjects Chosen	Methodology	Results
White & Griffin, 1981a	Information Science	39	1972-1979	Review Article Consultation with Experts Reputational Measure	Pearson's R MDS Factor Analysis Johnson's Cluster Analysis	2 Dimensions 7 Factors 4 Clusters
White & Griffin, 1981b	Judgement/ Decision Research	41	1972-1980	Texts Reputational Measures Citation/Cocitation Criteria	MDS Johnson's Hierarchical Cluster Analysis Factor Analysis	2 dimensions 8 Clusters 6 Factors
White, 1982 White & Griffith, 1982	Science, Technology, Society	71	1972-6/1980	Index of Scholars Reputational Measures Consultation with Experts Citation/Cocitation Criteria	Pearson's R MDS/Torsca Scale Factor Analysis	3 Dimensions 7 Factors
Sayers, 1983	Clinical Nutrition	14	1975-1979	Publications in Key Journal Citation/Cocitation Criteria	MDS Cluster Analysis	2 Dimensions 6 Clusters
White, 1983	Social Indicators	36	1972-6/1979 1972-1980	Consultation with Experts Reputational Measures	Pearson's R, MDS Johnson's Hierarchical Clustering Variable Cluster Analysis Principle Components Analysis	2 Dimensions 4 Clusters
McCain, 1983	Macroeconomics	42	1972-12/15/1981	References in Key Texts Consultation with Experts	MDS Variable Cluster Analysis	2 Dimensions 8 Clusters

TABLE 2.1
(continued)

Summary of Author Cocitation Literature

Author/Year	Specialty Studied	N	Years Spanned	How Subjects Chosen	Methodology	Results
Hopkins, 1984	New Causal Theory, Ethnomethodology	21	1972-1976	Index of Scholars Previous Research Citation Criteria	MDS 1)Factor Analysis of Full List 2)Factor Analysis of New Causal Theory 3)Factor Analysis of Ethnomethodology	2 Dimensions 72-76 = 4 Factors 77-81 = 4 Factors 72-76 = 4 Factors 77-81 = 4 Factors 72-76 = 3 Factors 77-81 = 4 Factors
Lane, 1984	Math Education	23	1973-7/1983	List from Key Journal Index of Scholars	MDS-Point Model, Hill Model, Circle Model	3 Dimensions 5 Clusters
McCain, 1984	Macroeconomics	41	1972-1977 1978-1983	Referenced in Key Texts Consultation with Experts	Pearson's R Nonmetric MDS 1) Variable Cluster Analysis 2) Complete Linkage (Johnson) Cluster Analysis	 2 Dimensions 72-77 = 8 Clusters 78-83 = 9 Clusters 72-77 = 10Clusters 78-83 = 9 Clusters
McCain, 1986a	Genetics	49	1974-1978	Review Articles Consultation with Experts	Pearson's R MDS Cluster Analysis	2 Dimensions 74-78 = 10Clusters 79-83 = 10Clusters
McCain, 1986b	1)Macro-economics 2)Genetics	41/49	1978-1982 1983-1979	Texts, Reviews, Consultation with Experts Citation/Cocitation Criteria	MDS Johnson's "smallest diameter" clustering	2 Dimensions 1) 12 clusters 2) 9 clusters

TABLE 2.1
(continued)

Summary of Author Cocitation Literature

Author/Year	Specialty Studied	N	Years Spanned	How Subjects Chosen	Methodology	Results
Culnan, 1986	Management Information Science	47	1972-1982	Citation Criteria Referenced in Key Texts Publication in Key Journals Involvement in Key Conferences	Factor Analysis	9 Clusters
Culnan, 1987	Management Information Science	42	1980-1985	Citation Criteria Reference in Key Textbooks Consulation with Experts	Factor Analysis	5 Clusters
McCain, 1989	Population Genetics	58	1981-1986	Previous Research, Texts Citation Criteria, Monographs	Pearson's R, MDS Complete Linkages Cluster Analysis	2 Dimensions 11 Clusters
Penan, 1989	Microeconomics & Finance	*	*	*	*	*
Bayer *et al*, 1990	Marriage & Family	36	1972-1981	Survey of Experts Award Winners in Specialty	Ranked Cocitation Counts, MDS, Complete Linkage Hierarchical Cluster Analysis	3 Dimenions 6 Clusters
Culnan *et al*, 1990	Organizational Behavior	52	1972-1984	Survey of Dept. Heads Consultation with Experts Faculty Rosters	Factor Analysis Principal Components 1)Analysis of Entire Specialty 2)Analysis of Micro 3)Analysis of Macro	 1)8 Factors 2)5 Factors 3)4 Factors

Note: * denotes document not available in English

TABLE 2.1
(continued)

Summary of Author Cocitation Literature

Author/Year	Specialty Studied	N	Years Spanned	How Subjects Chosen	Methodology	Results
Paisley, 1990	Communication	30	1972-1978	Review Articles in Yearbook Reputational Measures	z scores Pearson's R Principal Factor Analysis	72-78 = 10 Factors 79-84 = 10 Factors
Cotrill, 1987 Cotrill *et al*, 1989 Rogers & Cotrill, 1990	Diffusion of Innovations; Technology Transfer	63/47	1966-1972	Texts, Reviews Consultation with Experts Citation Criteria	MDS Single Linkage Cluster Analysis Factor Analysis	2 Factors 5 Clusters

White (1981a, 1981b, 1986) in the areas of social indicators research, archaeology, attribution theory and other fields; Chapman and Subramanyam (1981) in cytology; McCain in *Drosophila* genetics (1988) and in her summary of previous author cocitation research (1990).

Criteria for the Selection of Key Authors

According to White (1990a: 99), cocitation analyses "are only as good as the analysts' choice of authors." Thus, it is crucial to author cocitation analysis to include authors considered preeminent in the particular field under study. Table 2.1 provides an overview of the selection process used in previous author cocitation research. These studies use a variety of means to identify the key authors in the academic discipline under scrutiny, but most use a combination of reputational measures and objective measures. Reputational measures include surveys of university department heads, recommendations from other experts in the field, and researchers' own personal judgements about authors who should be included or excluded. The more objective criteria include a variety of methods which allow researchers to: (1) gain a broad sense of who represents a field (e.g., through compilation of faculty rosters from university departments); or (2) identify the more elite contributors to an area of study, using such indicators as whether the author was mentioned or had work published in notable textbooks, review articles or collections of key research in his or her field of study.

Once lists of representative or eminent authors are established with these techniques, researchers further narrow their samples by excluding authors with too few overall citations (thus, not considered to be among the top-level cited authors) and too few occurrences of cocitations with others on the original list (whose inclusion would cause too many empty data cells for adequate analysis). As a result of these selection processes, most of the studies identify between 30 and 60 authors to be used in the analysis. While Cottrill (1987) analyzes an unusually high number of 110 authors who represent two distinct sub-fields of his area, Lane (1984) and Sayers (1983) use smaller numbers (23 and 14, respectively) for their dissertation research due to the great expense of the on-line computer search necessary for this type of analysis. Kruskal and Wish (1978) suggest that, as long as the total number of data points is four times the number of dimensions selected, the statistics should not be affected by differences in numbers of authors (or author/time periods) involved.

Methodology and Results of Author Cocitation Mapping Research

McCain (1990) summarizes the technical intricacies of previous author cocitation research. As a detailed outline of that research, Table 2.1 summarizes various aspects of the author cocitation methodology. Table 2.1 shows that researchers using author cocitation analysis gather citation data for anywhere from five to eight years. McCain (1986a) and Paisley (1990) compare cocitation data of their selected authors for two subsequent four year time periods, based on the

dates of the citing articles. Most of the studies use multidimensional scaling (MDS) to determine the dimensions that define differences among authors in the discipline, (e.g. whether the authors focus on micro-level or macro-level units of analysis, whether their work is predominantly qualitative or quantitative, whether it is theoretical or experimental, or whether it is built around classical or contemporary models). The studies then employ factor or cluster analysis to determine how authors group together in the two- or three-dimensional space created by multidimensional scaling. For instance, a group of authors who develop theories regarding molecular configurations (micro-level and theoretical) would represent a group distinct from those authors whose work focuses on experimentation with living organisms (macro-level and experimental).

As Table 2.1 indicates, researchers using author cocitation analysis have generally interpreted the resulting two- or three-dimensional maps in such a way that they are able to identify four to twelve distinct groupings of authors. The spatial map which results from each analysis shows that some clusters of authors tend to be similar (demonstrated by the pictorial intertwining of the boundaries of the groups), while other groups of authors are quite different (spatially set apart on the pictorial graph). Figure 2.1 (taken from White and Griffith, 1981a) illustrates the spatial mapping of the cognitive relationships among information scientists. Through multidimensional scaling and cluster analysis, White and Griffith (1981a) identify two dimensions which allow them to divide the 39 information scientists into five groups: those researchers whose work focuses primarily on (1) scientific communication, (2) bibliometrics, and (3) information retrieval; in addition to 4)

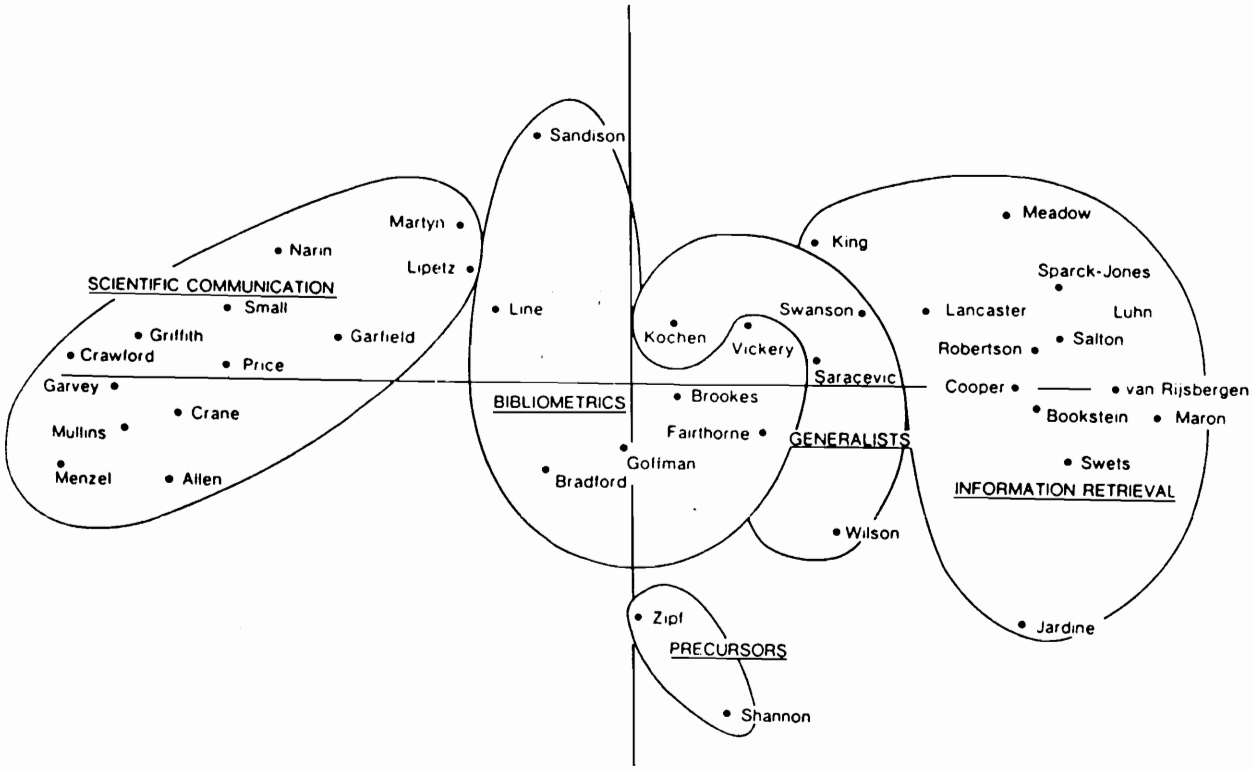

FIGURE 2.1: Example of an Author Cocitation Spatial Map

(Source: White, Howard D. and Belver C. Griffith. 1981a. "Author Cocitation: A Literature Measure of Intellectual Structure." Journal of the American Society for Information Science 32: 163-171.)

those researchers he defines as generalists, and 5) those he considers to be precursors to the field. As in this example, most of the author cocitation studies have revealed that the disciplines under scrutiny have distinct groupings of authors; yet other studies show that some disciplines are represented by a very scattered map, with a lack of close fit along the lines of the selected continua. This suggests that the field is not well integrated based on identified criteria. In some cases, groupings of authors align with subcultures previously identified as specialty areas in the discipline, but in other instances authors group together in a manner which suggests that there may be new subcultures previously unrecognized in the field.

In summary, previous research using author cocitation analysis has proven valuable in identifying subcultures within a variety of academic disciplines. Application of this technique to other fields appears to be warranted. Another dimension of the previous research which could be expanded is the concept of the historical development of author cocitation patterns. Although several studies have compared patterns of author clustering across different time periods of the citing articles, the literature lacks any attempt to examine how different patterns might occur when variations in the cited authors' publication careers are taken into consideration.

Finally, author cocitation analyses to date have shown that several specific statistical procedures (such as multidimensional scaling and cluster analysis) are useful in the identification of subcultures. These studies have based their conclusions primarily on quantitative methods rather than on the qualitative methods which characterized the early historical and sociometric studies of

scientific communities. The body of author cocitation literature would be enriched by adding qualitative dimensions to the strong quantitative methodology demonstrated in previous research.

CHAPTER THREE

METHODS

The purpose of this study is to develop a cultural profile of the academic discipline of higher education research. This goal is accomplished through gathering data which aid in the identification of subcultures formed by cocitation patterns of the most highly cited authors in the field. The cultural profile is historical, reflecting any changes in cocitation patterns over the authors' careers. In addition to identifying cognitive relationships among the authors, the present study offers an exploratory examination of the role that social relationships play in the development of subcultures within the discipline.

The methodology for the present study is an author cocitation analysis which includes a quantitative analysis of the cognitive distances between author/time periods. The quantitative analysis is supplemented by a qualitative analysis of authors' vitae; this supplementary analysis is intended to illuminate the characteristics of the subcultures to which the higher education researchers belong.

This methods chapter begins with a summary of the potential limitations of citation analysis, and the reasons for selecting the methods in light of these limitations. The chapter then moves to an explanation of the methods by which the most highly cited authors in higher education were selected. The next section outlines the important innovation of using the dates of cited articles as a temporal

factor in the cocitation analysis. A summary of the strategy for selection of author time periods for the present analysis is next, followed by an explanation of the manner in which the cocitation matrix was formed and ranks assigned to its values. Detailed explanations of the multidimensional scaling and cluster analysis procedures ensue.

Finally, the chapter closes with a description of the supplementary qualitative analysis of the authors' vitae. Data were gathered from the authors' vitae about research interests over the span of their careers as well as the academic institutions and professional organizations with which they have been associated. These supplementary data, coupled with the results of the quantitative methods, provide critical information from which the subcultures within higher education are identified, labeled and analyzed.

LIMITATIONS TO CITATION ANALYSIS

Citation analysis has come under considerable criticism on several fronts (MacRoberts and MacRoberts, 1986, 1987, 1989; Edge, 1979). MacRoberts and MacRoberts (1989) review the problems associated with citation analysis, offering the following summary: 1) in many cases, authors fail to properly cite (or fail to cite at all) the sources which influence their works; 2) citing is biased in that some facts are nearly always cited properly, while the sources of other facts are consistently credited improperly; 3) only formal communications (books, articles) are likely to be cited, leaving informal sources of information unaccounted for; 4)

the effect of self-citations has not been fully examined; 5) the reasons that certain sources are cited must be considered in determining the level of influence those sources ultimately have (e.g. positive or negative citations); 6) differences in citation rates are evident across types of publications, national origins of publications, the age of publications, and academic discipline; 7) technical limitations arise from different means of crediting multiple authors, varied spellings of authors' names, the presence of more than one author with the same name (homographs), clerical/typographical errors, and the fact that the citation indices cover only a portion of the scientific literature.

In addition, assessing the quality of literature on the basis of high or low citation frequencies may not be appropriate in all cases. For instance, a work of a well-known author might be cited more often than a work of a lesser-known author, regardless of the quality of the cited work (i.e., the "Matthew effect" as described by Merton, 1973). Frequency of citations is also related to such things as the length of the article, the number of references, and the level of circulation and frequency of publication of the journal in which the article is published. If a work is relatively inaccessible to other authors, no matter the value of the piece, it will not be cited as often as would more accessible pieces. In addition, Culnan *et al* (1990) state that much material is read, and thus considered worthy of attention, but may not be cited in written work. Moreover, the reason why a work is cited is not apparent from a citation count; some are cited because of method or instrumentation; some are cited in only a perfunctory way, while others are cited as contributing in a major way to the new paper (Moravcsik and Murugesan, 1975;

Chubin and Moitra, 1975).

Technical considerations involved in the listing of articles in citation indices are also of concern. The inability to attribute citations to junior authors, confusion which arises when different authors with the same surname and initials are indistinguishable, and delay of recognition of important works while the indices are in the process of being published, have all been noted as possible sources of distorted citation counts. Hicks (1987) suggests that cocitation analysis does not adequately reflect national participation in a specialty, but only a selected sample. She alleges that clusters emerge only after the field has been established for sometime, are inconsistent in coverage over time, reflect the usual citation errors, do not accurately reflect new ground-breaking work, and are too subjectively interpreted so as to reflect conventional wisdom about the specialty (Hicks, 1987). She further suggests that historical changes in cocitation cluster maps may reflect technical issues and can be affected by errors in citation (1988).

However, these criticisms have been abated through research which shows that in most instances these factors either do not significantly impact citation counts or can be alleviated through careful design of the citation analysis. White and McCain (1989) review several studies which demonstrate the validity of citation counts as indicators of peer influence. Other researchers have shown that the propensity of some authors to cite famous people to gain prestige for their work is countered by those who mention those famous people as "household" words without citing particular works (Merton, 1967; Zuckerman, 1987; Oromaner, 1987).

Mistaken attribution of citation due to homographs is abated in cocitation analysis; John E. Smith whose research focuses on chemistry is not likely to be cocited with an author publishing in higher education, whereas John E. Smith whose research focuses on college retention rates is. In fact, White and Griffith (1981a) show less than two percent error as a result of homographs in their cocitation data. On the point of subjectivity of interpretation which relies on prior classification schemes, author cocitation analyses are often undertaken by researchers who are not intimately familiar with the discipline under study before the onset of their analysis, and thus have no a priori classification scheme in mind when they undertake the statistical delineation of academic subculture clustering. Only after the statistics of the dimensional and cluster or factor analyses have already defined the appropriate groupings of authors does subjective interpretation, which may include professional classifications of various sorts, come into the analysis. Thus, this type of research is more exploratory--with interpretation being based on the statistics which emerge within the study--than it is confirmatory of some hypothesis or existing categorization schemata. Researchers employing author cocitation analysis often use other techniques to validate the subcultural clustering patterns that result from their studies; for instance, Lenk (1983) and McCain (1986b) examine conominations by colleagues or sorting of names by experts according to perceived similarity in the field to determine the congruence of various methods.

Studies have suggested that alleged distortions attributed to a preponderance of self-citations or negative citations is generally of nominal

consequence (Garfield, 1979; Lawani and Bayer, 1983). Furthermore, when thousands of citations are used as data for a cocitation analysis, typographical and other technical errors become minuscule in effect on the overall body of data. A host of research has shown that, when carefully undertaken, citation and cocitation analyses are appropriate and valid indicators--albeit certainly not the only indicators--of intellectual influence and patterns of scientific interactions, especially when examining aggregates of authors and papers (Small, 1987; Virgo, 1977; Cole and Cole, 1973, 1987; Sullivan, et al, 1977; Small, 1977; Mullins, et al. 1977; Garfield, 1982; Merton, 1967; Zuckerman, 1977, 1987).

SELECTION OF MOST HIGHLY CITED AUTHORS

In his article concerning characteristics of citation patterns in higher education, Budd (1990) identifies twenty-one authors who have been most frequently cited in the literature. Budd arrives at this list by examining 569 articles published from 1982 to 1987 in the *Journal of Higher Education*, the *Review of Higher Education*, and *Research in Higher Education*. The selection of these three journals is based on the fact that they directly address a broad array of research issues in the field of higher education within the confines of the United States and are generally identified as "flagship" journals in the field (Bayer, 1983). The resulting list of the most frequently cited scholars, shown in Table 3.1, is based on primary (first-) or sole-authorship of cited articles, with self-citations excluded. In his analysis, Budd notes that this list includes scholars from a variety of disciplines,

TABLE 3.1

Most Highly Cited Authors in Higher Education Research

Alexander W. Astin
J. Victor Baldridge
Alan E. Bayer
Anthony Biglan
Peter M. Blau
Howard R. Bowen
Allan M. Cartter
John A. Centra
Burton R. Clark
Michael D. Cohen
Kenneth A. Feldman
Christopher Jencks
E. Carll Ladd, Jr.
Herbert W. Marsh
Wilbert J. McKeachie
Robert K. Merton
Ernest T. Pascarella
Jeffrey Pfeffer
John C. Smart
Vincent Tinto
Karl E. Weick

Source: Budd, John M. 1990. "Higher Education Literature: Characteristics of Citation Patterns." *Journal of Higher Education* 61:84-97.

some of whom have written one or two major works pertaining to higher education, while others have been prolific and primarily focused on the field of higher education. In essence, this list of highly cited scholars reflects the multi-disciplinary nature of higher education research. The cocitation analysis which results from these data provides insight into the nature of the subculture formation within a heterogeneous field.

DATES OF CITED ARTICLES AS A TEMPORAL FACTOR

Several of the key researchers in the field of author cocitation analysis suggest the utility of studying patterns of cocitation over time. For the most part, the researchers who have undertaken study of the temporal factor have examined differences in citation patterns across different time periods based on the publication date of the citing article; that is, the article which references the work of the author in question (McCain, 1984; Hopkins, 1984; Paisley, 1990). As McCain (1990) notes, this procedure is helpful in tracing the refinements of theory over time and perhaps mapping shifts in paradigm foci of people in a particular field. However, all such linkages would be based on the perception of those writing the citing articles. Such analysis can reveal the perceptions of citers as to which authors are the ones to be cited currently in a specialty which may or may not serve as an indication of who was actually associated in a particular academic subculture at a particular earlier time. For instance, Paisley (1990) divides the citing articles used in his research into two time periods and is able to identify

which authors remain in the same clusters and which move in or out of different clusters over the decade. His conclusion that the clusters remained fairly constant over time reflects only that the citing authors tend to include the same people in their reference sections over time, not necessarily that those they are citing are working on similar theoretical or empirical endeavors at the same time. From such a study, one can discern a convergence of authors in a discipline as they are used to support a person's particular treatise in a citing paper.

However, this may say nothing of the actual group of people with whom that cited author was interacting, either literally or in theoretical/research circles, during his or her career. Grouping authors' bodies of work by time periods based on the cited articles' publication dates (i.e., the dates of the works being referenced) more readily leads to the discovery of patterns of intellectual development and theory building within an academic discipline. It also showcases periods of time marked by collaborative efforts, inter-author communication or relative isolation, and thus demonstrates intergenerational influence of researchers on one another in terms of how researchers or theorists build upon one another's work (Bayer *et al.* 1990). Actual knowledge of each others' similarities is not necessary as long as subsequent writers perceive the linkages through their citation practices. Authors producing work on related topics within a few years span are more likely to have exchanged ideas, either literally through personal or journal correspondence, or figuratively in terms of citing each others' work in their own. A temporal analysis differentiating time periods of the cited articles yields a clearer picture of which authors have been working on certain topics, using certain

paradigms at particular points in the history of the discipline and at particular points in the careers of the authors. A temporal analysis targets not only the current popular topic or designated experts within the culture of the discipline during a time span, but an analysis of authors who are cited together also suggests that other factors such as institutional affiliation or social arrangements might offer fertile ground for work in that particular field at that particular time. An in-depth study of relationships among knowledge producers is valuable to understanding the historical development of a discipline and the subcultures which form within the discipline.

Other advantages of the temporal analysis based on the dates of cited articles include the ability to trace a particular author's career, in terms of what foci he or she had and whether or not they shifted over time, what documents added most to their careers as cited authors, and during what periods of time they were considered experts in their fields. More interesting in terms of cocitation analysis is the examination of whether authors tend to have similar or dissimilar patterns of career building and waning. Analysis of how authors cluster differently with other authors over time can provide illustrations for perhaps quite varied paths by which different authors come to settle on similar subjects for a period of time. Another important result of such an analysis is a longitudinal profile of citation frequencies among cocited authors. Do most authors who are considered exemplary in their field have citation patterns which are consistent over time, or are there marked peaks and valleys in the dates of the works for which they are most frequently cited? Some authors' citation fame may be built upon a single work that is considered a "classic," for which they are frequently cited because the article

serves as a theoretical or methodological base for a variety of branches or subcultures within a discipline. However, in such a case this "classic" author may be cocited with a myriad of other authors whose work may be only tangentially related to the actual subject matter of the classic work. This suggests that a temporal analysis of author cocitation based on the date of cited articles can prove to be an interesting blend of author and document cocitation. If time periods for which cocitation clusters are to be analyzed are relatively short, the effect of a single document (such as a classic) on that author's career, and on the cocitation pattern with other authors or other classics, can be discerned more readily. In such a case, it may be possible to discover whether one published paper spawned an entire clustering of authors around a distinct area within their field. What begins as an analysis of the effect of an individual author on those with whom he or she is cocited can then be broadened with such questions as: How many cited authors have built careers based on documents (or even bodies of work) which have an unusually long time of sustained interest within the citing literature? Are authors of classics more frequently cited together than are authors with more consistent histories of cited works? Do the authors of these classics tend to remain in the same theory or methods cocitation clusters over time, while others change clusters because they change paradigms or are cited for more varied scope of articles over time? Such questions can only be answered in an analysis of author cocitation based on temporal divisions of their bodies of work.

An analysis of this sort has consequences not only for understanding the intellectual interactions of authors within an academic discipline, but may also point

out equally important consequences that impact on everyday social interaction within the culture of the discipline. The temporary prominence of theories or methodologies can influence social policy during the time periods in which they are most frequently cited and used. For instance, family policy and even family counseling issues have followed the changing fads in family research as Bayer (1982) describes them: an early focus on mate selection and marital outcome, leading into issues related to gender and sex roles, later developing into concerns over family power and family violence. In the field of sociology, the change oriented conflict paradigm was more in vogue during the 1960's and 1970's than was the status quo oriented structural functionalist paradigm. Thus, recommendations coming from sociologists at that time regarding solutions for current social problems tended to promote revolutionary restructuring of social institutions (schools, programs for the poor, etc.). More to the point, if a higher education scholar writing an article about race relations on a predominantly white campus tends to cite (and thus cocite) authors of an era in which such a conflict perspective is most popular, that article will have social policy indications different from those that might arise from the choice of cited authors from a less change-oriented time frame. Thus, analysis of clusters of cocited authors over time can provide an explanation as to when and how certain social policy trends have come about through intellectual networking. Such analysis of evolution of theory and policy can readily point to the formation, growth and waning of different subcultures within a field.

In summary, the present analysis offers an innovative way of using a

temporal factor in author cocitation analysis. An author cocitation analysis which compares clusters of authors across time spans based on the dates of their cited articles can provide insights into such cultural aspects of a discipline as 1) what topics are popular in what fields of study and with what authors at a given time; 2) patterns of intellectual networking among individuals and institutions across time; 3) similarities and dissimilarities in authors' career paths in terms of what has led them to particular interests, peaks and valleys of production and the impact of classic works; 4) how author and document cocitation analysis might be blended for a richer understanding of intellectual interaction; and 5) the impact of such intellectual interaction over time on social policy, another element reflecting the subculture of the discipline.

In the present analysis, the temporal factor offers insight into some of these issues as they pertain to the culture of higher education. The most crucial of these is the shift in topical, and therefore subcultural, focus of the selected authors over time. In addition, this analysis addresses the stability of the subculture memberships, the prominence of the subculture over time in terms of key citation years, and the comparison of subcultures in terms of their inclusion of "classics." In total, the summary of these temporal issues creates a descriptive picture of the culture of higher education research.

STRATEGY FOR SELECTION OF AUTHOR TIME PERIODS

After reviewing the positive value of including the temporal factor based on

dates of cited articles in the author cocitation analysis, the method by which to introduce the time divisions had to be determined. Each author's citation career was divided into early, late and, occasionally, middle time periods. The goal was to identify two or three distinct periods in each author's career for which there were approximately an equal number of cited references to the work published in those periods.

The 1980-1989 volumes of the *Social Science Citation Index* were used to gather the citation data for each author. For that ten year time period, the number of cited references for all articles written by the author from the beginning of his career through 1989 (or his death in the case of Cartter) was recorded by the publication date of each article (Table 3.2). For example for the year 1969, the number recorded for each author represents the total number of citations made during 1980-1989 to articles published by that author in 1969.

Once these counts were completed, the year for which the author received the most citations was identified. This year is considered a "banner year" and in most cases marks a break point used to determine time period boundaries. Thus, in most cases, the dividing line of the time periods reflects pinnacles for the author's citation career. The banner year is included in the time period which has the fewest citations in order to equalize the cited reference in each period. As a result, the time periods are quite varied in terms of the number of chronological years included. For instance, Cohen's 1972 publications have been so highly cited that only one year is included in his first period, and even then his first time period has fifty-percent more citations than does his later time period.

TABLE 3.2
Raw Citation Counts by Year of Cited Publication for Selected Authors

	ASTIN	BALDRIDGE	BAYER	BIGLAN	BLAU	BOWEN	CARTTER	CENTRA	CLARK	COHEN	FELDMAN
1988≥	1	0	0	4	2	0	0	0	2	0	0
1987	17	0	1	13	5	0	0	2	17	1	2
1986	3	1	0	1	13	24	0	1	3	12	4
1985	36	0	0	51	1	6	0	1	22	3	0
1984	49	1	3	23	44	4	0	0	10	21	6
1983	7	9	4	7	2	10	0	7	40	2	6
1982	83	8	8	2	50	12	0	2	2	0	0
1981	14	6	7	9	13	7	0	9	3	9	0
1980	18	5	0	1	7	31	0	63	8	1	0
1979	18	18	7	18	6	5	0	49	2	5	11
1978	44	56	1	0	5	14	0	22	18	0	26
1977	166	17	35	12	220	94	1	61	26	2	35
1976	10	9	3	0	106	2	34	47	1	15	57
1975	91	87	92	0	20	3	4	21	2	1	0
1974	12	2	1	0	116	16	0	26	1	132	0
1973	24	1	26	91	83	4	0	51	1	5	11
1972	31	4	15		43	6	4	10	67	317	6
1971	47	54	0		231	6	12	0	4	0	22
1970	51	0	5		107	4	2	12	18	0	11
1969	30	1	39		8	1	1	0	0	0	139
1968	53		30		64	1	0	1	4	*1	2
1967	7		12		598	0	4		0		
1966	9		38		37	2	112		30		
1965	37		0		9	0	6		11		
1964	18		1		461	0	1		2		
1963	11		0		84	0	0		9		
1962	13		0		202	0	0		17		
1961	22		0		0	0	0		3		
1960	0		0		70	0	0		64		
1959	10		*1		2	0	31		1		
1958	1				0	0	0		3		
1957					12	0	0		0		
1956					75	0	0		20		
1955					65	0	0		0		
1954					14	0	0		0		
1953					1	14	0		*2		
1952					*1	0	0				
1951					0	0	0				
1950≤					*1	63	*1				

(* denotes mistaken citation attributions--explained in Chapter 5; ___ denotes time period delineations)

TABLE 3.2
(continued)
Raw Citation Counts by Year of Cited Publication for Selected Authors

	JENCKS	LADD	MARSH	MCKEACHIE	MERTON	PASCARELLA	PFEFFER	SMART	TINTO	WEICK
1988≥	10	1	30	1	5	1	6	1	2	1
1987	8	1	22	4	8	3	13	5	15	13
1986	10	4	50	18	1	24	19	15	5	7
1985	32	18	112	10	10	20	7	3	3	20
1984	8	2	130	9	15	8	38	0	3	18
1983	31	5	78	6	8	90	42	5	0	30
1982	28	25	44	4	15	10	160	17	22	37
1981	3	27	22	1	6	25	510	12	4	4
1980	23	23	58	14	17	87	105	1	13	15
1979	123	77	41	74	37	40	13	0	0	382
1978	18	128	7	51	6	28	917	12	2	16
1977	38	16	15	6	30	31	276	1	1	140
1976	3	38	10	26	72	5	109	13	0	405
1975	27	104	26	23	41	2	13	20	189	2
1974	3	1		32	5		124	2	7	62
1973	59	40		8	348		110	3	1	8
1972	714	17		3	63		132	0		0
1971	3	5		47	42		0	0		13
1970	7	11		6	55		2	3		9
1969	20	9		22	23		*1	0		187
1968	97	0		3	639		*1	0		61
1967	9	0		4	81		0	0		17
1966	7	8		7	11		0	0		29
1965	1	0		0	56		0	0		16
1964	5	0		0	36		0	*1		19
1963	0	1		17	49		0	*2		1
1962	3			1	12		0	0		
1961				21	44		0	0		
1960				8	8		0	0		
1959				1	37		0	0		
1958				7	13		0	0		
1957				1	850		0	0		
1956				0	41		0	*1		
1955				10	2		0			
1954				3	1		0			
1953				0	3		0			
1952				4	24		0			
1951				6	9		*1			
1950 ≤					756					

(* denotes mistaken citation attributions--explained in Chapter 5; ___ denotes time period delineations)

The determination of whether to divide the authors' citation careers into two or three time periods was based on the total number of citations the author had received during 1980-1989. Fifteen authors have fewer than 650 total citations; once their careers are divided into two periods, these authors have fewer than 320 citations in each of the two time periods. Of the remaining six authors, one has 933 citations and five authors have 1300 citations or more. The author with 933 cited references has had a 32 year citation career and would have more than 450 citations in each of two time periods; thus he seems to fit more aptly with the other five most highly cited authors whose careers are divided into three time periods. Table 3.3 summarizes the data used to determine author time periods. The data in this table reflect changes made due to a few incorrect citation attributions detected later in the analysis which affected beginning dates of authors' citation careers. A full explanation of these changes is given in Chapter Five.

FORMATION OF THE COCITATION MATRIX

The *Social Science Citation Index (SSCI)* indexes 4,700 source journals (approximately 1,400 fully covered and 3,300 selectively covered) and includes more than 1,400,000 citations in each annual edition. The on-line electronic version of the *SSCI*, or *SocSciSearch*, served as the computerized database used in this analysis. The database was searched electronically to obtain information contained in the 1980 to 1989 versions of the *SSCI* publications which had cited the selected authors' works. For each of the forty-eight author/time periods, the

TABLE 3.3

Summary of Citation Career Patterns

Author	Year of Most Citations	Total Citations/ Years in Career	Period 1 (# Cites)	Period 2 (# Cites)	Period 3 (# Cites)
AW ASTIN	1977	933/32	1958-1971 (309)	1972-1977 (334)	1978-1989 (290)
JV BALDRIDGE	1975	279/21	1969-1975 (149)	1976-1989 (130)	
AE BAYER	1975	328/26	1964-1974 (167)	1975-1989 (161)	
A BIGLAN	1973	232/17	1973-1979 (121)	1980-1989 (111)	
PM BLAU	1967	2776/37	1953-1964 (986)	1965-1970 (823)	1971-1989 (967)
HR BOWEN	1977	329/47	1943-1976 (122)	1977-1989 (207)	
AM CARTTER	1966	212/19	1959-1966 (150)	1967-1977 (62)	
JA CENTRA	1980	385/22	1968-1976 (168)	1977-1989 (217)	
BR CLARK	1972	411/34	1956-1971 (186)	1972-1989 (225)	
MD COHEN	1972	526/21	1972 (317)	1973-1989 (209)	
KA FELDMAN	1969	338/22	1968-1971 (174)	1972-1989 (164)	
C JENCKS	1972	1290/28	1962-1969 (142)	1970-1972 (724)	1973-1989 (424)
EC LADD	1978	561/27	1963-1977 (250)	1978-1989 (311)	
HW MARSH	1984	645/15	1975-1983 (301)	1984-1989 (344)	

TABLE 3.3
(Continued)

Summary of Citation Career Patterns

Author	Year of Most Citations	Total Citations/ Years in Career	Period 1 (# Cites)	Period 2 (# Cites)	Period 3 (# Cites)
WJ MCKEACHIE	1979	458/39	1951-1975 (234)	1976-1989 (224)	
RK MERTON	1957	3479/56	1934-1956 (836)	1957-1967 (1197)	1968-1989 (1446)
ET PASCARELLA	1983	374/15	1975-1980 (193)	1981-1989 (181)	
J PFEFFER	1978	2596/20	1970-1977 (766)	1978-1979 (930)	1980-1989 (900)
JC SMART	1975	113/20	1970-1980 (55)	1981-1989 (58)	
V TINTO	1975	267/17	1973-1975 (197)	1976-1989 (70)	
KE WEICK	1976	1512/27	1963-1975 (424)	1976-1978 (561)	1979-1989 (527)

accession (identification) number corresponding to every citing article was recorded. Appendix A contains a detailed description of the process by which the accession numbers were gathered.

The results of the electronic search were data files containing accession numbers of all the articles which had cited work published by that individual author during the designated time periods. Each author/time period had a separate data file. Using a SAS computer matching program, each data file was then compared with each other data file to determine which author/time periods had common accession numbers, that is, which sets of author/time periods had been cited in the same articles. The number which resulted from each of these pair comparisons was the cocitation count for that pair of author/time periods. A total of 1,152 pairs were analyzed: each of the forty-eight author/time period data files was compared with forty-seven other author/time period data files (and with itself--a perfect match). The resulting cocitation counts for each of these pairs were then arranged into a forty-eight by forty-eight matrix. Each cell in the matrix represents the number of times the author/time period at the top of the matrix was cocited with the author/time period on the left side of the matrix in literature published (and documented in the *SSCI*) from 1980-1989. The diagonal of the matrix represents the comparison of each data file with itself and thus reflects the number of citations that author received during 1980-1989 for his works published in the designated time period. The totals of each column or row are considerably lower than the diagonal because each author has been cited in publications which do not cite any of the other authors included in this present analysis.

One of the "flagship" journals in the field, *The Review of Higher Education*, is not included in the *SocSciSearch* database; thus, a complete cocitation count was done by hand for the 1980-1989 volumes of this journal. The bibliographies of every article published in that journal during that time were examined; every citation of each of the twenty-one authors in this study was recorded by year, title and source. A hand count of cocitation occurrences for each author/time period was made and added to the number of cocitations which had resulted for each pair in the electronic cocitation search (and thus, added to each cell of the matrix). The final cocitation matrix, which includes the combined electronic and hand counts, is displayed in Table 3.4. This matrix was developed using the original time period delineations for each author. Later in the analysis, the starting date of several of the authors' citation careers was found to be in error due to mistaken citation attributions (explained fully in Chapter Five). However, this should have only a minute effect (if any) on the cocitation data since first, the works by unrelated authors are not likely to be cited with other authors in this data set. Secondly, only two of these citations based on misprinted date attributions were so far removed from the actual date that it would change the total number of citations in a particular time period (e.g. a 1951 date cited for a 1981 book), thus affecting cocitation aggregates between author/time periods.

The matrix of raw cocitation data was then transformed into a matrix of rankings to be used in the later analyses. The cocitation counts corresponding to each author/time period were ranked on a scale of one to forty-eight, with a rank of one representing comparison to self and a rank of forty-eight representing

TABLE 3.4

Cocitation Matrix for the Most Highly Cited Higher Education Researchers

	AS58	AS72	AS78	BO69	BO76	BG73	BG80	BL53	BL65	BL71	BU43	BW77	BY64	BY75	CE68	CE77	CH72	CH73	CL56	CL72	CT59	CT67	FE68	FE72	JE62	JE70	JE73	LD63	LD78	MA75	MA84	ME34	ME57	ME68	MK51	MK76	PA75	PA81	PF70	PF78	PF80	SM70	SM81	T173	T176	WE63	WE76	WE79
AS58	335	93	45	5	3	2	0	4	18	12	7	27	23	6	28	11	1	1	21	7	14	9	52	7	8	14	7	5	2	3	2	2	4	6	4	1	37	24	6	2	0	9	7	42	13	0	3	2
AS72	93	408	91	2	9	3	0	1	17	8	8	53	16	3	16	6	2	2	31	11	4	7	78	8	14	8	12	5	2	3	5	1	1	1	1	3	0	75	54	4	3	2	8	11	94	23	0	4	3
AS78	45	91	363	1	5	2	0	1	12	11	1	29	8	4	5	6	0	5	13	6	11	7	36	6	11	8	6	2	3	1	3	1	2	3	3	4	38	47	0	0	1	3	12	52	23	1	3	2
BO69	5	2	1	199	21	0	0	19	8	30	2	6	1	0	3	0	11	25	7	18	2	0	3	1	4	2	0	5	1	1	0	2	4	6	0	0	1	0	18	16	14	1	0	0	0	9	22	9
BO76	3	9	5	21	177	7	0	4	1	17	2	13	4	1	2	5	10	29	11	16	3	1	4	1	7	1	0	18	9	2	0	0	6	1	0	0	2	2	7	13	12	7	0	2	1	3	18	7
BG73	2	3	2	0	7	125	4	0	4	10	0	6	7	5	2	5	1	2	7	4	4	0	3	3	3	0	0	8	5	4	0	1	3	3	2	2	2	2	4	1	3	25	11	2	3	0	2	2
BG80	0	0	0	0	0	4	102	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
BL47	4	1	1	19	4	0	0	1367	85	114	1	3	1	0	0	1	20	15	12	5	0	0	1	1	3	14	6	2	1	0	0	51	92	51	0	0	1	0	66	110	64	2	0	1	0	47	54	41
BL65	18	17	12	8	1	4	0	85	1098	156	1	9	13	1	3	1	11	10	19	5	4	3	9	2	7	118	82	4	2	0	0	24	25	27	1	0	7	6	44	44	28	1	7	7	9	17	30	11
BL71	12	8	11	30	17	10	0	114	156	1007	2	16	15	5	4	5	19	14	16	12	20	11	6	3	10	15	11	15	9	1	1	33	40	48	1	3	1	1	74	85	57	7	2	3	1	34	47	26
BU43	7	8	1	2	2	0	0	1	1	2	184	8	0	0	0	2	0	2	2	1	3	8	2	0	2	1	0	0	1	0	0	0	1	0	1	0	1	1	2	1	0	2	0	0	0	0	2	1
BW77	27	53	29	4	13	6	0	3	9	16	8	321	1	3	6	3	2	9	7	12	8	6	39	2	10	8	5	10	3	2	0	3	0	0	2	1	13	15	3	3	3	3	6	15	4	0	6	3
BY59	23	16	8	1	4	7	0	1	13	15	0	1	200	10	12	5	1	3	3	2	16	4	4	2	4	2	1	14	3	1	0	3	5	15	0	0	4	0	4	2	1	7	3	9	1	0	0	0
BY79	6	3	4	0	1	5	0	0	1	5	0	3	10	218	16	5	1	2	1	0	3	7	2	2	1	1	0	9	4	1	1	2	8	12	0	5	0	1	4	0	2	3	4	0	0	0	0	0
CE68	28	16	5	3	2	2	0	0	3	4	0	6	12	16	206	40	0	0	3	2	6	3	17	29	2	0	1	6	1	44	8	2	2	2	27	30	13	6	2	1	1	0	1	13	2	1	1	0
CE77	11	6	6	0	5	5	0	1	1	5	2	3	5	5	40	227	1	4	4	5	5	0	4	36	6	3	1	3	8	52	15	0	1	1	29	41	3	0	1	2	0	5	0	1	1	1	4	2
CH68	1	2	0	11	10	1	0	20	11	19	0	2	1	1	0	1	559	78	13	12	0	1	0	0	1	1	0	3	0	0	0	6	10	8	0	0	0	0	40	49	53	0	0	0	0	25	89	76
CH73	1	2	5	25	29	2	0	15	10	14	2	9	3	2	0	4	78	1901	7	22	2	0	2	2	9	9	5	6	5	0	0	1	8	8	1	3	1	0	34	37	44	4	2	0	1	20	71	44
CL53	21	31	13	7	11	7	0	12	19	16	2	7	3	1	3	4	13	7	325	29	3	1	19	1	20	15	10	9	4	0	0	6	7	7	0	0	18	11	13	23	18	7	2	18	10	1	22	12
CL72	7	11	6	18	16	4	1	5	5	12	1	12	2	0	2	5	12	22	29	558	1	3	9	0	13	4	3	4	1	1	0	5	5	9	1	1	3	2	8	19	33	3	3	1	0	10	28	25
CT49	14	4	11	2	3	4	0	0	4	20	3	8	16	3	6	5	0	2	3	1	209	19	0	1	2	2	1	6	7	1	0	3	6	4	0	0	0	0	15	5	1	2	0	0	0	1	5	2
CT67	9	7	7	0	1	0	0	0	3	11	0	6	4	7	3	0	1	0	1	3	19	107	1	1	2	1	2	4	4	0	0	0	2	4	1	0	0	0	1	0	1	1	0	2	0	0	1	0
FE68	52	78	36	3	4	3	0	1	9	6	2	39	4	2	17	4	0	2	19	9	0	1	231	11	7	8	3	4	2	4	1	0	5	4	7	2	35	23	2	1	0	6	5	33	7	1	2	1
FE72	7	8	6	1	1	3	0	1	2	3	0	2	2	2	29	36	0	2	1	0	1	1	11	230	0	0	0	2	2	53	23	0	4	3	22	32	5	4	0	0	1	4	1	3	2	1	0	0
JE62	8	14	11	4	7	3	0	3	7	10	2	10	4	1	2	6	1	9	20	13	2	2	7	0	162	10	3	9	7	0	0	1	4	3	1	1	1	3	1	3	1	2	1	2	3	0	2	2
JE70	14	8	8	2	1	0	0	14	118	15	1	8	2	1	0	3	1	9	15	4	2	1	8	0	10	742	116	4	1	0	0	6	10	10	2	0	4	3	5	5	5	3	0	1	7	3	0	12	3
JE73	7	12	6	0	0	0	0	6	82	11	0	5	1	0	1	1	0	5	10	3	1	2	3	0	3	116	506	4	3	1	1	2	5	8	0	0	1	1	7	4	1	1	1	2	5	1	1	1
LD63	5	5	2	5	18	8	0	2	4	15	0	10	14	9	6	3	3	6	9	4	6	4	4	2	9	4	4	310	45	1	0	1	3	9	1	5	1	1	4	5	4	12	2	0	0	3	4	2
LD78	2	2	3	1	9	5	0	1	2	9	1	3	3	4	1	8	0	5	4	1	7	4	2	2	7	1	3	45	325	3	1	4	2	4	0	0	1	0	2	4	3	4	0	0	0	0	4	4
MA75	3	3	1	1	2	4	0	0	0	1	0	2	1	1	44	52	0	0	0	1	1	0	4	53	0	0	1	1	3	299	80	0	0	2	28	40	3	0	1	0	2	4	0	0	0	1	2	1
MA84	2	5	3	0	0	0	1	0	0	1	0	0	0	1	8	15	0	0	0	0	0	0	1	23	0	0	1	0	1	80	271	2	3	0	5	15	1	5	0	0	1	0	0	3	0	0	0	0
ME34	2	1	1	2	0	1	0	51	24	33	0	3	3	2	2	0	6	1	6	5	3	0	0	0	1	6	2	1	4	0	2	897	107	93	0	0	1	2	7	11	8	0	1	3	2	12	7	14
ME57	4	1	2	4	6	3	1	92	25	40	1	0	5	8	2	1	10	8	7	5	6	2	5	4	4	10	5	3	2	0	3	107	1384	115	1	1	3	3	20	22	21	3	2	5	1	11	20	23
ME68	6	1	3	6	1	3	0	51	27	48	0	0	15	12	2	1	8	8	7	9	6	4	4	3	3	10	8	9	4	2	0	93	115	2232	2	0	2	2	16	18	16	8	3	4	1	17	19	10
MK51	4	3	3	0	0	2	0	0	1	1	1	2	0	0	27	29	0	1	0	1	0	1	7	22	1	2	0	1	0	28	5	0	1	2	257	31	2	1	2	0	0	2	1	0	1	3	1	1
MK71	1	0	4	0	0	2	0	0	0	3	0	1	0	5	30	41	0	3	0	1	0	0	2	32	1	0	0	5	0	40	15	0	1	0	31	237	1	1	1	0	0	1	0	0	0	0	1	0
PA75	37	75	38	1	2	2	0	1	7	1	1	13	4	0	13	3	0	1	18	3	0	0	35	5	1	4	1	1	1	3	1	1	3	2	2	1	186	67	0	0	0	4	7	98	29	0	1	1
PA81	24	54	47	0	2	2	0	0	6	1	1	15	0	1	6	0	0	0	11	2	0	0	23	4	3	3	1	1	0	0	5	2	3	2	1	1	67	161	0	0	0	2	11	76	31	0	2	1
PF68	6	4	0	18	7	7	4	0	66	44	74	2	3	4	4	2	1	40	34	13	8	15	1	2	0	1	5	7	4	2	1	0	7	20	16	2	1	0	0	658	194	142	1	0	1	1	49	66	51
PF78	2	3	0	16	13	1	0	110	44	85	1	3	2	0	1	2	49	37	23	19	5	0	1	1	0	3	5	4	5	4	0	0	11	22	18	0	0	0	0	194	944	186	2	0	0	0	68	116	113
PF80	0	2	1	14	12	3	0	64	28	57	0	3	1	2	1	0	53	44	18	33	1	1	0	1	1	5	1	1	4	3	2	1	8	21	16	0	1	0	0	142	186	851	0	0	0	1	50	82	124
SM56	9	8	3	1	7	25	0	2	1	7	2	3	7	3	0	5	0	4	7	3	2	1	6	4	2	0	1	12	4	4	0	0	3	8	2	2	4	2	1	2	0	377	17	1	1	1	0	1
SM81	7	11	12	0	0	11	0	0	7	2	0	6	3	4	1	0	0	2	2	3	0	0	5	1	1	1	1	2	0	0	0	1	2	3	1	1	1	7	11	0	0	0	17	91	6	6	0	0
T173	42	96	52	0	2	2	0	1	7	3	0	15	9	0	13	1	0	0	18	1	0	2	33	3	2	7	2	0	0	0	3	3	5	4	0	0	98	76	1	0	0	1	1	6	232	39	0	2	2
T176	13	23	23	0	1	3	0	0	9	1	0	4	1	0	2	1	0	1	10	0	0	0	7	2	3	3	5	0	0	0	0	2	1	1	1	0	29	31	1	0	1	1	6	39	79	1	1	2
WE63	0	0	1	9	3	0	0	47	17	34	0	0	0	0	1	1	25	20	1	10	1	0	1	1	0	0	1	3	0	1	0	12	11	17	3	0	0	0	49	68	50	1	0	0	1	507	73	51
WE76	3	4	3	22	18	2	0	54	30	47	2	6	0	0	1	4	89	71	22	28	5	1	2	0	2	12	1	4	4	2	0	7	20	19	1	1	1	2	66	116	82	0	0	2	1	73	608	111
WE79	2	3	2	9	7	2	1	41	11	26	1	3	0	0	0	2	76	44	12	25	2	0	1	0	2	3	1	2	4	1	0	14	23	10	1	0	1	1	51	113	124	1	0	2	2	51	111	686

Note: Based on original time periods (before corrections); See text for explanation

comparison to the author with whom the individual had the fewest cocitations. For example, in Table 3.4, the left top cell of the matrix which compares Astin's early time period with itself would yield a rank of one, whereas the cells denoting the cocitations of Astin's first time period with Biglan's last time period, Pfeffer's last time period and Weick's first time period--all showing zero cocitations--would tie for a rank of 47 (rather than 48--because of ties in ranking). The resulting matrix depicts the strength of cocitation relationships between each author/time period and the forty-seven others with which it is paired. The ranking allows for a more direct measure of similarity of author pairs rather than examining a pair's similarity based on a comparison of their cocitation profile with those of all others in the sample. With this system of ranking, the data were left on the ordinal level, with the fewest assumptions necessary in data transformation (Bayer *et al.*, 1990).

MULTIDIMENSIONAL SCALING

The matrix of cocitation rankings was then entered into the ALSCAL multidimensional scaling program of the SAS data analysis package. Multidimensional scaling has been helpful to sociologists to "determine the structure of groups and organizations, based on members' perceptions of one another and their interaction patterns" (Kruskal and Wish, 1978: 6). Multidimensional scaling is a mathematical procedure that reveals the spatial relationships among points of data. With an understanding of the spatial map which results from multidimensional scaling, the researcher has the statistical grounds to draw theoretical conclusions

about patterns of similarity and dissimilarity within the data.

The premise of cocitation analysis is that an author's work in a particular time period is closely connected to another's work if they are cited together quite often. Multidimensional scaling plots the coordinates of data points corresponding to author/time periods based on how often they are cited together. Thus, a high cocitation rate would cause the data points corresponding to these author/time periods to be near one another on the spatial map, while those corresponding to author/time periods rarely cited together would be far away from each other. What can be concluded from the fact that some points of data (author/time periods) are geometrically close while others are geometrically distant? To make sense of this spatial arrangement, the researcher must identify the characteristics in the authors' published works which help to explain why the data are arrayed in a specific geometric configuration. Prior to labeling these characteristics, a determination must be made as to whether the configuration is one-dimensional, two-dimensional, three-dimensional or more.

The spatial configuration of data generated by multidimensional scaling can be visualized as a cloud of dots. Multidimensional scaling calculates a variety of mathematical solutions corresponding to this geometric cloud shape. It is up to the researcher to determine which mathematical solution appears to describe the shape most appropriately. For each mathematical solution offered by the multidimensional scaling analysis, it is as if a certain number of lines are drawn through the cloud to see which number and pattern of lines--or dimensions--best fits the contours of geometric arrangement of dots in the cloud. One important criterion in

multidimensional scaling is that there be at least twice as many data points as there are dimensions to be considered (Kruskal and Wish, 1978); with 48 data points this is clearly not an issue in this study.

It is usually the case that the characteristics of the data points found at the opposite extremes of each line (the negative and positive poles of the line) differ from each other in some discernable way (Kruskal and Wish, 1978). In general, a fit of one dimension would suggest that the data points differ in only one way--some tend towards one extreme of this variable and others tend towards another extreme--but that is the only difference among them. If a two dimensional solution best describes this cloud of data, that suggests that the data seem to fit most closely to a traditional x and y axes pattern--that is, each data point can be compared with each other data point based on its greater or lesser value on the x variable and a greater or lesser value on the y value. Or it may appear that three, four or more variables (dimensions) come into play in the explanation of why some points are closely related and others are more distant. In any case, the number of variables on which the data show essential differences will correspond to the number of dimensions chosen to best represent the space formed by the cloud of data.

However, the number of dimensions selected for a particular configuration is not always the same as the number of distinctive attributes on which the data differ. In some cases there may be more discernible attributes than there are dimensions, but the attributes are not strong enough across the whole set of data to form a separate dimension. On the other hand, three dimensions might be

indicated statistically while there are only clear interpretations for one or two. Even in the face of these uncertainties, it is possible to make accurate determination of the dimensionality and the important characteristics associated with those dimensions if the basic assumption of multidimensional scaling is kept in mind: the statistical analysis produces a solution only if the data vary sufficiently on the number of attributes that can be associated with the number of dimensions generated. Descriptive statistics associated with each dimensional solution will indicate how poorly or how well that dimensional solution fits the range of variation in the data at hand (Kruskal and Wish, 1978).

In most multidimensional scaling analyses, the choice of the optimal number of dimensions is made prior to any attempt to label attributes which appear to define the differences in the data. This determination is made on the basis of statistics generated by the mathematical solutions corresponding to the configuration of the data in one-dimensional space, two-dimension space, three-dimensional space and so on.

The stress statistic is the most crucial indicant of how closely the lines (dimensions) drawn through the cloud come to the actual points of data therein. The stress statistic is a calculation of the distance between the actual points of data and the lines created by the particular mathematical equation used in the analysis. This statistic has been referred to as a "badness of fit measure" because higher values are associated with less desirable, worse fitting solutions. To return to the cloud analogy, if a mathematical solution generates a large stress statistic, then the pattern of lines drawn by that solution does not very accurately follow the

contour of the data points in the cloud. Thus, a reduction in stress level is the goal of multidimensional scaling.

Each solution (one-dimensional, two-dimensional, etc.) generates a stress statistic. Stress decreases as dimensionality increases. The pattern of stress reduction between solutions provides the crucial information as to which solution best fits the data. The optimal solution is that which occurs after a marked reduction in stress, but before the reduction in stress levels off. Once the number of dimensions is determined in this way, the coordinates of the data points on each of the selected dimensions--arrayed from the negative to the positive extremes--can be examined. Any detectable patterns of variation among the points of data may indicate that there are distinctive attributes by which the data can be characterized. Mathematical formulae for statistics related to multidimensional scaling can be found in Kruskal and Wish (1978).

CLUSTER ANALYSIS

The values that each author/time period has on the dimensions which emerge from the multidimensional scaling--i.e., the reduced dimensional space--were then subjected to Ward's minimum variance hierarchical cluster analysis using the CLUSTER program within the SAS statistical package. In the clustering technique, each closest pair of authors is added together and the clusters of smaller numbers of author/time periods are added to make larger clusters until combining clusters is no longer necessary to arrive at the most parsimonious solution with the

best explanatory power. This procedure calculates the distance between two clusters, which is the analysis of variance sum of squares between the two clusters added up over all the variables. Each time two clusters are considered for agglomeration, the within-cluster sum of squares is minimized over all possible combinations of clusters. This method is most likely to add together clusters with a small number of observations, is biased towards generating clusters with similar number of observations, and is sensitive to outliers (SAS, 1989).

The optimal number of clusters was determined through the examination of the semi-partial R squared statistic (the between cluster sum of squares divided by the corrected total sum of squares), the R squared statistic (proportion of variance explained), the cubic cluster criterion (a conservative test comparing the expected and observed R squared--designed for multidimensional univariate or multivariate data with sample sizes down to 20 observations) and the Pseudo-F statistic (a measure of the separation among all the clusters in the current solution). Once the optimal number of clusters was determined, the centroid (central point) of each cluster was determined by averaging the cluster members' coordinates for each of the derived dimensions. The resulting averages represented the coordinates that correspond to the central point for the cluster in multi-dimensional space (SAS, 1983; 1990). Mathematical formulae for statistics related to the cluster analysis can be found in *SAS User's Guide: Statistics* (1985).

ANALYSIS OF AUTHORS' VITAE

In the tradition of previous sociological analysis of cocitation clusters which used document cocitation rather than author cocitation analysis, the present analysis attempted to "determine the extent to which social patterns among scientists reflect features of their intellectual products" (Mullins, et al., 1977: 553). In a manner similar to the work of Mullins et al. (1977), this study used the clusters identified in the quantitative analysis (authors considered to be intellectually related as indicated by high levels of cocitation) as the basis of inquiry regarding the social patterns of interaction among the authors. The source of information regarding the social patterns of interaction among the selected higher education authors was the authors themselves.

The nineteen living authors were sent letters (sample in Appendix B) requesting that they provide full vitae to be used in the analysis; seventeen of the nineteen complied with this request. One author's current address was not found, even after contact with the educational institution at which he was at the time of his last publication cited in the *SSCI*. Another chose not to participate after several mail and phone contacts. A search was made of biographical resources, including *American Men and Women of Science*, for these two cases. However, neither were included. Additional data (i.e., publication titles) were available through a manual search of articles in the journal *Review of Higher Education* and an electronic search of books written by these authors found in the Virginia Tech library. For the two authors who were deceased, the academic departments with

which they were most recently affiliated were contacted for vita information. Both departments responded, sending partial vitae for these two authors.

The authors' vitae were a valuable source of background information, including the dates, disciplinary fields, and institutional origins of academic degrees, as well as the organizational and institutional affiliations the scholars have had throughout their careers. All of this information was used to determine similarities and differences between the career research developments as well as the institutional backgrounds of the authors in the sample, in order to better understand their subcultural affiliations over time. For instance, in addition to providing the detailed titles of publications of the authors in a subculture to determine if their subject matter foci are similar, the vitae showed whether all the authors in the subculture have received degrees in the same major areas, have been employed in the same or similar institutions, and belong to the same professional organizations. This facilitated the labeling of the statistically generated clusters as distinct subcultures, each of which embodies a unique combination of organizational affiliations and research issues illuminated by the member authors' own accounts of their professional lives--that is, their vitae. The authors' vitae facilitated the determination of how each subculture contributes to the larger set of cognitive concerns and social organization which characterizes the field of higher education research. Because they included dates of important transition points within the authors careers (dates of key publications, job changes, etc.), the vitae also included data which was used to inform the analyses of author shifts from one subculture to another.

CHAPTER FOUR

RESULTS

This chapter presents the results of the quantitative and supplementary qualitative procedures which comprise the present author cocitation analysis of the subcultures within higher education research. The first section contains information generated from the multidimensional scaling analysis, identifying the common points which characterize this array of the most prominent authors in higher education research.

The second section outlines the results of the cluster analysis, which divides the authors into distinctive subcultures based on their statistical similarities and differences on the dimensions identified in the multidimensional scaling analysis. In addition, this section reports the results of the examination of each author's vita--a rich source of detailed background information about the author's career. This qualitative analysis aids in the determination of the bases of the similarities and differences of authors who are members of the various clusters. The result of the analysis of vitae is a description of the subcultural characteristics of the clusters, based on common characteristics of the publications and career paths of the higher education researchers which comprise each subculture.

The final portion of this chapter addresses the impact of the time division of the authors' career on the subcultural configuration within higher

education research.

MULTIDIMENSIONAL SCALING

The multidimensional scaling procedure produces results which must be interpreted in several stages. First, a variety of statistics offer information to aid in the selection of a solution with the appropriate number of dimensions which best characterize the similarities and dissimilarities within data. Once the optimal number of dimensions is determined, the position of the authors on each dimension is examined. This information, coupled with knowledge gathered about the research interests of the authors, is combined to determine the descriptive characteristics represented by each dimension. Thus, the primary purpose of this portion of the analysis is to define each of the dimensions identified through the multidimensional scaling procedure, thereby identifying the key points on which higher education researchers have commonalities and differences.

Selection of the MDS Solution

The multidimensional scaling (MDS) procedure has transformed the ranked 48 by 48 matrix of author cocitation data (based on Table 3.4) into dimensional solutions. The solution in which the dimensions most appropriately fit the data must be carefully selected to provide an accurate representation of the patterns of similarity and dissimilarity among author/time periods based on the frequency with which they were cited together in the literature.

The determination of whether the final solution is a one-, two-, three-, or N-dimensional solution is ultimately based on the level of the S-stress statistic (as defined in the previous chapter). In multidimensional scaling, a reduction of S-stress signifies that each successive solution offers an increasingly better fit with the data. Thus, the most desirable solution in multidimensional scaling is that which offers the highest explanatory power, containing several dimensions by which the data can be measured for similarity and dissimilarity, but also offering a substantial reduction in S-stress. The optimal solution is that which comes after a marked reduction of S-stress (a reduction of at least .10 is the hallmark in other cocitation analyses with a comparable number of data points as the present study) but before the reduction of S-stress levels off. As Table 4.1 indicates, the reduction of the S-stress statistics between the one- and two-dimensional solutions is .181 and between the two- and three-dimensional solutions is .107. The reduction of S-stress between the three- and four-dimensional solutions is about half as much (.058). Beyond the third dimensional solution there is little change in the level of S-stress reduction (reduction of .048 between four and five dimensions; .031 between five and six dimensions). Although one of the higher dimensional solutions potentially could add to the richness of the interpretation, none of them offers sufficient improvement in explanatory power to warrant their consideration. Thus, the **three-dimensional solution** is the optimal solution for these data.

TABLE 4.1

Statistics Pertaining to the Selection
of the Appropriate Number of Dimensions

Number of Dimensions	S-Stress	Reduction of S-Stress Between Solutions
1	.55339	
2	.37222	.18117
3	.26510	.10712
4	.20682	.05828
5	.15838	.04844
6	.12767	.03071

Note: ____ denotes key statistics for choice of three dimensions

Interpretation of the Dimensions

Multidimensional scaling is designed to assign statistical values for each data point on a number of dimensions. However, the procedure does not give any indication about the substantive meaning or interpretation of the dimensions or the placement of authors thereon. Each dimension is depicted as a continuum ranging from extreme negative to extreme positive poles. The labeling of these negative and positive poles, which leads to further understanding of why the data are arranged in these particular configurations, must be based on knowledge of the research topics addressed by the authors included in the cocitation database.

Three sources were consulted to gain information about the research topics addressed by the authors in the selected time periods. First, a list of the authors' publications was compiled from works cited in *The Review of Higher Education* from 1980 through 1989. A second source was the list of books attributed to each author by the catalogue of holdings for the Virginia Tech University Libraries. The final source consulted was a more complete listing of each author's publications provided by the authors themselves, or, in the case of the deceased authors, by the institutions with which they were last affiliated. From a reading of this compilation of data based on key words in titles, it became clear that some of the principal research topics addressed by the authors in this study included issues pertaining to the social organization of higher education, the role of faculty in higher education, the teaching process, and student experiences in higher education.

With this information in hand, the next step is to examine the values of each author/time period on each of the dimensions--that is, to determine where on the continuum each is placed in relationship to the others. These values are shown in Tables 4.2, 4.3 and 4.4. As was explained in Chapter Three, each dimension represents a linear continuum which fits the contour of the data points and offers some indication of the attributes which differentiate the authors. The best way to interpret the dimensions and what they represent for a particular data set is to focus on the positive and negative poles of each continuum, and to determine how the author/time periods found at these extremes differ from one another. After careful examination of research interests of the author/time periods which mark the extreme ends of each continuum, it is possible to label the positive and negative poles of each dimension in the following schema. In and of itself, each dimension depicts a unique categorization of the research interests of the authors in this study. However, because each dimension is derived from the same body of research, a particular research topic may be found at the extreme poles of more than one dimension. The reasons for this phenomenon are related to the arrangement of the data in three-dimensional space, an issue to be addressed here after each of the three dimensions is defined.

Definition of the First Dimension

The research covered in the author/time periods arrayed on the negative pole of the first dimension (Table 4.2) includes such topics as power and conflict in the

TABLE 4.2
Author Coordinates on Dimension #1

Author	Time Period	Coordinate	Labels on Poles
BALDRIDGE	1969-1975	-1.7083	Impact of Power,
COHEN	1972	-1.6807	Leadership, and
BLAU	1953-1964	-1.5524	Organizational
PFEFFER	1978-1979	-1.5417	Structure
PFEFFER	1980-1989	-1.5246	
WEICK	1963-1975	-1.5084	
COHEN	1973-1989	-1.4642	
PFEFFER	1970-1977	-1.4630	
WEICK	1979-1989	-1.3252	
WEICK	1976-1978	-1.3865	
MERTON	1934-1956	-1.3047	
MERTON	1968-1989	-1.2509	
CLARK	1972-1989	-1.1754	
MERTON	1957-1967	-1.1725	
BLAU	1971-1989	-1.0705	
BALDRIDGE	1976-1989	-1.0484	
BLAU	1965-1970	-0.5906	
CLARK	1956-1971	-0.4302	
JENCKS	1970-1972	-0.2602	
CARTTER	1959-1966	-0.2093	
LADD	1963-1977	-0.1782	
LADD	1978-1989	-0.1738	
JENCKS	1962-1969	0.0075	
JENCKS	1973-1989	0.1446	
BOWEN	1943-1976	0.2844	
CARTTER	1967-1977	0.3384	
BAYER	1964-1989	0.5888	
BAYER	1959-1974	0.6062	
BIGLAN	1973-1979	0.6155	
BOWEN	1977-1989	0.6222	
SMART	1970-1980	0.6920	
BIGLAN	1980-1989	0.7010	
ASTIN	1972-1977	1.0564	
ASTIN	1958-1971	1.0780	
CENTRA	1977-1989	1.0902	
TINTO	1976-1989	1.1052	
MCKEACHIE	1976-1989	1.1563	
ASTIN	1978-1989	1.1637	
MARSH	1975-1983	1.1759	
FELDMAN	1968-1971	1.1797	
TINTO	1973-1975	1.1879	
MCKEACHIE	1951-1975	1.2002	
MARSH	1984-1989	1.2802	Impact of the Direct
PASCARELLA	1981-1989	1.3212	Interaction Between
PASCARELLA	1975-1980	1.3283	"Players" Within
FELDMAN	1972-1989	1.3364	Academia on the
SMART	1981-1989	1.3888	Educational
CENTRA	1968-1976	1.4413	Experience

university, managing change in an educational organization, leadership, bureaucracy, academic governance, formal organizations, social psychology of organizations, and organizational theory. This research emphasis on organizational structure and behavior, especially in relation to power and leadership, seems to suggest that this pole is most focused on the administrative issues of academia.

The publications associated with the positive pole of this first dimension include research on student attrition, student ratings of teachers and instruction, and the effect of the college environment on student achievement and self-concept. This body of research is more concerned with the implications of direct human interaction among those involved in the educational process (e.g. the mutual influence of students and their peers or teachers and their students). Thus, the first dimension ranges from research emphasizing the **impact of power, leadership, and organizational structure on academia** to studies concerned with the **impact of the direct interaction among the academic "players" on the educational experience.**

Definition of the Second Dimension

For the second dimension (Table 4.3), the author/time periods on the most negative pole of the axis focus research efforts on such things as inequality in education due to the relationship of family background and schooling, student attrition in college, accessibility of college education, professors as an economic resource, career preparation in a liberal arts institution, the cost of and investment in higher education, achievement of academic excellence, and the effect of the

TABLE 4.3
Author Coordinates on Dimension #2

Author	Time Period	Coordinate	Labels on Poles
JENCKS	1973-1989	-1.6586	Effect of Academic
TINTO	1976-1989	-1.4815	System on the
JENCKS	1970-1972	-1.4743	Student
TINTO	1973-1975	-1.3227	
ASTIN	1978-1989	-1.2733	
PASCARELLA	1981-1989	-1.2386	
BOWEN	1977-1989	-1.2023	
SMART	1981-1989	-1.1750	
ASTIN	1972-1977	-1.1749	
PASCARELLA	1975-1980	-1.1617	
ASTIN	1958-1971	-1.0726	
BLAU	1965-1970	-1.0503	
FELDMAN	1968-1971	-1.0453	
CLARK	1956-1971	-1.0284	
JENCKS	1962-1969	-1.0259	
CLARK	1972-1989	-0.4157	
BLAU	1953-1964	-0.1497	
COHEN	1973-1989	-0.0189	
BLAU	1971-1989	0.0050	
MERTON	1934-1956	0.0085	
WEICK	1976-1978	0.0206	
BALDRIDGE	1969-1975	0.0356	
WEICK	1979-1989	0.0789	
PFEFFER	1978-1979	0.1226	
MERTON	1957-1967	0.1240	
PFEFFER	1970-1977	0.1531	
PFEFFER	1980-1989	0.2011	
MERTON	1968-1989	0.2131	
BOWEN	1943-1976	0.2481	
BAYER	1964-1974	0.2746	
COHEN	1972	0.2774	
CARTTER	1967-1977	0.2937	
BALDRIDGE	1976-1989	0.3628	
WEICK	1963-1975	0.4020	
CARTTER	1959-1966	0.5459	
LADD	1963-1977	0.6177	
SMART	1970-1980	0.6877	
CENTRA	1968-1976	0.8968	
LADD	1978-1989	0.9304	
BIGLAN	1973-1979	1.0001	
FELDMAN	1972-1989	1.1944	
MCKEACHIE	1951-1975	1.3248	
BAYER	1975-1989	1.3536	
MARSH	1984-1989	1.3604	
CENTRA	1977-1989	1.3782	
MARSH	1975-1983	1.5486	Effect of the
MCKEACHIE	1976-1989	1.5757	Student on the
BIGLAN	1980-1989	1.7345	Academic System

college environment on students. This pole seems to revolve around determinants for successful or unsuccessful student experiences, or, more succinctly, factors which affect academic persistence.

The publications associated with the author/time periods positioned at the positive pole of the second dimension most often focus on student evaluations of faculty effectiveness. Also, related topics of faculty development, improvements in teaching methods, and the academic reward system for faculty are included. This end of the continuum depicts an emphasis on student assessment of the teaching process and the assessment's impact on faculty success. Thus, the second dimension reflects a range of research from that concerned with the **effect of the academic system on the student** to that which focuses on the **impact of students on the academic system.**

Definition of the Third Dimension

In multidimensional scaling, the first dimension is often the most clearly defined, while the higher level dimensions appear less and less distinct. These data appear to follow that pattern; that is, the poles of the third dimension (Table 4.4) include research that spans a wider spectrum of topics than is the case on the first and second dimensions.

The research found at the negative end of the third dimension includes such topics as academic output in certain disciplines, student evaluations, appraisals of instructional quality, learning cognition, power in formal organizations, and

TABLE 4.4
Author Coordinates on Dimension #3

Author	Time Period	Coordinate	Labels on Poles
BIGLAN	1980-1989	-1.5885	Outputs of
MARSH	1984-1989	-1.1291	Academia
MCKEACHIE	1951-1975	-1.0137	
FELDMAN	1972-1989	-0.9206	
MARSH	1975-1983	-0.8856	
WEICK	1963-1975	-0.8853	
MERTON	1934-1956	-0.8782	
MCKEACHIE	1976-1989	-0.8231	
BLAU	1953-1964	-0.8045	
COHEN	1972	-0.6632	
WEICK	1979-1989	-0.6040	
CENTRA	1968-1976	-0.5940	
PFEFFER	1980-1989	-0.5933	
BLAU	1965-1970	-0.5820	
MERTON	1957-1967	-0.5563	
CLARK	1972-1989	-0.5430	
JENCKS	1973-1989	-0.4709	
PASCARELLA	1981-1989	-0.4518	
CENTRA	1977-1989	-0.4364	
WEICK	1976-1978	-0.4295	
TINTO	1976-1989	-0.4165	
PASCARELLA	1975-1980	-0.4079	
PFEFFER	1970-1979	-0.3920	
PFEFFER	1968-1977	-0.3695	
BALDRIDGE	1969-1975	-0.3580	
TINTO	1973-1975	-0.3219	
JENCKS	1970-1972	-0.3145	
FELDMAN	1968-1971	-0.2832	
MERTON	1968-1989	-0.1605	
COHEN	1973-1989	-0.1585	
SMART	1981-1989	-0.1387	
ASTIN	1978-1989	0.0349	
CLARK	1956-1971	0.1170	
ASTIN	1972-1977	0.1728	
ASTIN	1958-1971	0.2288	
BLAU	1971-1989	0.2359	
BOWEN	1977-1989	0.5776	
BALDRIDGE	1976-1989	1.1457	
JENCKS	1962-1969	1.2007	
BAYER	1975-1989	1.3063	
SMART	1970-1980	1.3590	
BIGLAN	1973-1979	1.4054	
LADD	1963-1977	1.4933	
BAYER	1964-1974	1.5899	
LADD	1978-1989	1.6239	
CARTTER	1959-1966	1.7284	
CARTTER	1967-1977	1.9269	Inputs into
BOWEN	1943-1976	2.0278	Academia

bureaucracy. These works appear to center on the results or products of academia.

On the positive side of this continuum, the research topics include the politics of the professorate, collective bargaining in academia, who benefits from and who should pay for higher education, leadership and policy making, faculty development and reward structures, accountability of institutions, the academic labor market, black college freshmen, enrollment management, and student financial need. This wide variety of issues seems to have a central theme of the resources and investment which go into academia. Thus, the third dimension differentiates research focused on the **outputs of academia** at the negative pole from studies which concentrate on the **inputs into academia** at the positive pole.

Summary of Dimensional Analysis

Through this analysis it has been determined that three dimensions best describe the differences and similarities within this sample of the most prominent higher education researchers. The dimensional continua on which the authors are arrayed are 1) **research ranging from that regarding the impact of power, leadership and organizational structure in academia to research regarding the impact of direct interactions among the "players" within academia**, 2) **research ranging from the effect of the academic system on the student to research regarding the effect of the student on the academic system**, and 3) **research ranging from that which is concerned with the outcomes of academia to research concerning the inputs and investment into academia**.

A review of Tables 4.2 through 4.4 offers insight into the complex nature of such a three dimensional solution. For example, while McKeachie and Marsh are among a variety of authors on the positive poles of both the first and second dimension, they can be found on the negative pole of the third dimension. In each case, they are arrayed with a slightly different group of author/time periods. This demonstrates that, while their research interests--student perceptions of teaching excellence--might be a factor at the extremes of each of the dimensions, a different nuance of those interests is detected by each dimension. For the first dimension, it is the fact that student evaluations are a result of direct student/teacher interaction that is important; for the second dimension the salient issue is the role that the students play in affecting the academic environment through their evaluations of the teaching process; the third dimension reflects the fact that learning, and the student evaluations of that process, are an outcome of academia. Thus, one general research area can be viewed in three distinct ways, and is in this sense three-dimensional. Each research focus can be viewed in this threefold manner because each can be found in one area or another on each of the dimensions.

CLUSTER ANALYSIS

The first step in the cluster analysis is the determination of the number of clusters which best represents groupings of author/time periods based on their statistical distances from one another within three-dimensional space. Once the number of clusters is determined, the numerical values of each cluster's author/time

periods on the three dimensions must be examined to determine the dimensional characteristics of each cluster, identifying each as a separate entity within the field of higher education research. Then, the statistical nature of each distinct cluster must be examined in the context of information regarding the research interests and career developments of the authors in the clusters. Through this analysis the internal characteristics of each cluster can be determined. The result is that each of the clusters is labeled in such a way that the subcultural elements distinguishing it from each of the other clusters is revealed. Since the cluster analysis is based on the dimensional analysis, the resulting subcultural clusters reflect the three-dimensional nature of the research of each of the author/time periods; the authors/time periods are joined in such a way that all three aspects of their research foci are evaluated in determining their proximity to one another.

Optimal Number of Clusters

Table 4.5 displays the statistics used to determine the number of clusters which best fits the data. The values of the semi-partial R-squared statistic denote the decrease in the proportion of variance accounted for when two clusters are joined together (that is, the between-cluster sum of squares divided by the corrected total sum of squares). A sharp drop in this statistic, such as that which occurs between the four and five cluster solutions, suggests that, in this case the four cluster solution is not as powerful in its ability to explain the differences in the data as is the five cluster solution. The corresponding R-squared statistic, which

TABLE 4.5

Statistics Pertaining to the Selection
of the Appropriate Number of Clusters

Number of Clusters	Semipartial R-Squared	R-Squared	Cubic Cluster Criterion	Pseudo-F
9	.006314	.956084	11.9808	97.97
8	.007997	.948087	12.0181	96.53
7	.009881	.938206	12.1667	96.16
6	.015366	.922840	12.0613	93.29
5	.016249	.906590	12.7250	97.06
4	.049183	.857407	11.1570	82.18
3	.182320	.675087	3.8006	43.63
2	.297061	.378027	.2474	26.13

Note: ____ denotes key statistics for choice of five clusters

necessarily drops in proportion to the semi-partial R-squared, reveals that the five cluster solution explains over ninety percent of the variance compared with approximately eighty-six percent of the variance explained when the data are divided into four clusters. The indicator clue which points to the selection of the five cluster solution is the fact that the cubic cluster criterion, a statistic which at its peaks indicates the desirable number of clusters, reaches its maximum of 12.725 at the five cluster solution. The pseudo-F statistic, a measure of the separation among all the clusters in the current solution, also reaches one of its highest levels at the five cluster solution, indicating that the five clusters are relatively distinct from one another (SAS, 1989). Thus, a combination of the essential indicators in cluster analysis suggests that **the optimum number of clusters** for these author/time period cocitation data **is five.**

Characteristics of the Clusters

Table 4.6 lists the author/time periods in each of the five clusters. A five percent trimming procedure has been employed because of the detrimental effect that outliers (extreme points) in the data set have on the accuracy of cluster formation. This trimming results in the exclusion of three author/time periods from the final cluster analysis. The author/time periods eliminated because of the dissimilarity of their work to the work of the others in the study are **Biglan 1980-1989, Marsh 1975-1983**, and **Marsh 1984-1989**. The implications of the loss of these data are addressed in Chapter Five.

TABLE 4.6

Authors by Clusters and Dimensional Coordinates

Cluster	Author Time Period	Coordinates on Dimension #1	#2	#3
Cluster A:	Pfeffer 1970-77	-1.4630	.1531	-.3695
	Pfeffer 1978-79	-1.5417	.1226	-.3920
	Weick 1976-78	-1.3865	.0206	-.4295
	Baldridge 1969-75	-1.7083	.0356	-.3580
	Cohen 1973-89	-1.4642	-.0189	-.1585
	Merton 1968-89	-1.2509	.2131	-.1605
	Clark 1972-89	-1.1754	-.4157	-.5430
	Blau 1971-89	-1.0705	.0050	.2359
	Blau 1953-64	-1.5524	-.1497	-.8045
	Merton 1934-56	-1.3047	.0085	-.8782
	Pfeffer 1980-89	-1.5246	.2011	-.5933
	Weick 1979-89	-1.3952	.0789	-.6040
	Merton 1957-67	-1.1725	.1240	-.5563
	Cohen 1972	-1.6807	.2774	-.6632
	Weick 1963-75	-1.5084	.4020	-.8853
Cluster B:	Pascarella 1975-80	1.3283	-1.1617	-.4079
	Pascarella 1981-89	1.3212	-1.2386	-.4518
	Feldman 1968-71	1.1797	-1.0453	-.2832
	Smart 1981-89	1.3888	-1.1750	-.1387
	Tinto 1973-75	1.1879	-1.3227	-.3219
	Tinto 1976-89	1.1052	-1.4815	-.4165
	Astin 1958-71	1.0780	-1.0726	.2288
	Astin 1972-77	1.0564	-1.1749	.1728
	Astin 1978-89	1.1637	-1.2733	.0349
	Bowen 1977-89	.6222	-1.2023	.5776

TABLE 4.6
(continued)

Authors by Clusters and Dimensional Coordinates

Cluster	Author Time Period	Coordinates on Dimension #1	#2	#3
Cluster C:	Bowen 1943-76	.2844	.2481	2.0278
	Cartter 1967-77	.3384	.2937	1.9269
	Bayer 1964-74	.6062	.2746	1.5899
	Biglan 1973-79	.6155	1.0001	1.4054
	Smart 1970-80	.6920	.6877	1.3590
	Bayer 1975-89	.5888	1.3536	1.3063
	Cartter 1959-66	-.2093	.5459	1.7284
	Ladd 1963-77	-.1782	.6177	1.4933
	Ladd 1978-89	-.1738	.9304	1.6239
	Baldridge 1976-89	-1.0484	.3628	1.1457
Cluster D:	Feldman 1972-89	1.3364	1.1944	-.9206
	McKeachie 1951-75	1.2002	1.3248	-1.0137
	McKeachie 1976-89	1.1563	1.5757	-.8231
	Centra 1977-89	1.0902	1.3782	-.4364
	Centra 1968-76	1.4413	.8968	-.5940
Cluster E:	Jencks 1970-72	-.2608	-1.4743	-.3145
	Jencks 1973-89	.1446	-1.6586	-.4709
	Blau 1965-70	-.5906	-1.0503	-.5820
	Clark 1956-71	-.4302	-1.0284	.1170
	Jencks 1962-69	.0075	-1.0259	1.2007

Table 4.6 also includes the coordinate values on each of the three dimensions for all the members of each cluster. This table shows that there are definite similarities within most clusters in terms of negative and positive values on the dimensions. This indicates that the cluster procedure has produced clusters which are fairly homogeneous and distinct from one another, as is desirable for cluster analysis.

In order to reach a more statistically accurate determination of the points of dissimilarity among the clusters, the centroid (central point) of each cluster is determined by averaging the coordinate values across all members of the clusters for each of the three dimensions. The coordinates of the centroids for each cluster are listed in Table 4.7. Figure 4.1 shows a three-dimensional map of the relationships of the members of each cluster and the clusters to one another. With these depictions of the positions of cluster members on each dimension, it is then possible to determine the characteristics which distinguish one cluster of author/time periods from the other clusters. Clusters can be characterized as embodying strong, moderate or low emphases on the two poles of each dimension. These cluster characteristics are summarized in Tables 4.8 and 4.9, and are explicated in the next section.

Labeling the Clusters

Clusters are labeled on the basis of two sources of data. First, a cluster's strong or moderate emphasis on each dimensional characteristic is considered

TABLE 4.7

Dimensional Coordinates of Centroids for Each of the Five Clusters

Cluster	Dimension 1 (-1.7083 to 1.4413)	Dimension 2 (-1.6586 to 1.7345)	Dimension 3 (-1.5885 to 2.0278)
Cluster A	-1.4132	.0705	- .4773
Cluster B	1.1431	-1.2147	- .1005
Cluster C	.1515	.6314	1.5606
Cluster D	1.2449	1.2733	- .7575
Cluster E	-.2259	-1.2475	-.0099

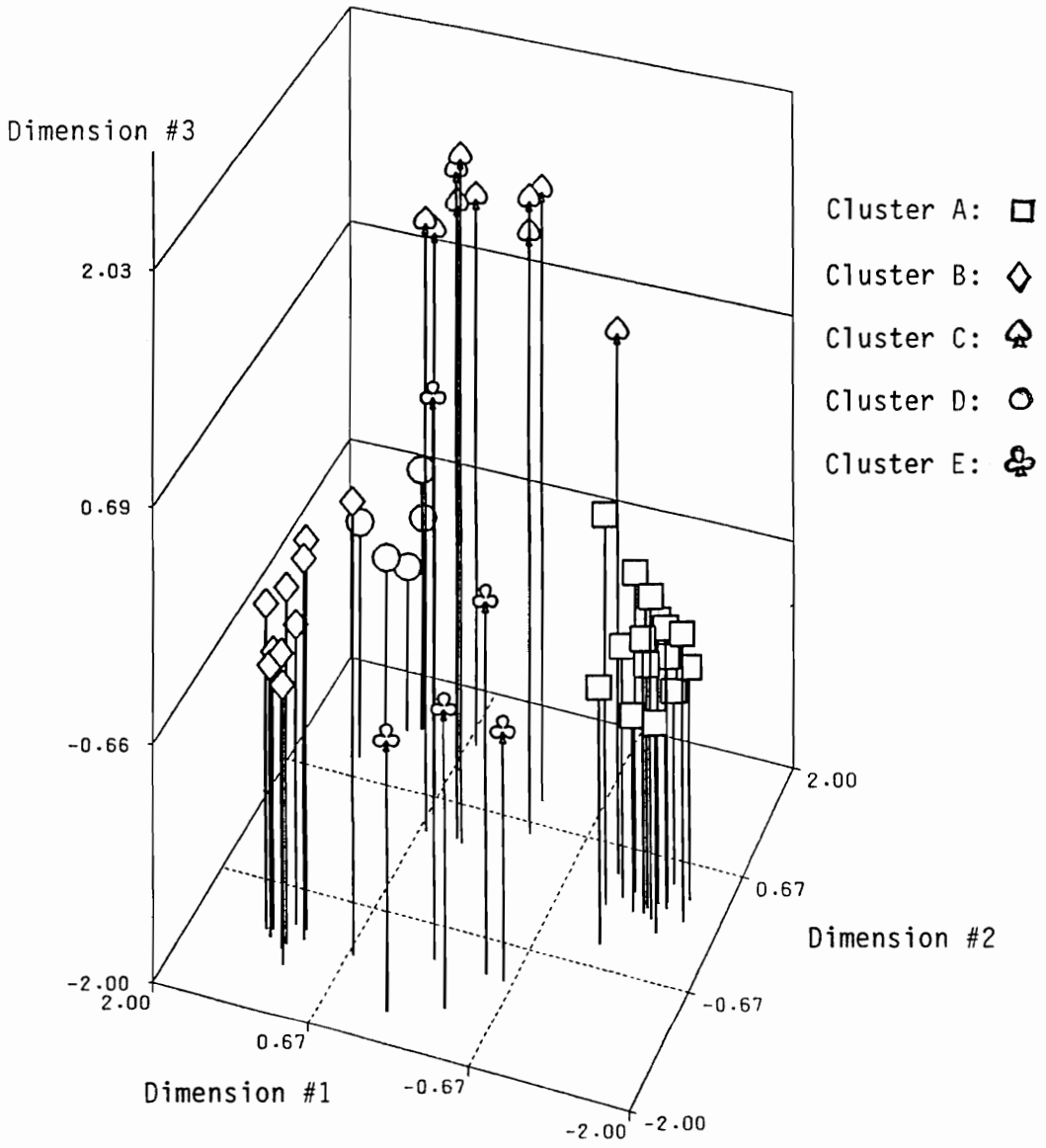

FIGURE 4.1: Three-Dimensional Map of the Culture of Higher Education Research

TABLE 4.8

Delineation of Low, Moderate and Strong Values on Each Dimension

Dimension 1:	Power, leadership and organizational structure	Direct interaction between "players" within academia
	<----------	---------->
	-	+
Dimension 2:	Effect of Academic System on Students	Effect of Students on Academic System
	<----------	---------->
	-	+
Dimension 3:	Results/Output of Academia	Input/Investments into Academia
	<----------	---------->
	-	+

Dimension 1:

-	-	-	+	+	+
strong	moderate	low	low	moderate	strong
-1.7	-1.2	- .7	- .15	.4	.9	1.4

Dimension 2:

-	-	-	+	+	+
strong	moderate	low	low	moderate	strong
-1.7	-1.15	- .6	0	.6	1.15	1.7

Dimension 3:

-	-	-	+	+	+
strong	moderate	low	low	moderate	strong
-1.6	-1.0	- .4	.2	.8	1.42	2.0

TABLE 4.9

Summary of Dimensional Characteristics
for Each Cluster

Cluster A

1. Strong emphasis on power, leadership and organization
2. Near neutral position, but very slight emphasis on students affecting the system
3. Low to Moderate emphasis on results/output of academia

Cluster B

1. Moderate emphasis on direct interactions within academia
2. Strong emphasis on the effect of the academic system on the students
3. Low emphasis on results/output of academia

Cluster C

1. Neutral position between emphases on power/leadership/organization and direct interaction
2. Moderate emphasis on effect of students on the academic system
3. Strong emphasis on the input/investments into academia

Cluster D

1. Strong emphasis on direct interactions within academia
2. Strong emphasis on the effect of students on the academic system
3. Moderate emphasis on the results/output of academia

Cluster E

1. Low emphasis on power, leadership and organization
2. Strong emphasis on the effect of the academic system on students
3. Low emphasis on the results/output of academia

(Tables 4.8 and 4.9). Secondly, the background characteristics of the authors as provided by their vitae are considered: titles of publications, academic majors in which their degrees were earned, and professional organization memberships (it should be noted that data for degrees and memberships are unavailable for Baldridge and Tinto). These data are summarized in Table 4.10-4.14, which show that the members of the clusters have been cocited with one another (a form of intellectual interaction) because they focus on similar research issues and have had similar organizational experiences. As explained in Chapter One, academicians who share such characteristics constitute an academic subculture. Thus, from this point forward, the term "cluster" can be read as synonymous with academic "subculture."

Cluster A: Organizational Structure and Leadership in Academia

As shown in Table 4.10, authors included in Cluster A are Pfeffer (1970-1977, 1978-1979, 1980-1989), Weick (1963-1975, 1976-1978, 1979-1989), Baldridge (1969-1975), Cohen (1972), Merton (1934-1956, 1957-1967, 1968-1989), Clark (1972-1989) and Blau (1947-1964, 1971-1989). These authors earned degrees in psychology, sociology and business and they attended universities which have renowned programs in these areas (e.g. Harvard, Stanford, Columbia). Each of the members of this cluster belongs to the American Sociological Association. According to the dimensional analysis, the study of organizational behavior, including the issues of power, leadership and higher education administration, is the focus of these authors' research. A few titles of

TABLE 4.10

Academic Majors and Primary Issues Addressed
During the Careers of Authors in the
Organizational Structure and Leadership in Academia
Subculture

Authors	Degrees/Position	Issues
Pfeffer (1970-1977) (1978-1979) (1980-1989)	business organization	organization management power, resources
Weick (1963-1975) (1976-1978) (1979-1989)	psychology business	organization management
Baldridge (1969-1975)	*	organizational innovations institutional characteristics power, authority academic governance
Cohen (1972) (1973-1989)	social science public policy	organization leadership
Merton (1934-1956) (1957-1967) (1968-1989)	sociology	social structure bureaucracy leadership
Clark (1972-1989)	sociology higher education	systems, structure power in education-- international & in U.S coordination
Blau (1953-1964) (1971-1989)	sociology	structure organization bureaucracy leadership

Note: * denotes information not available; see text explanation

their works which illustrate their research emphasis include: "Managing Change in Educational Organizations: Sociological Perspective, Strategies and Case Studies," "Academic Governance: Research on Institutional Politics and Decision-making" (Baldridge), "Educational Organizations as Loosely Coupled Systems," "How Professional Organizations Work: Implications for School Organization and Management" (Weick); "The Ambivalence of Organizational Leaders," "Social Theory and Social Structure" (Merton); "A Garbage Can Model of Organizational Choice," "Leadership and Ambiguity: The American College Presidency" (Cohen); "Bureaucracy in Modern Society," "Organization of Academic Work" (Blau); "The Organizational Saga in Higher Education," "Academic Power in the United States" (Clark); "The External Control of Organizations," "The Bases and Use of Power in Organizational Decisionmaking: The Case of a University" (Pfeffer). Thus, Cluster A is entitled **Organizational Structure and Leadership in Academia.**

Cluster B: Impact of College Environment on Student Outcomes

Pascarella (1975-1980, 1981-1989), Tinto (1973-1975, 1976-1989), Astin (1958-1971, 1972-1977, 1978-1989), Smart (1981-1989), Feldman (1968-1971), and Bowen (1977-1989) are members of Cluster B (Table 4.11). This cluster consists of authors with degrees in the following areas: psychology, public administration, economics, and educational research. They are all members of the American Educational Research Association and the Association for the Study of Higher Education. According to the dimensional analysis, the primary focus of their

TABLE 4.11

Academic Majors and Primary Issues Addressed
During the Careers of Authors in the
Impact of College Environment on Student Outcomes
Subculture

Authors	Degrees/Position	Issues
Smart (1981-1989)	political science research in higher education	research outcomes: achievement self-concept values attainment persistence
Feldman (1968-1971)	sociology social psychology	college impact
Astin (1958-1971) (1972-1977) (1978-1989)	psychology higher education	productivity effect of college achievement college environment characteristics of students & faculty attrition, outputs protests equal access
Pascarella (1975-1980) (1981-1989)	educational research higher education	student perceptions faculty and administration perceptions college environment attrition freshman outcomes student/faculty relations influence of campus on students achievement attainment Tinto's work

TABLE 4.11
(continued)

Academic Majors and Primary Issues Addressed
During the Careers of Authors in the
Impact of College Environment on Student Outcomes
Subculture

Authors	Degrees/Position	Issues
Bowen (1977-1989)	economics education	investment in learning costs of higher education professors as a resource
Tinto (1973-1975) (1976-1989)	*	college attendance retention, attrition in higher education academic authority and productivity occupational attainment

Note: * denotes information not available; see text explanation

research is the effect of academia on students--through direct interactions. Illustrative titles include: "College Effects on Occupational Status Attainment," "The Influence of College on Self-Concept" (Smart); "The Impact of College on Students," "Change and Stability of Religious Orientations During College" (Feldman); "Four Critical Years," "Measuring the Outcomes of Higher Education" (Astin); "Student-Faculty Informal Relationships and Freshman Year Educational Outcomes," "The Influence of Living on Campus Versus Commuting to College on Intellectual and Interpersonal Self-Confidence" (Pascarella); "Stages of Student Departure: Reflections on the Longitudinal Characteristics of Student Learning," "Patterns of Educational Sponsorship to Work: a Study of Modes of Early Occupational Attainment from College to Professional" (Tinto), "American Professors: a National Resource Imperiled," "Investment in Learning" (Bowen). This cluster is best summarized in the title **Impact of College Environment on Student Outcomes.**

Cluster C: Material and Nonmaterial Culture of Academia

Cluster C (shown in Table 4.12) includes Baldridge (1976-1989), Bayer (1964-1974, 1975-1989), Ladd (1963-1977, 1978-1989), Cartter (1959-1966, 1967-1977), Bowen (1943-1976), Smart (1970-1980), and Biglan (1973-1979). The academic backgrounds of authors in Cluster C represent an eclectic mix: economics, sociology, political science, public affairs, and psychology. Most of the authors have been associated with the American Council on Education; several are

TABLE 4.12

Academic Majors and Primary Issues Addressed
During the Careers of Authors in the
Material and Nonmaterial Culture of Academia
Subculture

Authors	Degrees/Position	Issues
Biglan (1973-1979)	psychology	subject matter in departments
Bayer (1964-1974) (1975-1989)	sociology educational & developmental psychology	productivity resources professional rewards norms, attitudes protests gender differences
Ladd (1963-1977) (1978-1989)	government social inquiry	politics & academia
Bowen (1943-1976)	economics	financing education efficiency of education economics labor market accountability teaching/learning
Cartter (1959-1966) (1967-1977)	*	wages, income, economic aid supply/demand for college teachers faculty needs and resources academic labor market financing education quality of education

Note: * denotes information not available; see text explanation

TABLE 4.12
(continued)

Academic Majors and Primary Issues Addressed
During the Careers of Authors in the
Material and Nonmaterial Culture of Academia
Subculture

Authors	Degrees/Position	Issues
Smart (1970-1980)	political science higher education research in higher education	departments disciplines money issues: rewards, salary grants, collective bargaining
Baldridge (1976-1989)	*	academic governance unions, collective bargaining professional autonomy leadership management, college administration enrollment change in educational organizations

Note: * denotes information not available; see text explanation

affiliated with polling organizations. Otherwise, there is very little overlap in their backgrounds. The primary interest of this group is in the input and investments made into academia, not only in terms of financial resources, but also in regards to the norms and attitudes of the students and faculty. Exemplary titles include: "Assessing the Impact of Faculty Collective Bargaining," "The Campus and the Microcomputer Revolution: Practical Advice for Nontechnical Decisionmakers" (Baldridge); "Human Resources and Higher Education," "Student Protest and Sex Role Attitude Change 1967-1971" (Bayer); "The Opinions and Norms of the American Academics," "Unionizing the Professorate" (Ladd); "The Finance of Higher Education," "Efficiency in Liberal Education" (Bowen); "Faculty Needs and Resources in American Higher Education," "Higher Education: Who Pays? Who Benefits? Who Should Pay?" (Cartter); "Goal Orientation of Academic Departments," "Reward Structures of Academic Disciplines" (Smart); "The Characteristics of Subject Matter in Different Academic Areas," "Relationships between Subject Matter Characteristics and the Structure and Output of University Departments" (Biglan). With its emphasis on the resources affiliated with academia--both financial and human--this cluster is given the title **Material and Nonmaterial Culture of Academia.**

Cluster D: Student Perceptions and Effective Teaching

Cluster D (shown in Table 4.13) includes three authors--McKeachie (1951-1975, 1976-1989), Centra (1968-1976, 1977-1989), and Feldman (1972-1989)--

TABLE 4.13

Academic Majors and Primary Issues Addressed
During the Careers of Authors in the
Student Perceptions and Effective Teaching
Subculture

Authors	Degrees/Position	Issues
McKeachie (1951-1975) (1976-1989)	psychology learning & teaching	teaching student ratings psychology of learning faculty/university motivation, anxiety
Feldman (1972-1989)	sociology social psychology	student ratings instructional effectiveness
Centra (1968-1976) (1977-1989)	social science psychology higher education	college environment student perceptions improving instruction women, ethnicity, and racial issues faculty development enrollments

who have academic backgrounds in psychology, social psychology and higher education. All three are members of the American Psychological Association and the American Educational Research Association, and have served in an editorial capacity for the *Journal of Higher Education*. Interestingly, Feldman and McKeachie received degrees and were employed by the University of Michigan; Centra was affiliated with Michigan State University. According to the dimensional analysis, the research focus of the members of this cluster has been on the effect of the student on academia--through direct interactions; that is, they have all done research on student ratings of teacher performance. Their titles include: "Teaching Tips: a Guidebook for the Beginning College Teacher," "Improving Lectures By Understanding Students' Information Processing" (McKeachie); "The Superior College Teacher From the Students' View," "Course characteristics and College Students' Ratings of their Teachers--What We Know and What We Don't" (Feldman); "School and Teacher Effects: An Interrelational Model," "The Effectiveness of Student Feedback in Modifying College Instruction." Thus, Cluster D is best entitled **Student Perceptions and Effective Teaching**.

Cluster E: Hierarchy and Inequality in Education

Cluster E also includes three authors--Blau (1965-1970), Clark (1956-1971), and Jencks (1962-1969, 1970-1972, 1973-1989)--all of whom hold degrees in sociology (among other degrees, e.g. higher education--Clark, education and urban affairs--Jencks) and belong to the American Sociological Association (Table 4.14).

TABLE 4.14

Academic Majors and Primary Issues Addressed
During the Careers of Authors in the
Hierarchy and Inequality in Education
Subculture

Authors	Degrees/Position	Issues
Blau (1965-1970)	sociology	organization authority
Clark (1956-1971)	sociology higher education	organization authority
Jencks (1962-1969) (1970-1972) (1973-1989)	sociology human development educaton/urban affairs	equality of educational opportunity testing poverty

Clark and Jencks have degrees from Harvard, Blau from Columbia. The dimensional analysis showed that this cluster focuses on the effect of academia on students--a macro-level, sociological perspective. Among the exemplary titles are: "The Hierarchy of Authority in Organizations," "The American Occupational Structure" (Blau); "The Study of Educational Systems," "Faculty Organization and Authority" (Clark); "Who Should Control Education," "Whom Must we Treat Equally for Education Opportunity to Be Equal?" (Jencks). The emphases of the works of these authors suggests the title of **Cluster E: Hierarchy and Inequality in Education.**

IMPACT OF TIME PERIOD DIVISIONS ON SUBCULTURES

The final portion of this chapter concerns the impact of the author's career time divisions on the clusters. These results show which authors belong to different clusters at different points in their career, and through examination of the development of their careers, suggest the reasons why these authors move from one cluster to another.

As previously noted, each author's citation career is divided into two or three time periods based on the total number of citations they had received and the length of their careers. Differentiating time periods based on the dates of the authors' cited works is an innovation which allows for a more pointed analysis of which authors research certain topics at particular periods of time. This information, combined with background information provided by the vita of each of the authors, can aid in the determination of key shifts in the ideas, interests, and

professional associations of the most prominent scholars in the field of higher education. In other words, an analysis of time differentials as illuminated by chronological developments shown on the authors vitae contributes greater understanding of changing research emphases, scholarly relationships, and key institutional affiliations which define the culture of higher education research.

Knowledge regarding the patterns of citation careers over time also indicates patterns in the historical development of academic subcultures within the discipline. Division of each author's career into several time periods offers an opportunity to trace the shifts in research interests of the prominent people in the field, so as to gain a greater understanding of the manner in which individual authors build upon one another's work and contribute to the formation of subcultures. In other words, such an analysis can address the following questions about academic subcultures: Are some subcultures less stable in terms of author membership--i.e. experience more shifts in or out--than other subcultures? Are some subcultures built on the prominence of one or two very highly cited classic works while others are built upon a wide array of many works that have been fairly well cited over time? Do authors in the different subcultures have similar or different patterns of waxing or waning career citation frequencies? Do certain subcultures tend to attract authors in the earlier or latter part of their careers? Are there clear points in history when particular subcultures gained prominence as evidenced by the citation frequencies associated with it? Answers to each of these questions offer another piece in the puzzle of understanding the "collective mutual shaping patterns . . . that guide the behavior" (Kuh and Whitt, 1988: iv) of higher education researchers--i.e, their

culture.

First to be addressed is the issue of whether or not prominent authors shift from one subculture to another during their careers, and if they do, what factors contribute to those shifts. Following that discussion is an analysis of how the temporal factor contributes to the understanding of subculture development within higher education research.

Subcultural Shifts of Authors Across Time

Based on this analysis, the research interests of most of the authors appear to be relatively homogeneous across their careers. That is to say, all of their career time periods are contained in a single subculture. However, there are exceptions. The following authors are found in different subcultures at different points in their careers: Baldridge, Blau, Bowen, Clark, Feldman, and Smart. A summary of their clustering patterns and shifts is shown in Table 4.15. Tables 4.10-4.14, previously displayed, provide information regarding the authors' academic majors and research areas which aid in the explanation of the career subcultural shifts.

Baldridge

Baldridge begins his career with a major work on academic governance, politics, and decision-making. Subsequent works in his early time period focus on power, conflict, organizational change and other sociological issues as they apply

TABLE 4.15

Authors Who Appear in More Than One Cluster
Over Their Citation Careers

Author	Time Period	Cluster
Baldridge	1969-1975	Organizational Structure and Leadership in Academia
Baldridge	1976-1989	Material and Nonmaterial Culture of Academia
Blau	1953-1964	Organizational Structure and Leadership in Academia
Blau	1965-1970	Hierarchy and Inequality in Education
Blau	1971-1989	Organizational Structure and Leadership in Academia
Bowen	1943-1976	Material and Nonmaterial Culture of Academia
Bowen	1977-1989	Impact of College Environment on Student Outcomes
Clark	1956-1971	Hierarchy and Inequality in Education
Clark	1972-1989	Organizational Structure and Leadership in Academia
Feldman	1968-1971	Impact of College Enviroment on Student Outcomes
Feldman	1972-1989	Student Perceptions and Teaching Effectiveness
Smart	1970-1980	Material and Nonmaterial Culture of Academia
Smart	1981-1989	Impact of College Environment on Student Outcomes

generally to the field of education. These topics clearly relate to the issues associated with the **Organizational Structure and Leadership in Academia** Subculture, and indeed, Baldridge is a member of this subculture during the early period of his career.

Later in his career, Baldridge continues his interest in academic governance, but his research turns to more specific institutional modes of utilizing power and politics in education to gain resources in academia: collective bargaining, unions, college administration, and management systems for effective enrollment. In his study of these areas, Baldridge addresses the social and political status of employees and employers, the material gains made with advancement in status, and the structures through which status is gained--all a part of the culture of any social institution, including education. Thus, Baldridge's later work focuses on the issues which fit well within the bounds of the **Material and Nonmaterial Culture of Academia** subculture.

Blau

During the middle of his career, Blau's research interests switch from those topics which associate him with the **Organizational Structure and Leadership in Academia** subculture, to that related to the **Hierarchy and Inequality in Education** subculture. In his third time period, he returns to the **Organizational/Leadership** subculture once again. The question is then, what is different about his work during the 1965-1970 period from that of the rest of his career? The key difference is that his most highly cited publication, *The American Occupational*

Structure, was published in 1967. This work includes one of Blau's most famous contributions, the status attainment model which he developed in conjunction with Otis Dudley Duncan. This model showcases the correlation of a son's and his father's levels of education to the son's level of occupational attainment. This special focus on the crucial consequences of academic achievement on the rest of a student's life demonstrates the reason that Blau's emphasis shifts with this piece of research. The dimensional analysis of the clusters shows that a temporary switch from the **Organizational and Leadership** subculture to the **Hierarchy and Inequality** subculture would signify that, for the designated period of time, the author has a much greater emphasis on the effect of the academic system on students--such as the effect of education on occupation. Blau's work before and after that year is more generally focused on bureaucracy, and the organization of academic work.

Bowen

Bowen is affiliated with the **Material and Nonmaterial Culture of Academia** subculture for his earlier publications and moves into the **Impact of College Environment on Student Outcomes** subculture for the latter part of his career. According to the dimensional analysis, he becomes more interested in direct interactions between the players in higher education and less interested in the inputs and investments. It appears that Bowen's early major works focus more on the economy, business and the study of economics in a broad sense than as applied to higher education. After 1969, and most especially in the 1977-1989 later time period, his books all focus on academia--some in terms of the investment and costs,

but others on such things as the "agenda for higher education", the American professorate, and "academic recollections". His career path in terms of organizational affiliations takes a similar turn to that of his research interests, as he moves from positions of corporate economist and professor of economics to greater roles in higher education administration, finally serving as president of three higher education institutions. Bowen's final position was as Professor of Economics and Education in the Claremont Graduate School--which combined his career work in economics and experience in the educational system into his first formal position as professor of education.

Clark

Clark's earlier years are associated with the **Hierarchy and Inequality in Education** subculture, while his later work places him in the **Organizational Structure and Leadership in Academia** subculture. Thus, Clark's cluster transition parallels that of Blau in the latter two-thirds of Blau's career. Movement in this direction suggests a lessening emphasis in later years on the effect of the academic system on the students, and a greater emphasis on power, leadership and organization. It seems as though Clark becomes more and more focused in his study of comparative and cross-national academic power systems in the latter time period, whereas he has studied faculty authority and more general education system problems in the previous time period. In his most highly cited year, which occurs at the very beginning of his later time period, his two key works address the "organizational saga" within education and student/college interaction and change.

Feldman

Feldman's early work falls in line with the **Impact of College Environment on Student Outcomes** subculture, before he moves on to publications which align him with the **Student Perceptions and Teaching Effectiveness** subculture. The dimensional analysis shows that such a career path suggests a growing concern with the direct interactions between the players within academia, a strong shift from emphasizing the effect of the academic system on the students to an emphasis of the effect of students on the academic system, and a slightly greater focus on the results and outputs of academia. It is not surprising then, that in perusing the titles of Feldman's publications, the key phrase for his first time period, and the most highly cited year in his career, is "college impact." Neither is it surprising to discover that the research he conducts in the second time period, especially from 1976 forward, focuses on such things as "student ratings" and "instructional effectiveness". Feldman's transition from one area of interest to another--and thus from one cluster to another--is quite clear.

Smart

Smart moves from the **Material and Nonmaterial Culture of Academia** subculture in his early period to the **Impact of College Environment on Student Outcomes** subculture in his later period. His transitional pattern parallels that of Bowen, yet the differences in Smart's interests over the two time periods is clearer than Bowen's. An analysis of the primary dimensional differences in these two

subcultures suggests that Smart's later career publications reflect more of an emphasis on direct interactions within academia, more concern with the effect of the academic system on the student, and less emphasis on the inputs and investments into academia. This is indeed reflected by the key words in the titles of his early and later publications. His earlier works deal with financial issues related to academia, such as the rewards systems, salary, collective bargaining, and grants; they also focus on departments and disciplines. The titles of his works published during his later period, especially after 1985, suggest that Smart's interests turn to student outcomes such as achievement, self-concept, values, attainment and persistence; these new interests may be related to, among other things, his appointment as director of a university accreditation self-study from 1985-1987. Like Feldman, Smart's transition from one cluster to another is clearly reflected in the research topics on which he focuses at the two different points in his career.

Stability of Academic Subcultures Across Time

As illustrated in Table 4.16, in four of the subcultures there are more authors who remain in the subculture for their whole careers than there are authors who move in and out; the exception is the **Hierarchy and Inequality in Education** subculture, which has one author who remains the whole time, one who moves in and then out again and one who is in the cluster only during his early period.

TABLE 4.16

Stability of Cluster Subcultures

Cluster	Number of Authors Who Are Members For			
	Entire Career	Early Period	Middle Period	Late Period
Organizational Structure and Leadership in Academia	4	2	0	2
Impact of College Environment on Student Outcomes	3	1	0	2
Material and Nonmaterial Culture of Academia	3	3	0	1
Student Perceptions and Teaching Effectiveness	2	0	0	1
Hierarchy and Inequality in Education	1	1	1	0
Total # of Authors/Time Periods (forty-eight minus three outliers)	31	7	1	6

Thus, it appears that the subcultures are fairly stable, with switches in membership but no signs of strengthening or weakening in numbers over time. Table 4.16 also shows that, when authors do move from one subculture to another, there is no apparent pattern as to whether or not a cluster is more likely to attract members in the earlier or later periods of their careers.

Key Citation Years for Each Subculture

Table 4.17 indicates that all five subcultural clusters span at least thirty years, and include authors whose citation careers are still active as of 1989. The **Organizational Structure and Leadership in Academia** subculture is the oldest subculture, beginning with Merton's career in 1934; the **Material and Nonmaterial Culture of Academia** subculture follows, beginning with Bowen's career in 1943; the **Student Perceptions and Effective Teaching** subculture and the **Hierarchy and Inequality in Education** subculture come next with McKeachie's (1951), and Clark's (1956) careers respectively. The **Impact of College Environment on Student Outcomes** subculture is the youngest subculture; it was begun in 1958 with the advent of Astin's career.

In addition, Table 4.17 shows that some clusters have more narrow windows corresponding to their authors' most highly cited years than do others. The **Organizational Structure and Leadership in Academia** subculture and the **Material and Nonmaterial Culture of Academia** subculture include the longest ranging sets of most highly cited years, with the prior spanning twenty-two years,

TABLE 4.17

Key Citation Years of Each Subculture

Cluster	Range of Member Authors' Careers	Most Highly Cited Years of Members
Organizational Structure and Leadership Academia	1934-1989	1957, 1964, 1972, 1972, 1975, 1976, 1978
Impact of College Environment on Student Outcomes	1958-1989	1969, 1975, 1977, 1977, 1982, 1983
Material and Nonmaterial Culture of Academia	1943-1989	1943, 1973, 1975, 1975, 1976, 1978, 1978
Student Perceptions and Teaching Effectiveness	1951-1989	1976, 1979, 1980
Hierarchy and Inequality in Education	1956-1989	1960, 1967, 1972

from Merton's 1957 hallmark to 1978, and the latter spanning thirty-six years from the strong beginning of Bowen's career in 1943 to 1978. These subcultures and their topics of research appear to have long lasting impact on the culture of higher education. However, for three of the five subcultures, even though the citation careers span more than three decades, the most intensely cited years for each are concentrated in half the length at many years. The most highly cited years for authors in the **Student Perceptions and Effective Teaching** subculture span only five years, from 1976 to 1980, suggesting that this research area had its major impact during those years. The most highly cited years for the **Hierarchy and Inequality in Education** subculture occur during the thirteen year period from 1960 to 1972. The **Impact of College Environment on Student Outcomes** subculture includes authors whose most highly cited years range from 1969 to 1983, or fifteen years. The shorter spans of heavily cited years are in part due to the half-life phenomenon which suggests that published works will be cited for a limited number of years after their publication (the half-life of a publication is the length of time in which the document has garnered the more recent fifty-percent of the total citations it has received overall--a long half-life indicating a more consistent impact over time--White and McCain, 1989). Since the citing articles range only from 1980 to 1989, it is highly unlikely that articles written in the earliest part of some of the longer careers (unless they are considered classic works) will be cited as heavily as those in the later years. In addition, works published in the decade of the 1980's are less likely to have received enough citations to be counted among the most highly cited. Thus, some of the information regarding key citation years for each subculture is

affected by the selectivity of the method. However, since there is no great variation across subcultures in terms of the authors' affiliation during early and late periods, any effect due to this selectivity artifact should impact upon each of the subcultures equally.

Subcultures Built Upon "Classic Citation Years"

In order to determine whether some subcultures were more or less likely to be built on "classic" works by the member authors, each author is given a "classic year" score for this analysis. This score is calculated by dividing the number of citations received during an author's most highly cited year by author's total number of citations. The "classic" year designations are outlined in Table 4.18. For those authors who belong to different clusters during different time periods, the most highly cited year in that time period is used. For example, Tinto has a very high classic score because the citations he received for 1975 (189) are seventy-one percent or his total number of career citations (267). On the other hand, during the most highly cited year for his later period (1971), Blau received 231 citations, representing only eight percent of his total 2778 citations. Using this criterion, if an author has a year which generates a score of greater than fifty percent, that is considered a "prime classic" year; a score of twenty-one to fifty percent represents a "moderate classic" year and a score of twenty percent or less indicates that author has "no classic" year.

Table 4.18 indicates that there is very little difference in the presence of

TABLE 4.18

The Presence of "Classic Citation Years" in Subcultures

Cluster	Author	Classic Score and Designation	
Organizational Structure and Leadership in Academia	Cohen (1972-1989)	60%	Prime Classic
	Pfeffer (1970-1989)	35%	Moderate Classic
	Baldridge (1969-1975)	31%	Moderate Classic
	Weick (1976-1989)	27%	Moderate Classic
	Merton (1934-1989)	24%	Moderate Classic
	Blau (1953-1964)	17%	No Classic
	Clark (1972-1989)	16%	No Classic
	Blau (1971-1989)	8%	No Classic
Impact of College Environment on Student Outcomes	Tinto (1973-1989)	71%	Prime Classic
	Feldman (1968-1971)	41%	Moderate Classic
	Bowen (1977-1989)	29%	Moderate Classic
	Pascerella (1975-1989)	24%	Moderate Classic
	Astin (1958-1989)	18%	No Classic
	Smart (1981-1989)	15%	No Classic
Material and Non-material Culture of Academia	Cartter (1959-1977)	53%	Prime Classic
	Bowen (1943-1976)	47%	Moderate Classic
	Biglan (1973-1979)	39%	Moderate Classic
	Bayer (1964-1989)	28%	Moderate Classic
	Ladd (1963-1989)	23%	Moderate Classic
	Baldridge (1969-1975)	20%	No Classic
	Smart (1970-1980)	17%	No Classic
Student Perceptions and Teaching Effectiveness	Feldman (1972-1989)	17%	No Classic
	McKeachie (1951-1989)	16%	No Classic
	Centra (1963-1989)	16%	No Classic
Hierarchy and Inequality in Education	Jencks (1962-1989)	55%	Prime Classic
	Blau (1965-1970)	22%	Moderate Classic
	Clark (1956-1971)	16%	No Classic

classic years across most of the subcultures. That is, the **Organizational Structure and Leadership** subculture, the **Impact of College Environment on Student Outcomes** subculture, the **Material and Nonmaterial Culture of Academia** subculture and the **Hierarchy and Inequality in Education** subculture each contain one author who has a "prime classic" year, one which accounts for more than half of his overall citations. Beyond that, the **Organizational Structure and Leadership in Academia** subculture has four authors with moderate classics and three with no classics; the **Material and Nonmaterial Culture of Academia** subculture has four with moderate classics and two with no classics; and the **Impact of College Environment on Student Outcomes** subculture has three with moderate classic years and two with no classics. In addition to its one author with a prime classic year, the **Hierarchy and Inequality in Education** subculture includes one author with a moderate classic year and one with no classic. Thus, all three levels of "classic" influences are evident in each of these four subcultures.

The **Student Perceptions and Effective Teaching** subculture is the exception on this item. In this subculture, none of the three authors has any publication years that can be considered classics as it is defined here. However, an author in this cluster, McKeachie, has one publication that went through eight editions, published in eight different years, in addition to several partial reprints and translations into foreign languages. When the total citations for the years in which these editions and reprints were issued are combined, the total for this major work still only represents twenty-six percent of McKeachie's total citations, thus constituting a moderate classic at best. Thus, even with this additional information, this

subculture does not appear to be influenced by a classic year to the extent that the other four are.

SUMMARY OF RESULTS

The multidimensional scaling analysis performed on the cocitation data collected in this research reveals three distinct dimensions on which the twenty-one most highly cited higher education researchers are arrayed. The first dimension places authors on a continuum ranging from those studying the impact of power, leadership and organizational structure to those studying the impact of the direct players within academia on the educational experience. The second dimension arranges authors whose research focus is the effect of the academic system on the student on one end of the continuum and those whose focus is the effect of the student on the academic system on the other end. The third dimension ranges from authors interested primarily in the outputs of academia to those interested in the input of resources into academia.

The cluster analysis of the cocitation matrix reveals the presence of five distinct clusters within this data set of highly cited higher education researchers. As a result of a comparison of means for each cluster on each of the three dimensions, and an examination of authors' lists of published work as well as their educational and professional backgrounds, it is possible to define the subcultural characteristics of each of the five clusters.

The first subculture includes authors whose research focus is organizational structure and leadership in academia. The review of vitae shows that the authors in this subculture earned degrees in psychology, sociology and business; belong to the American Sociological Association; and publish research focusing on issues of power, leadership, higher education administration and organizational behavior in their research.

The second subculture consists of authors studying the impact of the college environment on student outcomes. Their vitae reveal that they hold degrees in psychology, public administration, economics and educational research; are all affiliated with the American Educational Research Association and the Association for the Study of Higher Education; and as their publications show, are interested in the influence of academic relationships (with faculty and other students) on students outcomes, such as learning and self-image.

Research regarding the material and nonmaterial culture of academia is the common bond among authors in the third subculture. Their educational backgrounds include economics, sociology, political science, public affairs, and psychology. Most of the authors have been associated with the American Council on Education and several with various polling organizations. The titles of their publications center on the investments and inputs--financial, normative and attitudinal--that students and faculty contribute to academia.

Authors in the fourth subculture focus on concerns relating to student perceptions and effective teaching. Their academic backgrounds are in psychology, social psychology and higher education; they are members of the American

Psychological Association and American Educational Research Association, and have been editors for the *Journal of Higher Education*; and they have published articles examining student ratings of teacher performance.

Finally, the authors in the fifth subculture are primarily interested in issues of hierarchy and inequality in education. They all have degrees in sociology (among other degrees), are members of the American Sociological Association, and publish work with titles on authority and issues of educational opportunity.

One of the major objectives of the present analysis is to discern the effect of dividing authors' careers into two or three time periods in order to detect movement in subcultural affiliation over time. Six authors appear in more than one subculture over their citation careers. Reasons for these career shifts are made clear through an analysis of marked changes in the research focus of each author as evidenced in their published work and institutional affiliations.

An overall analysis of subcultural shifts reveals that the subcultures remain fairly stable in membership levels over time. However, there is some variation among subcultures as to their longevity as important areas of study among these authors, and in the length of their most highly cited periods. Four of the five subcultures include an author whose citations can be attributed to an apparently prime classic citation year, or a year which accounts for more than half of his citations. All but one subculture also include authors with moderately classic years and authors with no classic years at all. In only one subculture do all three authors have citations which were spread so fully over their published works that each falls into the no classic years category. Thus, in terms of the temporal factor used in

this analysis, the subcultures identified within higher education research are similar in some ways and diverse in others: they are fairly similar in terms of stability over time and their reliance on classic citation years, but they vary somewhat in terms of subcultural longevity and the length of highly cited periods.

CHAPTER FIVE

CONCLUSIONS

As outlined in Chapter One, this analysis addresses three sociological questions posed by Harriet Zuckerman (1988: 536, 539): 1) "what can be learned, if anything, about specialties and the structure of science from the procedure of cocitation analysis?" 2) "how are [specialties] socially as well as cognitively organized?" and 3) "how are these social and cognitive units linked together to form the larger structures of science?"

This concluding chapter addresses Zuckerman's broad questions about the usefulness of author cocitation analysis in an effort to understand the social and cognitive structure of a discipline. It does so by examining one particular academic area within science--the field of higher education research. This chapter describes the organizational structure of the discipline of higher education research, and illustrates the pluralistic nature of its subcultures as identified through the present author cocitation analysis.

The chapter begins with an explanation of the cognitive and social contexts within which the subcultures are formed, summarizing the common issues, actions, institutions, and academic identity shared by members of each subculture. Five subcultures are identified. A discussion of the importance of the temporal factor introduced into the analysis follows, focusing on the implications of cognitive shifts

in authors' careers for the structure of the five subcultures. The subsequent section discusses the manner in which these subcultures form a confederation, creating the larger culture of higher education research.

In addition to addressing Zuckerman's questions, this chapter also addresses the methodological issues brought to light by the present author cocitation analysis of higher education research. The discussion includes a review of the relationship of this analysis to previous author cocitation research. After identifying the manner in which the present study follows strong methodological precedent, the discussion turns to the unique contributions it offers to the area of author cocitation analysis. As with any research, this analysis was subject to certain procedural limitations; these limitations are discussed in tandem with suggested solutions for overcoming them in future analyses. The discussion then turns to several methodological expansions, especially those more qualitative in nature, which can be used in future research to gain further insight into the academic subcultures of higher education.

Before closing, the chapter addresses the application of the premise and procedures on which this research is based to the identification of subcultures in other subspecialties of the discipline of sociology, including sociological theory, social psychology and feminist scholarship as illustrative examples. The last portion of the chapter notes the success with which Zuckerman's sociological questions can be addressed through author cocitation analysis.

ORGANIZATIONAL STRUCTURE OF HIGHER EDUCATION RESEARCH

This author cocitation analysis illuminates the organizational structure of the field of higher education research in several ways. First, it identifies the discipline's primary subcultures and clarifies the cognitive and social contexts in which they are formed and persist. Secondly, it demonstrates the importance of temporal shifts in authors' cognitive foci to the structure of higher education's subcultures. Finally, the analysis provides a more clear picture of how the combination of the subcultures form the larger culture of the discipline of higher education.

Cognitive and Social Contexts of the Subcultures

The most highly cited authors in the field of higher education research are arrayed in five subcultures. Based on the cognitive dimensions--or the types of research foci--on which they are built, these subcultures are identified as follows: **1) Organizational Structure and Leadership in Academia, 2) Impact of College Environment on Student Outcomes, 3) Material and Nonmaterial Culture of Academia, 4) Student Perceptions and Effective Teaching,** and **5) Hierarchy and Inequality in Education.**

The **Organizational Structure and Leadership in Academia** subculture includes seven of the most highly cited higher education researchers: Pfeffer (1970-1977, 1978-1979, 1980-1989), Weick (1976-1978, 1979-1989), Baldridge (1969-1975), Cohen (1972, 1973-1989), Merton (1934-1956, 1957-1967, 1968-1989), Clark

(1972-1989), and Blau (1953-1964, 1971-1989). These authors have backgrounds in business, organization, sociology, psychology, public policy, and higher education. Their research covers topics such as organization, bureaucracy, management, governance, power and leadership in higher education. All the members of this subculture are members of the American Sociological Association.

The subculture titled **Impact of College Environment on Student Outcomes** consists of six top-rated authors who are associated with the disciplines of political science, sociology, psychology, higher education research, and economics; they are Tinto (1973-1975, 1976-1989), Smart (1981-1989), Feldman (1968-1971), Astin (1958-1971, 1972-1977, 1978-1989), Pascarella (1975-1980, 1981-1989), and Bowen (1977-1989). Their research encompasses such issues as levels of achievement, attrition, persistence, and development of self-concept and values among students; as well as the influence that campus life, the investment in learning, fellow students and faculty have on the students in college and after graduation. These authors have a common bond in terms of institutional membership in the American Educational Research Association and the Association for the Study of Higher Education.

The **Material and Nonmaterial Culture of Academia** subculture includes six of the most highly cited authors in higher education: Baldridge (1976-1989), Biglan (1973-1979), Bayer (1964-1974, 1975-1989), Ladd (1963-1977, 1978-1989), Bowen (1943-1976), Cartter (1959-1966, 1967-1977) and Smart (1970-1980). Their fields of study include psychology, sociology and social inquiry, economics, political science and educational research. The researchers found in this subculture

focus on norms and attitudes of student bodies, academic departments, and issues of productivity, collective bargaining, and financing within higher education. Social institutional connections among some of the authors within this group include affiliation with the American Council on Education and professional polling organizations.

The subculture entitled **Student Perceptions and Effective Teaching** includes three of the top researchers in higher education--McKeachie (1951-1975, 1976-1989), Feldman (1972-1989), and Centra (1968-1976, 1977-1989), each of whom has an academic background in psychology combined with either sociology or education. The topics encompassed by this cluster include student ratings, instructional effectiveness, the psychology of learning and faculty development. The members of this subculture belong to the American Psychological Association, the American Educational Research Association, and have had editorship duties with *The Journal of Higher Education.*

The last subculture, **Hierarchy and Inequality in Education,** includes three of the prominent scholars whose backgrounds all include sociology, but also span higher education and education/urban affairs. These authors are Blau (1965-1970), Clark (1956-1971), and Jencks (1962-1969, 1970-1972, 1973-1989). The key foci of this subculture are the issues of organization, authority and equality of educational opportunity. The members of this subculture have a common social institutional affiliation in that they are all members of the American Sociological Association.

Implications of the Temporal Factor for the Formation of Subcultures

For two reasons the temporal factor introduced in this author cocitation analysis is critical to gaining greater understanding of the academic subcultures within higher education. First, it shows the impact that cognitive shifts within the prominent authors' careers have upon the membership of the subcultures. Secondly, the analysis offers a comparison of similarities and differences across subcultures based on the temporal factors within the member authors' careers.

Author Mobility Between Subcultures

As the summary above shows, it is possible that one author can appear in more than one subculture. This occurrence is due to the fact that each authors' career has been divided into two or three time periods based on the length of his career and the total number of citations he has received. Fourteen of the twenty-one authors remain in the same subculture over their entire careers. Seven of the twenty-one shift subcultural positions in the early, middle or late periods of their careers.

In the latter part of his career, Biglan's work deviates from the field of higher education to such an extent that he becomes a statistical outlier in this study and is not included in any of the five subcultures for his late period. However, the other six authors for whom the time factor is critical display clear patterns of subcultural mobility during their citation careers.

Baldridge moves from the **Organizational Structure and Leadership in**

Academia subculture in his early period to the **Material and Nonmaterial Culture of Academia** subculture in his late period. Blau leaves the **Organizational Structure and Leadership in Academia** subculture after his early period, becomes associated with the **Hierarchy and Inequality in Education** subculture in his middle period, but moves back to his original subculture for the latter years of his career. Bowen and Smart both move from the **Material and Nonmaterial Culture of Academia** subculture in their earlier years to the **Impact of College Environment on Student Outcomes** subculture in the later time periods. Clark shifts from the **Hierarchy and Inequality in Education** subculture to the **Organizational Structure and Leadership in Academia** subculture. Feldman moves from his earlier membership in the **Impact of College Environment on Student Outcomes** subculture to the **Student Perceptions and Teaching Effectiveness** subculture later in his career. In each case, a review of the author's vita shows changes in topical focus of the author's research and publications which explain the subcultural shifts. These shifts also demonstrate the fluidity of choice of research topics for some scholars--in contrast to others who focus their full careers on a topical area.

Temporal Characteristics of Subcultures

In all but one of the subcultures, more authors remain in the cluster for their entire careers than move in and out. For those who do move between clusters, there is no apparent pattern as to the likelihood of subcultural membership in the earlier or later parts of the authors' careers. All of the subcultures have lengthy

histories (based on the beginning of members' careers through 1989), with ages ranging from thirty-two (**Impact of College Environment on Student Outcomes**) to fifty-six years (**Organizational Structure and Leadership in Academia**). With one exception, there is a similar pattern across subcultures as to whether the number of citations to the authors in that cluster are affected by very highly cited "classic" years or by a broader base of less singularly influential publications; each subculture has one author whose citations pertain to a "prime classic", other authors who have moderately classic pieces, as well as authors who have no classics. In the one subculture that stands apart (**Student Perceptions and Effective Teaching**), there are no authors whose citations revolve around classic works.

One of the greatest temporal differences among the subcultures is the range of years which include the member authors' most highly cited year. To highlight the extreme examples, one subculture, **Student Perceptions and Effective Teaching**, has a narrow five year period during its thirty-nine year span in which the three member authors' key years occur. The most highly cited years for the authors in two other subcultures, **Material and Nonmaterial Culture of Academia** and **Organizational Structure and Leadership in Academia**, span thirty-six years and twenty-two years, respectively, primarily due to the moderately classic years of Bowen and Merton. This suggests that the subject matter of these subcultures, and the prominence of the authors associated with them, has a more enduring impact, or longer half-life, on the wider culture of higher education than those with shorter spans of key years.

In summary, the temporal factor does not point to any particularly interesting definitive differences between the subcultures of higher education on a structural level (patterns of movement in and out, influence of classic works). It is, however, helpful in pointing out key directional changes in particular authors' careers, and thus, in their affiliation with subcultures over time.

Length of career and the span of highlighted years in the member authors' careers are the most clearly delineating characteristics. However, the data herein do not allow a determination as to whether older subcultures have reached their peak and are on a decline, or whether the younger subcultures show greater promise as they age. Continued study of the development of these authors' careers and the subcultures would be necessary to detect these patterns. If this were to be the case, this too would suggest that all of the subcultures are structurally similar while maintaining distinction in terms of content. Conversely, some subcultures may prove to be short-lived, reflecting fleeting trends in the field, on areas in which research problems are basically resolved. The data in the present study suggest the possibility of these trends, but do not offer enough evidence for confirmation.

Contribution of the Distinct Subcultures to the Larger Culture of Higher Education Research

What does this identification of subcultures, with their cognitive, social and structural characteristics, suggest about the larger culture of higher education? First of all, it is clear that higher education research is a diverse field rather than a field of study with a singular focus; that is, the discipline has several distinct areas

of intellectual concentration. It includes research on broad institutional issues such as organizational structure, culture of academia and educational inequality, as well as research on more micro-oriented concerns such as direct interaction of students with faculty and administration. The analytical results, focusing on clusters, show that in several cases the areas follow classic disciplinary lines--e.g., either "sociological problems" or "psychological problems." Although several of the statistically derived clusters include members from a variety of academic backgrounds and professional disciplines, even these clusters show distinct commonality on some institutional measures. Moreover, the fact that two of the clusters which emerge from the statistical analysis have members who all have the same training and organizational affiliation (in sociology and psychology) provides strong validation of the statistical methods used to identify the subcultures within the larger culture of higher education research.

One measure of the impact of the subcultures on the larger culture of higher education is the relative contribution of the membership of each subculture to the total number of citations received by these, the most prominent researchers in the field. As Table 5.1 shows, the subculture with the most heavily cited authors is the **Organizational Structure and Leadership in Academia** subculture. The citations of authors in this subculture account for approximately sixty percent of all the sample's citations. This is primarily due to the fact that the four most highly cited authors in the sample are associated with this subculture. Merton, Pfeffer, and Weick can be found in this subculture for their entire careers and Blau for two-thirds of his career. Interestingly, for none of these authors is higher education either his

TABLE 5.1

Citation Statistics for Subcultures in Higher Education Research

Name of Subculture	Number of Member Authors	Number of Author Time Periods	Number of Citations (% of Total)
Organizational Structure and Leadership in Academia	7	15	10,440 (60.4%)
Impact of College Environment on Student Outcomes	6	10	2,013 (11.6%)
Material and Nonmaterial Culture of Academia	7	10	1,529 (8.9%)
Student Perceptions and Teaching Effectiveness	3	5	1,007 (5.8%)
Hierarchy and Inequality in Education	3	5	2,299 (13.3%)
Total	26[1]	45[2]	17,288[3] (100.0%)

[1]26 = 21 original authors - 1 trimmed (Marsh) + 6 in two subcultures

[2]45 = 48 original author time periods - 3 trimmed (1 for Biglan, 2 for Marsh)

[3]17,288 = 18,044 original citations - 756 trimmed (111 for Biglan, 645 for Marsh)

primary area of research, nor is it in his educational or associational background. Two are prominent sociologists and two work primarily in the business/ organizations area. Regardless, their scholarly work in the areas of organization, management, leadership and social structure has been critical to the field of higher education research and to those citing authors who study institutions of higher learning.

Each of the remaining four subcultures accounts for substantially fewer citations than the first. Two subcultures contribute similarly to the overall number of citations in the sample; they are the **Hierarchy and Inequality in Education** (13.3%) and **Impact of College Environment on Student Outcomes** (11.6%) subcultures. The fifth most highly cited author, Jencks, accounts for more than half of the citations attributed to **Hierarchy and Inequality in Education.** Although this subculture still has an eclectic nature with the inclusion of the sociologist Blau and with Jencks' ties to sociology, it is much more heavily weighted towards direct research on educational issues. Jencks' major work on educational opportunity and Clark's academic background in higher education are critical to the nature of this subculture.

In the **Impact of College Environment on Student Outcomes** subculture, Astin accounts for nearly half of the citations. His academic background and research combine the area of higher education with psychology; the research of the other authors in this group combines higher education with such fields as political science, sociology, and economics. Thus, once again, the variety of perspectives adds breadth and richness to this subculture, and to the culture of higher education

research as a whole.

The **Material and Nonmaterial Culture of Academia** subculture has a somewhat smaller impact in terms of citation contributions to the larger culture (8.9%). The citations within this subculture are more evenly distributed across subculture members. The backgrounds of these researchers are again of a wide variety: psychology, sociology, government/social inquiry, economy, and higher education. The composition of this subculture reiterates the contributions that a variety of fields of study make to higher education research.

The smallest subculture, in terms of citation contributions, is the **Student Perceptions and Teaching Effectiveness** subculture (5.8%). Although it has the same number of member authors and author time periods as does the **Hierarchy** subculture, it accounts for less than half the number of citations. McKeachie offers the most career citations to this cluster, Centra follows and Feldman's early period contributes the least. Regardless of the number of citations held by each, the work of each of the authors in this subculture emphasizes the connection of psychological concerns to the field of higher education.

To summarize, the five subcultures represent the current bodies of scholarly inquiry in the field of higher education research, and they showcase the diversity of academic backgrounds and areas of study which characterize the most prominent authors in that field. Not only does the culture of higher education research include macro- and micro-level issues, it also draws expertise from a plethora of other academic cultures such as psychology, economics, sociology, political science, business and research on organizations, in order to more completely examine the

context in which institutions of higher learning exist and function.

METHODOLOGICAL ISSUES WITHIN THIS AUTHOR COCITATION ANALYSIS

This research is a critical methodological contribution for a variety of reasons. First, it follows in the path of a growing tradition of research which dissects academic disciplines through author cocitation analysis in order to gain greater understanding of academic cultures. Secondly, this research has added several unique contributions to the literature: (1) the addition of higher education research to the list of other academic cultures studied in this manner, (2) the addition of the temporal factor based on cited articles (rather than citing articles as was done in previous analyses), and (3) the addition of supplemental qualitative analysis of authors' vitae--documents which provide information on the educational training, social organizational affiliations and the chronological developments in research foci as presented by the authors themselves. This research also brings to light some of the limitations and suggested solutions which must be addressed when utilizing author cocitation analysis. Furthermore, as the present research has progressed, evidence has arisen as to possible methodological expansions which could further enhance the understanding of the academic culture of higher education through future research. Finally, the success of the present study suggests that this methodology could be used to illuminate the cultural and subcultural structures of a variety of other fields or subspecialties--such as sociological theory, social psychology and feminist scholarship--in which

classification of subject matter, research foci and theoretical issues has long been debated. These issues are addressed in the following sections.

Adding the Present Analysis to the Author Cocitation Literature

As Chapter Two demonstrates, author cocitation analysis has been employed in efforts to identify academic subcultures within a variety of fields of study: management/information science, population genetics, marriage and the family, organizational behavior, and communication, to name a few. The intent of the present analysis is to extend that diversified list one academic culture further, adding the field of higher education research. To that end, this project is modeled after the previous studies in many ways. A comparison of the following characteristics of this study with those summarized in Table 2.1 illustrates this point.

For instance, the careers of the 21 subjects of this study are subdivided into forty-eight author/time periods which ultimately represent the units of analysis; this number fits well within the range of sample cases which were examined in previous studies. The present study examines cocitation rates which span a decade of citing articles, again reflecting the range of citing year sampling practices of forerunners in the field of author cocitation analysis. The subjects of this study, higher education researchers, have been chosen from a list of the most prominent authors in the discipline, as defined by the number of citations they have received in key journals within the field. Citation criteria and the use of key journals have been employed in several of the previous author cocitation analyses to identify appropriate samples of

authors (White and Griffith, 1981a; White, 1983; White and Griffith, 1982; Sayers, 1983; Hopkins, 1984; Lane, 1984; McCain, 1984; McCain, 1989; Cottrill, 1987; Rogers and Cottrill, 1990). Multidimensional scaling analysis and cluster analysis, the statistical methods used herein, have been used in nearly all of the earlier author cocitation analyses, and the present results also parallel those previous studies. The present study identifies three cultural dimensions and five subcultural clusters. Most of the studies using the similar statistical procedures found two or three dimensions, and anywhere from five to eleven clusters. Thus, this author cocitation analysis of higher education could easily be added to the table in Chapter Two which summarizes author cocitation literature and appears to be well within the parameters of the previous literature.

The Unique Contributions of the Present Analysis

Although the present analysis appropriately reflects the successful methodology of previous author cocitation research, it also builds upon that methodology by breaking new ground in several areas. First is the application of author cocitation methodology to a field which previously has not been subjected to this mode of subcultural analysis. As is evident from this report, the endeavor to illustrate the nature of the culture of higher educational research through author cocitation analysis has been lucrative: five distinct subcultures have been successfully identified through the dimensional and cluster analyses of the most highly cited authors in higher education research.

The second key methodological contribution of this analysis is its treatment of the temporal factor. While other studies have examined the impact of historical changes across citing articles, none has delved into the impact of distinguishing between different time periods within the authors' citation careers based on the dates of cited articles. The premise of this distinction is that authors may migrate to different subcultures, and thus develop association with different colleagues, at different times in their careers--all in relationship to career changes in cognitive focus. In fact, for those seven authors who change subcultural associations over time, there do appear to be shifts in cognitive foci during their careers as the following section illustrates.

Blau's early and late period research, which is associated with bureaucracy and the organizational structure of academia, is interrupted by a highly acclaimed work on occupations that reflects his interim cognitive alliance with those studying the effect of academia on student's life opportunities. Thus, Blau moves from the **Organizational Structure and Leadership in Academia** subculture, to the **Hierarchy and Inequality Education** subculture and back again. Clark moves from cognitive concern with faculty authority and the educational system to more focused work in comparative and cross-national academic power systems, switching from the **Hierarchy and Inequality in Education** subculture to the **Organizational Structure and Leadership in Academia** subculture.

Baldridge addresses broad-based issues of academic governance and organizational innovations early in his career, and then becomes more focused on specific modes of political influence in academia such as the impact of collective

bargaining, faculty senates and unions, college administration, and management strategies. Thus, his move from the **Organizational Structure and Leadership in Academia** subculture to **Material and Nonmaterial Culture of Academia** reflects a transition from examination of general sociological concerns to research on the particular avenues by which those in academia gain power and resources.

Feldman moves from an emphasis on college impact on students to an emphasis on student ratings and instructional effectiveness and likewise moves from **Impact of College Environment on Student Outcomes** to **Student Perceptions and Teaching Effectiveness.** Smart moves from a concern about departmental/discipline issues and financial matters in higher education to a more concentrated interest in student outcomes, which is reflected in his shift from the **Material and Nonmaterial Culture of Academia** subculture to the **Impact of College Environment of Student Outcomes** subculture. Bowen's career subcultural shift is the same as Smart's, reflecting the manner in which his early focus on economic concerns in academia shifts to a focus on the roles of faculty and administration.

Biglan's early study of the subject matter of academic departments causes him to be associated with the **Material and Nonmaterial Culture of Academia** subculture during his early period, while his later research is so far removed from the field of higher education that he no longer clusters with any of the subcultures. Thus, the present analysis shows that members of the subcultures within higher education do demonstrate subcultural shifts and changes in cognitive alliances during their careers, and these changes reflect the variability in the cognitive foci in their own research and academic affiliation.

The third contribution offered by the present research to the body of author cocitation research is the introduction of the supplemental analysis of vitae for the subject authors, a more descriptive, qualitative, author-focused addition to the traditionally quantitative author cocitation methodology. First of all, each author's vita offers an in-depth account--from the author's viewpoint--of the factors which he believes define his academic research career. Each vita includes not only one of the most exhaustive lists of the author's publications available, but it also documents the social organization affiliations which he deems to be pertinent to his career development. The information gathered from the vitae offers a rich characterization of the cognitive and social connections between members of each subculture, including such data as geographical proximity during particular career crossroads, common professional organizational affiliation, and whether terminal degrees were earned in similar or diverse areas and at similar or different institutions. The addition of this type of qualitative analysis to supplement the quantitative statistical procedures parallels some of the early work by Mullins (1973) and others who have used qualitative sociometric analyses or historical techniques to investigate relationships among scientists. Instead of the anecdotal information and answers to surveys or interviews, the use of the vitae offers an inexpensive, time-conserving means by which to gather knowledge about the breadth and depth of authors' careers from their own viewpoint. This analysis' combination of qualitative and quantitative methodology is a crucial contribution of the present study to author cocitation literature.

In summary, the present analysis adds to the body of knowledge in the area

of author cocitation research in three distinct ways. It applies the methodology to a previously unassessed field of higher education research; it addresses the issue of temporal changes in author's subcultural affiliations based on the year of cited articles and also examines the impact of the temporal factor on the subcultures; and finally it offers a new method of combining qualitative and quantitative strategies to more richly describe the subcultures within the field of higher education research.

Procedural Limitations and Suggested Solutions

As in all research projects, limitations of the methodology have become apparent as the analysis has progressed. The following section discusses the nature of these limitations, including those which pertain to most citation analyses and those unique to this study: citation error, missing vitae data, the trimming procedure and the issue of gender exclusion. In each case, suggestions are offered for minimizing the impact of these limitations.

Citation Error

In this analysis, there are instances of typical errors (noted in Chapter Three) which can occur when using citation counts as a source of data. These issues include such things as the 1) inclusion or exclusion of important citation information depending on the specificity of author's names and initials, 2) attribution of articles to the wrong author, 3) typographical misprints of publication dates, and 4) loss of some pertinent citations due to misspellings of authors' names.

The decision was made to use both first and middle initial with the author's last name to gather initial data on yearly citation counts from the *Social Science Citation Index*; as a result, all the citations which use the author's first initial alone are excluded. However, this procedure ensures that those counts for each author are much less likely to include works by a person other than the targeted author (but who has the same last name and first initial). Exclusion of authors with surname homonyms--and thus increasing the probability that the counts are only for the targeted author--is more crucial for the gathering of raw citation counts (the purpose of which is to offer information about the patterns and key dates of each author's career) than it is for data gathering to compare author cocitation rates. Later, when the citation counts for each author are gathered electronically for the author cocitation analysis, the author's last name and only the first initial are used to maximize the inclusion of all appropriate citations. Inclusion of unrelated articles by an author with the name and first initial identical to that of the targeted author does not affect these latter data because unrelated authors are not likely to be cocited with the other higher education researchers in the sample.

The most critical issue in regard to error in citation information was detected during the gathering of initial data on the yearly citation counts for each of the authors over his career. One of the keys to the temporal analysis is accurate knowledge of the important citation dates in each author's career. Certainty as to the beginning date of the author's career is important for understanding the context of his earliest works and the temporal range of each of the subcultures.

At the onset, the beginning of each author's citation career was considered to be analogous to the earliest date recorded for his cited articles. However, there are a few discrepancies in these earlier dates which required further investigation. Table 5.2 compares the dates of the years in which the authors' received their terminal degrees, the dates of the first publication for which they were first author as noted on their vitae, and the date recorded in the *Social Science Citation Index* for their first cited publication. For those authors whose vitae show that their terminal degrees and first publications are dated prior to the *SSCI* date, the *SSCI* date for their first citation is used for the beginning date of their citation career.

However, there are seven authors for whom this is not the case, and for whom there are several years in between the first and subsequent years of cited articles recorded in the *SSCI*. These authors are Bayer, Blau, Cartter, Clark, Cohen, Pfeffer, and Smart. Further investigation revealed the reasons for each of the seven discrepancies.

According to the *SSCI*, one citation is recorded for an article which was written in 1959 by A. E. Bayer. However, Alan E. Bayer's vita indicates that his first publication is dated 1963. Further investigation revealed that the error is due to a homonym. The 1959 article had been published in a non-English sociological journal. The journal is not available for confirmation; however, Alan E. Bayer was able to confirm that this is not an article which should be attributed to him. Thus, the correct beginning date for Bayer's citation career is 1964, the next earliest citation recorded for A. E. Bayer.

TABLE 5.2

Dates of Authors' Ph.D. Degrees, First Publications as Noted on Vitae, First Publications Cited in SSCI, and Corrected Beginning Dates of Citation Careers

Author	Ph.D.	First Publication Noted on Vita	First Cited Publication In *SSCI*	Beginning of Career
Astin	1958	1958	1958	1958
Baldridge	NA	NA	1969	1969
Bayer	1965	1963	1964	1964
Biglan	1971	1970	1973	1973
Blau	1952	1953	1947*	1953
Bowen	1935	1939	1943	1943
Cartter	1952	1956	1949*	1959
Centra	1965	1965	1968	1968
Clark	1954	1956	1953*	1956
Cohen	1972	1969	1968*	1972
Feldman	1965	1965	1968	1968
Jencks	1961	1961	1962	1962
Ladd	1964	1962	1963	1963
Marsh	1974	1975	1975	1975
McKeachie	1949	1950	1951	1951
Merton	1936	1934	1934	1934
Pascarella	1973	1974	1975	1975
Pfeffer	1972	1971	1951*	1970
Smart	1971	1970	1956*	1970
Tinto	NA	NA	1973	1973
Weick	1962	1961	1963	1963

Note: NA denotes information not available (see text); * denotes incorrect citation attribution

There are two articles attributed by the *SSCI* to Blau prior to the date given in his vita for his first publication. A review of the data shows that both are citing article misprints of the dates of articles authored by Blau; the first is a 1962 article misprinted with a 1952 date and the second is a 1964 book cited with a 1947 date. The correct beginning date for the citation career of Peter Blau is 1953.

In the third case, the one article attributed to Cartter for the year 1949 is actually one that he published in 1959. This discrepancy is a result of typographical error on the part of the citing article. Thus, the most recent information obtained for Cartter indicates that his citation career actually began in 1959.

The earliest date recorded for Clark's cited articles is 1953--only one year before he received his Ph.D. from UCLA. Upon further investigation, it appears that the cited work, a thesis published at the University of Manchester, is not authored by Burton R. Clark, who received all of his academic degrees from UCLA. This discrepancy is most likely an example of the inclusion of a work by another author named B. R. Clark. Thus, the corrected starting date for Burton Clark's citation career is 1956.

In the instance of Cohen, a citing article mistakenly attributed an unrelated book to this higher education researcher: the 1968 book attributed to "M.D. Cohen" is actually a book published by Percy S. Cohen. In light of this information, the correct date of the premiere citation for Michael D. Cohen is 1972.

In the case of Pfeffer, two of the mistaken citations attributed to him for dates prior to when he actually published work are a result of citing article misprints

of publication dates (a 1951 date cited for a 1981 book and a 1968 date for a 1978 book). The third, a 1969 article, is a completely mistaken attribution of a piece which was written by two authors; the first author's surname began with the same letter as Pfeffer, but beyond that there is no similarity which might have caused confusion. Pfeffer did publish, and was cited for, a 1970 article in *Managerial Planning* two years prior to the date he received his PhD; however, this article was not noted on his vita. Thus, the correct starting date for Pfeffer's citation career is 1970.

Finally, there are three citations attributed to J.C. Smart for publications which date six, seven and fourteen years before he actually began his publishing career (according to his vita). Upon investigation it was discovered that these are works actually written by John Jamieson Carswell Smart, a philosopher. Thus, this error was in part a homonym problem, but with the very few mistaken attributions, it seems to be more likely due to the incorrect use of "J.C. Smart" rather than "J.J.C Smart" in the references citing the philosopher's work. The correct date of origin for the career of John C. Smart, researcher of higher education, is 1970.

In terms of suggestions as to how to lessen the impact of these citation errors on the analysis, an investigation into the documents which appear to be mistaken attributions--as was done here--is one way to gain greater understanding of the source of the error. In this case, no distinct pattern of errors surfaced, suggesting that the citations of one author are no more likely to be subjected to misinformation than another.

There is one additional issue which should be noted in regards to the limitations of citation data; it is not a result of citation error, but more an artifact of the citation procedure. Cited references are attributed to an author in the *Citation Index* volumes of the *Social Science Citation Index* only if he or she is the first author of the publication. In the present case this would mean that a publication which is listed on an author's vita would not be attributed to that author in the *SSCI* unless he was the first author.

In a sense, this phenomenon has positive implications for the present analysis because those publications which are included in the cocitation analysis are those with which each author is most strongly identified--so much so that he is considered the primary researcher involved. Excluding publications for which each author is a second or subsequent author eliminates citation counts for work that might not be as essential to his cognitive foci. Instead, such an article might be more of a reflection of the author's mild interest in or minor contribution to a particular project spearheaded by other researchers.

It is true that these collaborative cognitive associations are interesting and informative in terms of the author's career, but using these secondary authorships in a cocitation analysis could detract from the assessment of the core cognitive relationships which define the authors career. However, in some cases, the use of only senior or sole authorships may serve to eliminate the examination of certain periods of time in an authors career. For instance, collaboration with others as a junior author may be more likely to occur in the early stages when the author is under someone else's tutelage, in an occupational setting which promotes

coauthorship, or later in the career when he or she is serving as a mentor to a student with primary authorship. In each case, the publication may be important to that author's career publication pattern. An examination of patterns of collaboration within that author's career should provide enough information to determine whether reliance on first authorship is an adequate measure of the author's publication career.

There is one other issue to be examined in regards to order of authorship. In some fields, it is not unusual to list multiple authors in alphabetical order regardless of their level of contribution to the research. An analysis of the extent to which this is true in the field of higher education would suggest whether secondary authorships should be considered for this reason.

It is possible to perform a supplemental analysis to examine these secondary authorships if they appear to be a major factor at any particular point in an author's career. The *Source Index* volumes of the *SSCI* attributes publications to each author regardless of whether she/he was first author or a more minor collaborator. Once the publications attributed to that author are known, accession numbers for those publications could be obtained and used in an extension of the usual author cocitation analysis based on first author status. However, this would seem advisable only after determining that the use of sole or senior authorship distorts the career publication patterns for the authors under study.

Missing Vitae Data

Another limitation related to data collection is the fact that, although sixteen

of the twenty-one authors responded to the request for their vitae, some of the authors' full curriculum vitae were not made available for the supplemental background analysis. Most authors responded to the request for vitae without hesitation; one if fact sent two copies at different times, concerned that he had perhaps overlooked compliance with the request because of his hectic schedule! Another author did not respond to the request immediately; however, upon investigation, it became clear that he did not receive the inquiry because he was on summer leave. His departmental staff took the liberty of forwarding a file copy of his vita, certain that he would be glad to participate.

Of the remaining authors, two are deceased, one was unable to be located, and the other chose not to participate. The first issue in regards to these authors was to make an attempt to obtain as complete a set of background information as was possible about the two authors, Bowen and Cartter, who are deceased. In both cases, their former academic departments were able to provide a source of background information. A partial vita was sent for Bowen and a copy of an issue of the publication, *UCLA educator*, which was dedicated to the memory of Cartter (and included biographical data) was sent in lieu of the vita. Repeated attempts to locate one of the remaining non-respondent authors--at the department for which he worked when he published his last work, and at the forwarding address they suggested--were unsuccessful. The last of the four for whom full vitae were not received elected not to respond to the request despite several written appeals and a follow-up telephone call.

Thus, incomplete data for these four authors hampered some of the in-depth background research on their careers that was able to be done for the other higher education researchers. Nevertheless, the sources received for Bowen and Cartter, and the availability of source lists through a compilation from the *Source Index* of the *Social Science Citation Index* and other bibliographies afforded enough information to obtain a basic understanding of the paths of their careers. Beyond such extreme measures as contacting family members of the deceased, or circumventing the wishes of the author, little more could have been done to increase the return rate of the curriculum vitae.

Another problem in using vitae is that there is no normative standard as to what is to be included in such documents. For example, some may only list "selected" publications, or some may not list professional association affiliations. Despite these limitations, however, the vitae for these subjects contained sufficient commonality of content so that this analysis proved extremely useful as a qualitative component which aided in the interpretation of these highly quantitative analyses.

The Trimming Procedure

As discussed in Chapter Three, Ward's Minimum Variance Clustering procedure can be adversely affected by extreme outliers. The present study follows the suggested corrective remedy by omitting five percent of data points with the lowest estimated probability density from the analysis (SAS, 1989). When this is

done, three author/time periods are found to be outliers to such an extent that their inclusion would have distorted the clustering pattern which best fit the data set as a whole. Thus, the data point representing Biglan's later career time period and both data points representing Marsh's entire career are not included in the cluster analysis. Although the trimming decision increases the integrity of the clustering pattern for the data set as a whole, it diminishes the availability of valuable information for understanding how this time of Biglan's citation career and how Marsh's entire career meshes with the careers of the other most highly cited authors in the field of higher education research.

In the case of Biglan, an examination of his vita shows that his later work is clearly not related to education. After 1979, Biglan's work focuses on a variety of psychological issues related to depression, smoking behavior among teenagers and family dynamics. There are no articles related to higher education among his publications from 1980 to 1989. Thus, the exclusion of his later period seems appropriate.

For both of his time periods, Marsh's relationship with other authors is distant enough for him to be considered an extreme outlier, and thus is also eliminated from the cluster analysis. Unfortunately, his status as the only author in the sample who lives outside of the United States--and as far away as Australia--is not explanation enough! Marsh's vita, the cocitation rankings used in the MDS analysis, and a review of the authors with whom he is cited in *Review of Higher Education* provide evidence as to why his research stands apart from the clusters formed by the rest of the authors.

During his earlier period, from 1975 to 1983, the bulk of Marsh's work is dedicated to the area of student evaluations of teaching. It is not surprising then that the cocitation rankings show that he is most closely associated with Feldman, McKeachie, and Centra (as shown in Table 5.3). Marsh, like these three, holds academic degrees in psychology and is associated with the American Psychological Association as well as other professional organizations in this field. In addition, Marsh contributes to the research area of the material and nonmaterial culture of higher education during this time, specifically with articles on peer review, productivity, earnings and retirement of faculty and on student achievement in reading. This is reflected in the fairly close cocitation association of Marsh with Biglan's and Smart's early work. However, the rest of Marsh's publication repertoire during his early period is less focused on academia as an institution and more on strictly psychological issues related to the learning process such as psychological measurement and determination of self-concept. In some cases the context of this research is technical and methodological--not necessarily related to the field of education.

In his later period, Marsh's work develops an even stronger psychological focus; during that time, as compared with his earlier period, he publishes half as many articles on student evaluations of teaching and eight times as many on self-concept. In that his focus is increasingly psychological, it makes sense that he is still most often cocited with Feldman, McKeachie, and Centra, although his cocitations with them are fewer than before. His latter publications still include works on methodology and measurement, and an increased number of works on

TABLE 5.3

Cocitation Ranks of Marsh with Related Authors

Authors Most Frequently Cocited with Marsh During At Least One Time Period	Marsh 1975-1983	Marsh 1984-1989
Astin 1958-1971	12.5	13.5
Astin 1972-1977	12.5	**8**
Astin 1978-1989	25.5	11
Biglan 1973-1979	**9**	35.5
Biglan 1980-1989	40	18.5
Centra 1968-1976	**5**	**6**
Centra 1977-1989	**4**	**4.5**
Feldman 1968-1971	**9**	18.5
Feldman 1972-1989	**3**	**3**
McKeachie 1951-1975	7	**8**
McKeachie 1976-1989	**6**	**4.5**
Pascarella 1975-1980	12.5	18.5
Pascarella 1981-1989	40	**8**
Smart 1970-1980	**9**	35.5
Smart 1981-1989	40	35.5
Tinto 1973-1975	40	**11**
Tinto 1976-1989	40	35.5

Note: **Bold** denotes closest rankings. Ranks range from 1-48--Marsh's own time periods rank 1 and 2 with themselves. Identical cocitation counts will result in tied rankings

student achievement in reading and other skills.

An apparent budding interest for Marsh during this time is research regarding the psychological and sociological effects of gender roles on participation and achievement in academia and other institutions. The fact that he tends to be cocited with Astin and Pascarella during this time reflects this turn towards an interest in a quantitative analysis of the interplay of the academic environment (attitudes towards gender) and student participation. In this period of his career, Marsh combines his interests in psychological measurement, self-concept and gender in several articles. This suggests that Marsh considers the self-concept of students to be both an output from and input into the academic process.

To summarize, Marsh's work is related to the research of several others in this sample of highly cited educational researchers, yet it stands apart from any one subculture in its focus. Marsh delves further into the psychological issues of individuals within academia than do even those higher education researchers in the **Student Evaluation of Teaching Effectiveness** subculture. His work is similar to the focus of that subculture, especially early on, but he also is cocited with members of the **Material and Nonmaterial Culture of Academia** subculture and the **Impact of College Environment on Student Outcomes** subculture for his research on issues related to the individual as producer and product of the learning process within an institutional setting. His psychological research spans several academic subcultures but is too far removed from any to be included in any one cluster.

The loss of these data points due to trimming is unfortunate, but understandable once the analysis of vitae is undertaken. However, it might be

interesting to run another analysis without the trimming procedure to determine with which clusters these three author/time periods are most closely associated. Given the statistical limitations of the procedure, the results of such an analysis would only be appropriately considered if the clusters outlined in the present analysis remains in tact and unaffected by the inclusion of the outliers.

Perhaps one suggested solution for future analyses would be to perform the clustering procedure with and without the trimming factor in order to see whether the level of apparent distortion in the rest of the data warrants this loss of data on two of the subjects. If the resulting subcultures are similar in membership and characteristics, then perhaps the method is robust enough even with the outliers present, and the suggested cautionary measures can be relaxed.

Issue of Gender Exclusion

One limitation of the present analysis is the exclusion of female higher education researchers from the sample. The source of the sample, Budd's (1990) list of the scholars who were most highly cited in three key higher education journals, indicates that no women are among the most prominent in the field according to this criterion. It seems appropriate to explore the possible factors leading to the lack of women among the most highly cited authors in academia.

Long (1992) clearly states that lower citation rates for women are directly connected to their lower productivity, especially in early cohorts and in the early years of the scholar's career. He notes that if women were as productive as their male counterparts, the women's citation counts would far outweigh that of the

men because, on average, papers of the women scientists in his study tend to be cited more often than those of the men. In fact, Long (1992) finds that as women's careers approach the two decade mark, their papers are cited one and one-half times more than those of the men. Thus, it appears that differences in the **citation rates** of men and women should level off as the length of time women are in an academic field grows. Additionally, if it is true, as Zuckerman *et al.* (1991) note, that women tend to cite women and men tend to cite men, the greater productivity of women in later years will increase the number of citing authors who will in turn cite works written by women.

The issue then is to determine factors affecting lower productivity of women, especially in their early career years. Lower productivity of female scholars in terms of publication rates is most probably influenced by the historical dominance of males in graduate research programs (some of which were in universities not open to women until the last several decades) and in the realm of professional scholarly research in general. Later entrance of women into the field may have an effect on the chance of their accumulation of large enough citation counts to be included in the top twenty higher education researchers. However, this factor may be alleviated over the lifetime of the field of study, because Long (1992) found that later cohorts of female scholars tend to have higher **productivity rates** than do earlier cohorts. In fact, Long (1992) suggests that, over time, women increase their productivity at higher rates than do men over the span of their careers. Zuckerman *et al.* (1991) cite the influence of such anti-discrimination forces as the women's movement and affirmative action in this growth of productivity of women

through recent history.

Still, women, especially those beginning their careers, are less likely to have gained the credentials and formal opportunity to publish than have the men. Several factors lead to the lower rates of productivity of women. Long (1990) suggests that collaboration with mentors is the most important factor affecting productivity rates immediately following graduate school. He further suggests lower rates of female productivity at this time are affected by his finding that scholars who are mothers of young children are less likely to collaborate with a mentor than those who are not. Long (1992) notes, however, that when women are included in articles written by multiple authors, there is no evidence to suggest that they are less likely to be senior authors than are men.

Astin and Bayer (1979) point to institutional factors (e.g. higher teaching loads, affiliation with colleges rather than universities)--and not factors reflecting the demands of traditional social roles related to the women's personal lives--as the key contributors to sex differences in productivity. In fact, their results show that female scholars who are married are more productive than those who are not--and are more productive than men in some fields when adjustments are made to academic rank.

Zuckerman *et al.* (1991) also refute the notion that family obligations adversely affect the research productivity of women. As a result of their review of research on the disparity between male and female scholars, they attribute lower productivity of female scholars to their limited access to institutional resources such as research funds and graduate students, as well as to the women's greater

isolation than men from collegial networks within and between institutions--all due to the women's lower status in academia. Furthermore, Zuckerman *et al.* (1991) suggest that women are less likely to be socialized as to the norms of academic productivity because they do not have as many collaborative relationships as do men before and after receiving their terminal degrees. However, Zuckerman *et al.* (1991) report no correlation between sex and acceptance or rejection of manuscripts submitted to journals, nor for success of grant requests. Thus it appears that the lower productivity is due more to institutional sexism than to direct discrimination.

Regardless of the origin of exclusion, because of the lack of women in the selected author list, the analysis is missing an interesting component in terms of understanding the overall culture of the field of higher education research. If women were to be included--through stratified sampling or by studying them alone--information could be gathered as to whether women tend to join the traditional subcultures formed by males and have similar patterns of career citations, or whether they tend to have diverse career patterns and/or coalesce with other women in subcultures distinct from those formed by men. This limitation can and should certainly be addressed in a future study. Other examples of suggested further research are discussed in the next section.

SUGGESTED METHODOLOGICAL EXPANSIONS FOR FUTURE ANALYSES

As a result of the present analysis, several other possibilities for further

investigation into the nature of the culture of higher education research arise. The following suggestions of methodological expansions for future cocitation analyses may be undertaken as efforts to confirm the results reported herein, although it is possible additional information could suggest some modifications of this exploratory map of the subcultural structure of higher education research.

The suggested expansions include narrowing the body of citing journals to be analyzed to those specifically dedicated to education issues; in addition, alternative sources for the selection of the most prominent authors in the field of higher education research could be used. Also discussed is the possibility of utilizing the authors' vitae and other archival sources in a more in-depth analysis to gain a greater understanding of social and cognitive affiliation, as well as interviewing the authors to obtain their views about the social and cognitive connections they may or may not have with those in and outside of their subcultures. Further examination of the most highly cited "classic" years could be undertaken to determine whether or not there are specific documents which are key to each author's career; these could then be subjected to a document cocitation analysis to further illuminate the nature of the subcultures. The possibility of using alternative career time division strategies is also discussed. In addition, a longitudinal analysis of subcultures is suggested, in order to detect the waxing and waning of subcultures and to identify the changing priorities of those involved with institutions of higher education. Finally, this section concludes with a discussion of three examples of other academic areas to which the methods of present author cocitation analysis can be applied.

Focus on Education Journals

For several of the twenty-one authors, higher education is not their primary field of research. In the case of at least two authors, sociologists Blau and Merton, it is highly likely that a substantial number of their cocitations can be attributed to sociological treatises unrelated to the field of education.

One way to ensure that the cocitation analysis is more focused on authors' commonality in regard to higher education issues, rather than to their work in other fields, would be to limit the analysis of the twenty-one authors to citing articles published in journals with an education focus. The *SocSciSearch* electronic database is structured in such a way that a cocitation analysis of authors can be performed using citations which occur only in those journals which fall under the *Social Science Citation Index* categories of education, educational research and educational psychology. Thus, a more educationally focused analysis is possible.

To illustrate the usefulness of such a limited focus, a brief exploratory analysis of Blau's and Merton's cocitation pattern within the educational journals included in the *SSCI* is summarized in Table 5.4. This analysis shows that Blau and Merton are much more closely associated in terms of cocitation ranks when all journals are considered than when just educational journals are considered. Table 5.4 indicates that when citations in all journals covered by the *SSCI* are considered, the mean cocitation rank (ranging from 1-48) for Blau and Merton across all time periods is 9.22 (the median is 9.5). When only the education journals are analyzed, the mean rank for Blau and Merton across all time periods is 24.78 (the median is

TABLE 5.4

Cocitation Counts and Ranks of Blau and Merton
In Analysis with All Journals and Education Journals Only

Author/Time Period	All Journals		Education Journals	
	Cocitation Count	Cocitation Rank	Cocitation Count	Cocitation Rank
Blau 1953-64 Merton 1934-56	51	9.5	4	9
Blau 1953-64 Merton 1957-67	92	4	4	9
Blau 1953-64 Merton 1968-89	51	9.5	2	14.5
Blau 1965-70 Merton 1934-56	24	12	1	34.5
Blau 1965-70 Merton 1957-67	25	11	3	22
Blau 1965-70 Merton 1968-89	27	10	2	27
Blau 1971-89 Merton 1934-56	33	11	1	42
Blau 1971-89 Merton 1957-67	40	9	3	32.5
Blau 1971-89 Merton 1968-89	48	7	3	32.5

27). Thus, it appears that Blau and Merton are more cognitively similar in their general sociological foci than on issues that are more specifically educational in nature. This difference is more pronounced during some time periods than during others. For instance, the change in the Blau/Merton cocitation relationship (from all journals to only education journals) is barely perceptible for the authors' earliest time periods. However, cocitation rates of work published in Blau's late period and Merton's early period are quite different when comparing all journals to just educational journals. While they have a cocitation rank of seven out of forty-eight for all journals, they have a rank of forty-two out of forty-eight when only education journals are considered, demonstrating that, during these time periods, they are in the bottom quartile of close associations of authors in the sample. The results of this exploratory analysis are different enough from the analysis of all journals to suggest that there may be merit in pursuing additional analysis using only the educational journals.

A potential limitation to such a restricted analysis would be that authors' publications concerning broad issues which may affect higher education directly or indirectly--such as institutional organization, public opinion, wages and employment--may be less likely cited in more narrow educational journals than in the wide range of journals included in the *Social Science Citation Index*. Thus, in order to do justice to the breadth of the author's research interests as they relate to the more narrow field of higher education, an analysis limited to education journals would best serve as a companion piece to the present analysis rather than as a separate research enterprise.

Expansion of the Methods by Which Subjects are Selected

The present study analyzes the cocitation patterns of the most prominently cited higher education researchers listed in Budd's (1990) compilation of citations from three flagship journals in the field. This procedure, combining citation criteria with the appearance of authors names in key publications in the field, is similar to the selection procedures in over one-third of the previous author cocitation studies.

However, additional sources might be helpful in confirming the prominence of these researchers, and possibly adding other names to the list of authors who might be subjected to an analysis such as the one presented herein. For example, the list might be expanded to include those authors most highly cited in a compilation of all of the journals listed under the *SSCI* designation of educational journals, in addition to the three key journals chosen by Budd. Furthermore, texts addressing the field of higher education may be able to provide not only a list of the most influential researchers in the field, but also offer an *a priori* classification scheme against which the author cocitation analysis of higher education subcultures could be measured. Another method of selection might be to identify award winners for exemplary research within the four most prominent professional associations in the field--the Association for the Society of Higher Education, the American Association for Higher Education, the American Educational Research Association, and the Association for Institutional Research. In addition, these associations could be a source of data for the selection of prominent researchers through surveys of the memberships as to their "expert" opinions on who qualifies

for this designation. Another population which could be surveyed in this manner is the faculty membership at institutions granting doctoral degrees in higher education research.

Each of these proposed methods, as well as the inclusion of female higher education researchers through stratified sampling using these sources of data--or through conducting a study using women scholars alone--has the potential to add to the richness of data about the cultural characteristics of the present analysis, and to confirm or modify the findings of the present analysis.

In-Depth Use of Archival Data

In the present analysis, archival sources in the form of the authors' vitae have proven to be an invaluable resource for collection of background data, at least as an exploratory means by which to detect patterns of similarity among subcultural members' institutional affiliations and areas of research interest. However, an in-depth analysis of vitae could constitute an entire research project in and of itself, one focused on gaining a much greater understanding of the extent to which these intellectual associations and the social institutional commonalities of authors define each particular subculture.

It is crucial to note that the data are variable from vita to vita in regard to what information is presented about each author's membership in professional associations, attendance at key conferences in the field, sources of research funding, and common links in terms of coauthors, editors, publishers and journals in

which their work appears. Other printed sources, including journal indices, past programs of pertinent professional association meetings, and membership rosters of the associations themselves could provide both missing data not included in certain vitae and more detailed information about the likelihood of direct contact of these authors within the context of their intellectual foci. Mullins (1973) details the means by which such rich data on social and intellectual commonalities among authors can be utilized towards greater understanding of who belongs to which academic subcultures.

In addition, information on subcultural affiliation could also be gathered through the identification of authors whose works are published in special editions of journals which focus on a particular topic in higher education. Similarly, those who are identified as affiliates with the different sections (by which research topics are often divided) at professional meetings and in professional organizations could provide affirmation of the subcultural categories identified in the present analysis, or offer information that might suggest some modification.

Author Interviews

Direct interviews with the authors would provide an additional source of information regarding "the extent to which social patterns among scientists reflect features of their intellectual products" (Mullins, et al., 1977: 553). Such things as the dates, disciplinary fields and institutional origins of their academic degrees, as well as the organizational and institutional affiliations which the scholar has had

throughout his career are available in the archival sources already mentioned. However, the authors themselves would be able to illuminate whether or not they have actually established direct or indirect cognitive and social relationships with those fellow higher education researchers who appear to be closely related to them based on cocitation frequency--and thus appear in the same academic subcultures.

Through telephone interviews, authors might be asked to comment on their perceptions of the structural nature of the discipline, their thoughts on the validity of their placement in the subcultures outlined in the present analysis, their familiarity with the work of the authors in their own subculture and those far removed from their position on the author cocitation map. In addition, the authors could be asked if they had ever cited, corresponded with, collaborated with, been at the same institution with, or interacted professionally or socially with, the authors in and outside of their own subcultures.

If authors have closer direct social connections to the researchers in their identified subcultures than to those in other subcultures, this information could confirm that, indeed, concrete social ties mirror the intellectual affinities among authors. This would also provide additional evidence of "the invisible college" (Crane, 1972). In other words, the quantitative analysis of the cocitation counts could be affirmed in the social world of the authors. Appendix C contains a proposed draft interview schedule for obtaining the data needed for this in-depth sociometric analysis.

In-Depth Examination of "Classic" Contributions

The analysis of classic contributions in the present analysis is based on the proposition that a single year to which a proportionately large number of citations are attributed constitutes evidence that a very important career document or documents are published by the author during that year. The data gathered for this analysis are not detailed enough to determine whether the citations for that year are for a single document or multiple documents.

Further analysis is warranted to determine whether a classic citation year is due to the publication of one or more published works. This information could be gathered by returning to the volumes of the *Citation Index* of the *SSCI* which list the 1980-1989 citing articles in order to obtain a citation count for each document which was published during each author's classic year.

Once this is accomplished, a form of document cocitation analysis could proceed to supplement the information received by the author cocitation analysis. In other words, the electronic *SocSciSearch* database would be searched for the number of citing articles in which each author's most highly cited article is cited with another author's most highly cited article. At that point statistical analyses similar to the ones employed herein could be performed to see if this cocitation analysis based on single documents reflects the same sort of patterns shown in the author cocitation analysis. It is likely that there will be some author pairs for whom there are no document cocitations and thus some authors will have to be dropped from this analysis. However, those with classic contributions or moderately classic

contributions may prove to have enough common citations to offer adequate document cocitation comparisons.

Alternative Career Time Division Strategies

In the present analysis, the author's careers are divided into early, late, and sometimes middle time periods on the basis of the length of their career and the total number of citations received over that career. In most cases, the points at which careers are divided are years in which authors have published highly cited articles. An attempt has been made to ensure that each of the two or three time periods designated for each author's career represents approximately equal numbers of career citations. This exploratory attempt to introduce a time factor based on the dates of the cited articles has proven to be informative in terms of illuminating career shifts of authors. However, it is a fairly rough representation of those shifts because of the large discrete blocks of time that comprise the temporal factor.

The success of this exploratory use of the temporal factor suggests that perhaps a more fine-tuned strategy for career time divisions is warranted for future analyses. What temporal scheme might offer the best explanatory power for understanding the changes in the organization of the culture of higher education research?

One suggestion would be to attempt to use a more continuous measure of time; however, a cocitation analysis of author pairs for each year of their careers would be impossible because of the low probability of cocitation occurrences in

each year. One way to attempt to approximate a more continuous measure of time periods would be to examine the raw citation data for the sample of authors in order to determine the smallest number of years that must be included in each time division to offer a robust analysis of cocitations.

Once shorter time periods are determined, an analysis of variance would be one means by which to test how important the career shifts from time period to time period (an interval variable) are to the authors' subcultural membership (a nominal variable). This analysis would require that the number of years included in the time periods were uniform across authors. For instance, those authors with thirty year careers would have ten time periods of three years each and those with twelve year careers would have four career time periods (as opposed to the present scheme of authors' careers having an equal number of time periods with variable number of years in each).

Another option is to create time periods in which not only the number of years in each time period is uniform but the actually dates of time periods correspond across all authors. That is, if five year intervals are determined to be optimum, the time periods to be analyzed for Merton would be 1930-1934, 1935-1939 . . . 1980-1984, 1985-1989, and for Cohen they would be 1965-1970, 1970-1974, 1975-1979, 1980-1984, 1985-1989. This would allow a more detailed analysis of shifting subcultural affiliations within each author's own career, in addition to a more in-depth historical comparison of the contributions of member authors over the life span of each subculture, and of the culture of higher education research as a whole.

In summary, the present analysis has brought to the fore a variety of potential methodological strategies which could be explored in future analyses to add to the understanding of the nature of the academic subcultures within higher education research or for any other disciplinary group. Each suggestion stems from a successful strategy in this analysis, and offers the possibility of confirmation and/or expansion of the results reported herein.

Longitudinal Analysis of Subcultures

This analysis provides a snapshot of the subcultures which emerge through an analysis of cited articles from 1980 to 1989. The five subcultures which emerge from the data are those which have the most impact on the writers of that ten year period. The contribution of each subculture to the larger culture of higher education research can be measured in a variety of ways (some of which have been explored in this analysis): number of most highly cited author/time periods dedicated to the area of research; total number of citations associated with the subculture; length of careers of the authors within that subculture; range of most highly cited years associated with the subculture--among others.

Changes in these measurements over time might suggest whether a subculture is in its early stages, has come of age, or is on a decline in terms of its impact on the field. Such a longitudinal analysis might offer insight into tangential issues which arose in this analysis, such as: what accounts for the fact that the median "most highly cited year" for each subculture occurs a decade prior to the

citing articles (as shown in Table 4.17)? Were these the "most highly cited years" for these researchers in the body of citing articles published immediately after the cited articles were published? Is this phenomenon due to a time lag in publication and citation, or is it reflective of the waning subcultures revolving around less than current research? In order to detect such patterns the present analysis would have to be replicated for a citing article time span other than the 1980-1989 window used herein.

The *Social Science Citation Index* was first published in 1973; thus, in addition to the time frame used in this analysis, a similar study could be performed on citing articles which range from 1973-1979. Another option is to break the citing article time periods into smaller segments--for instance, from 1973-1977, 1978-1982, 1983-1987, 1988-1993. If a subcultural cocitation analysis were done for each of these intervals, it might be possible to detect small changes in the prominence of subcultures over time. If interviews with cited authors were conducted, they might offer insight as to if, when, and why the authors believe certain subcultures with which they are affiliated changed in terms of their influence on the field of higher education. If there was change over time, was it due to external influences such the onset and completion of mandated governmental research, or due to more personal reasons such as the geographical gathering or diffusion of a particularly focused group of researchers?

An important goal of such a longitudinal analysis (which then could be carried on into the future) might be to pose questions as to why certain research subjects have been strong enough within higher education to warrant the attention

of the most prominent scholars in the field, and why others have not. In the present case, for example, why are more of the most highly cited authors engaged in research pertaining to the organizational, administrative and material concerns within academia rather than to the issues of inequality and student learning? Do these differences persist over time and what do they say about the priorities within the institutions of higher education? Are these priorities related to stratification systems outside of education? And, if the women involved in higher education research are considered (as suggested above), are there any differences in the subcultural priorities within this field of study as it is viewed by female researchers? In order to address such complex issues, several of the suggestions for future analysis would need to be undertaken together. The questions emanating from the present study reinforce the notion that this research has indeed been an initial step in a rich field of inquiry and analysis within the culture of higher education, and that it might be useful as a model for research in other areas as well.

Application of Author Cocitation Analysis to Other Fields

It is clear from the review of literature and from the present study that author cocitation analysis can be applied successfully to the study of subcultural organization within a wide range of fields. Perhaps the academic cultures which would be especially interesting to examine through this sort of analysis of the structural nature of the discipline are those in which there has been some controversy over the most accurate subcultural placement of certain theorists and

researchers. Equally interesting would be those disciplines which have coalesced in recent years to the extent that subcultures are in the early stages of formation. The procedures used in the present analysis could be replicated using the prominent authors in these sorts of subdisciplines or specialty areas to give credence to, or call into question, the academic subcultural categories in which each discipline's key authors have been placed. For example, there are three illustrative areas within sociology which might benefit from such verification through quantitative and supplemental qualitative author cocitation analysis.

Sociological Theory

Although Hopkins (1984) uses author cocitation analysis to explore a few areas of sociological theory, analysis of this complex field could be expanded to include a wider range of theoretical paradigms. There are a myriad of ways in which sociological theorists have been classified over the years. Each textbook which attempts to outline sociological theory has its own subcultural classification, most often a variation of the classical triad: the functional perspective, the conflict perspective, and the interactionist perspective. Table 5.5 displays Jonathan Turner's (1982) textbook organization of sociological theories; his is basically a four-way categorization of the early influences and currently prominent contributors to the field. The temporal factor as used in the present analysis could be helpful in understanding theorists, such as Peter Blau, who appear under one of Turner's classifications for his early theories and under another for his more recent work.

TABLE 5.5

Categorization of Sociological Theorists
in
Turner: *The Structure of Sociological Theory*

Functional and Structural Theorizing

Auguste Comte, Herbert Spencer, Emile Durkheim, A.R. Radcliffe-Brown, Bronislaw Malinowski, Talcott Parsons, Robert K. Merton James G. Miller, Peter M. Blau

Conflict Theorizing

Karl Marx, Georg Simmel, Ralph Dahrendorf, Lewis A. Coser, Randall Collins, J. H. Turner

Exchange Theorizing

Adam Smith, David Ricardo, John Stuart Mill, Jeremy Bentham, Sir James Frazier, Bronislaw Malinowski, Marcel Mauss, Claude Levi-Strauss, B.F. Skinner, George C. Homans, Peter M. Blau, R. M Emerson

Interactionist Theorizing

Georg Simmel, Max Weber, Emile Durkheim, William James, Charles Horton Cooley, John Dewey, George Herbert Mead, Robert Park, Jacob Moreno, Ralph Linton, Darwinism, Herbert Blumer, Manfold Kuhn, Edmund Husserl, Alfred Schutz, Erving Goffman, Aaron Cicourel, Harold Garfinkel, Harvey Sacks, Don Zimmerman, D. Lawrence Wider, Melvin Pollner, Ralph H. Turner

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Source: Turner, Jonathan H. 1982. *The Structure of Sociological Theory/Third Edition.* Homewood, Illinois: The Dorsey Press.

This, of course, is interesting in light of the findings of the present analysis which showcase the changes in Blau's association with different higher educational subcultures at different times in his career.

Other scholars, such as Ritzer (1975), have developed classification schemes that recombine some of the traditional classifications with a focus on scholars who bridge the gaps between paradigms. In his examination of his three paradigms, Ritzer examines the subject matter, theories and methods which bind the paradigms and their exemplars together (see Table 5.6).

Ritzer (1975) suggests that systems theorists belong to the "social fact" paradigm; in addition, he suggests that most conflict theorists and structural functionalists join together in this paradigm because they have an affinity that overcomes their diversity. This affinity is the focus of these theorists on the importance of social facts (norms, institutions, structure, authority, positions, etc.) to societal analysis.

Ritzer's (1975) "social definition" paradigm includes theorists working in the action, symbolic interactionist and phenomenologist areas, all of whom point to the importance of the mental process by which humans actively create their own dynamic social reality. Theorists in his "social behavior" paradigm, encompassing traditional psychological behaviorism and exchange theory, are interested in the effect of perceived rewards and punishments on human interaction. Ritzer's analysis also showcases those sociologists who combine elements of two or more paradigms.

TABLE 5.6

Categorization of Sociological Theorists
in
Ritzer: "Sociology: A Multiple Paradigm Science"

Social Facts Paradigm

Emile Durkheim, Charles K. Warriner, Robert K. Merton, Ralf Dahrendorf, Walter Buckley, Amitai Etzioni, James Coleman (structural functionalists, system theorists, conflict theorists)

Social Definition Paradigm

Max Weber, George Herbert Mead, Charles Horton Cooley, Talcott Parsons, Peter Berger, Luckman, W.I. Thomas, Alfred Schutz, Manfred Kuhn (action theorists, symbolic interactionists, phenomenologists)

Social Behavior Paradigm

B.F. Skinner, Chavannes, Mauss, George Homans, Peter Blau, C. Abbott, C. R. Brown and P. V. Crosbie, R. Burgess, D. Bushell (exchange theorists, behaviorists)

Paradigm Bridgers

Emile Durkheim: social facts/social definition
Max Weber: social facts/social definition
Karl Marx: social facts/social definition
Talcott Parsons: social facts/social definition/social behavior
Peter Blau: social facts/social behavior
John Finley Scott: social facts/social behavior
Singelmann: social definition/social behavior
Warriner: social facts/social definition

Source: Ritzer, George. 1975. "Sociology: A Multiple Paradigm Science," *The American Sociologist*, 10: 156-167.

The key in analyzing Ritzer's classification scheme through author cocitation analysis would be to see 1) if the dimensional analysis shows that subject matter and method are key factors to the classification, 2) if the subcultures reflect Ritzer's categories more than those of Turner or someone else, 3) if Ritzer's categories are depicted by author cocitation analysis, which subcultures would each of the transitional individuals join, 4) whether the transitional scholars demonstrate subcultural shifts scholars related to some temporal factor in their careers and 5) whether the corresponding cocitation map shows that transitional scholars are found at the edge of one subculture closest to the subculture with which he is also related.

Through an analysis of intellectual and social connections of each author, Mullins (1973) classifies many of the important contemporary contributors to sociology into eight categories, some mirroring traditional divisions--such as Symbolic Interactionism and Ethnomethodologists--and others unique to his scheme: Standard American Sociologists, Small Groups Theory Groups, Social Forecasters, New Causal Theorists, Structuralists, and Radical-Critical Sociologists (Table 5.7). In fact, Hopkins (1984) so admired the exhaustive nature of Mullins list that she used it in her author cocitation analysis of ethnomethodologists and new causal theorists. However, as is evident from Table 5.7, there are many more areas which have yet to be analyzed using this methodology; the present analysis and certainly Hopkins (1984) study would be valuable guiding resources.

Mullins (1973) uses background information akin to that available in the present analysis through the authors' vitae. In fact, a dimensional analysis of the

TABLE 5.7

Categorization of Sociological Theorists
in
Mullins: *Theories and Theory Groups in Contemporary American Sociology*

Standard American Sociologists

Theodore Abel, Harry Alpert, C. Arnold Anderson, Robert C. Angell, Robert F. Bales, Bernard Barber, Allen Barton,Howard P. Becker, Wendell Bell, Robert Bellah, Reinhard Bendix, Bernard Berelson, Jessie Bernard, Robert Bierstedt, Peter M. Blau, Leonard Broom, Theodore Caplow, Harold Christensen, John A. Clausen, Marshall Clinard, Richard Cloward, Albert K. Cohen, Lewis A. Coser, Kingsley Davis, Edward C. Devereux, Stuart C. Dodd, Joseph Elder, Amitai Etzioni, Renee Fox, Nathan Glazer, Charles Y. Glock, William J. Goode, Leo A. Goodman, Alvin W. Gouldner, Neal Gross, Louis Guttman, Philip M. Hauser, Rudolf Heberle, August Hollingshead, George C. Homans, Herbert H. Hyman, Alex Inkeles, Morris Janowitz, Elihu Katz, Clifford Kirkpatrick, Mirra Kormarovsky, Paul F. Lazarsfeld, Alfred McC. Lee, Marion Levy, Stanley Lieberson, Seymour M. Lipset, Charles P. Loomis, George Lundberg, Robert M. MacIver, Robert K. Merton, Russel Middleton, Wilbert E. Moore, Kaspar Naegele, Charles Page, Talcott Parsons, William Petersen, Stuart Queen, John W. Riley, Jr., Matilda W. Riley, Peter Rossi, Calvin F. Schmidt, Karl Schuessler, Philip Selznick, William H. Sewell, Edward A. Shils, George E. Simpson, Neil J. Smelser, Pitirim A. Sorokin, Samuel A. Stouffer, Jackson Toby, Martin A. Trow, Melvin Tumin, Ezra Vogel, Robin M. Williams, Jr., Robert F. Winch, Dennis Wrong, J. Milton Yinger, Morris Zelditch

Small Groups Theory Group

Psychological social psychologists.

Kurt W. Back, R. R. Blake, Dorwin Cartwright, Leon Festinger, J.R.P. French, Frank Harary, George C. Homans, Harold H. Kelley, N. Kogan, Kurt Lewin, Gardner Lindzey, R. Lippitt, Theodore M. Newcomb, Henry W. Riecken, Jr., Stanley Schachter, Muzafer Sherif, Renato Tagiuri, John W. Thibaut, R.K. White, Alvin Zander

Sociological social psychologists

Robert F. Bales, Edgar F. Borgatta, Lewis F. Carter, Leonard S. Cotrell, Jr., A. Paul Hare, John T. Lanzetta, Theodore M. Mills, Philip Slater, Fred L. Strodtbeck

Works alone

Solomon Asch, Alex A. Bavelas, W.R. Bion, E. Bovard, Theodore Caplow, William F. Whyte

Another group of social psychologists

Helen H. Jennings, Jose L. Moreno

Others

B. Bass, L. Berkowitz, E. Chapple, Morton Deutsch, Harold Guetzkow, A.S. Luchins, M. Shaw, G.A. Talland, H. Thelen, E. Paul Torrence

TABLE 5.7
(continued)

Categorization of Sociological Theorists
in
Mullins: *Theories and Theory Groups in Contemporary American Sociology*

Symbolic Interactionists

Read Bain, Howard S. Becker, Herbert Blumer, Charles Bolton, Hubert Bonner, Leon Bramson, Ernest W. Burgess, Ruth Cavan, Charles H. Coates, Leonard S. Cottrell, Jr., C.J. Couch, Walter Coutu, Donald Cressey, Melville Dalton, Arlene Daniels, Fred Davis, Norman Denzin, Irwin Deutscher, Robert Dubin, Joan Emerson, Bernard Farber, R.E.L. Faris, Nelson Foote, E. Franklin Frazier, Elliott Freidson, Herbert Gans, Blanche Geer, Hans H. Gerth, Barney G. Glaser, Daniel Glaser, Erving Goffman, Edward Gross, Robert Haberstein, Jerold Heiss, Irving L. Horowitz, Everett C. Hughes, Alan C. Kerckhoff, Nathan Keyfitz, Louis M. Killian, John Kinch, Orrin E. Klapp, William Kolb, William Kornhauser, Ernest T. Krueger, Manford H. Kuhn, Gladys E. Lang, Kurt Lang, Shu Ching Lee, Alfred R. Lindesmith, Theodor J. Litman, John Lofland, Jerome G. Manis, Don A. Martindale, George McCall, T.P. McPartland, Bernard N. Meltzer, Francis Merrill, Sheldon Messinger, C. Wright Mills, S. Frank Miyamoto, Harold Mulford, John Petras, Enrico Quarantelli, Walter C. Reckless, Arnold M. Rose, Julius A. Roth, Thomas Scheff, Michael Schwartz, Ethel Shanas, Tamotsu Shibutani, David Solomon, Gregory P. Stone, Anselm L. Strauss, Sheldon Stryker, Guy E. Swanson, William Troyer, Ralph Turner, William Waller, Paul Wallin, Leon Warshay, S. Kirson Weinberg, Kimball Young

Social Forecasters

Social Indicators

Raymond A. Bauer, Albert Biderman, O.D. Duncan, Joseph Fisher, Daniel Glaser, Kermit Gordon, Bertram M. Gross, Leon Keyserling, Stanley Lebergott, Norton Long, Wilbert E. Moore, Iwo M. Moriyama, Bruce M. Russett, Eleanor Sheldon, Conrad Taeuber, Sidney Verba

Future

Clark Abt, Daniel Bell, Michael Cetron, Yehezkel Dror, Theodore J. Gordon, Olaf Helmer, Fred C. Ikle, Erich Jantsch, Herman Kahn, Ralph Lenz, Harold Linstone, Joseph Martino

Simulation

Jay W. Forrester, Michael Inbar, Clarice Stoll

Others.

Amitai Etzioni, Edward Lehman, Joyce M. Mitchell, William C. Mitchell, Daniel P. Moynihan, Harold Wilensky

Ethnomethodologists

Al Adato, Peter L. Berger, Egon Bittner, Milton Bloombaum, Alan Blum, Robert J. Boese, Lindsey Churchill, Aaron V. Cicourel, Anthony Crowle, Jack D. Douglas, Troy Duster, Henry Elliott, Harold Garfinkel, Aron Gurwitsch, Ted Hajjar, Kenji Ima, Kenneth Jennings, John Kitsuse, Kenneth Leiter, Thomas Luckmann, Craig MacAndrew, Robert MacKay, Peter McHugh, Earl Mead, Hugh Mehan, Warren Mintz, Maurice Natanson, Gerald Platt, Melvin Pollner, Antonio Riquelme, Edward Rose, David Roth, Harvey Sacks, Schenbein, Emanuel A. Schegloff, Alfred Schutz, Howard Schwartz, Marshall Shumsky, Joan Smith, Matthew Speier, David Sudnow, Fred Thalheimer, Edward Tiryakian, Roy Turner, Helmut Wagner, Jules Washington, Martin S. Weinberg, D. Lawrence Wieder, Houston Wood, Don H. Zimmerman

TABLE 5.7
(continued)

Categorization of Sociological Theorists
in
Mullins: *Theories and Theory Groups in Contemporary American Sociology*

New Causal Theorists

Bert Adams, Robert P. Althauser, J. Michael Armer, Kenneth D. Bailey, Alan E. Bayer, H. M. Blalock Jr., Peter M. Blau, Zahava Blum, George W. Bohrnstedt, Phillip Bonacich, Edgar F. Borgatta, Raymond Boudon, Richard P. Boyle, Serge Carlos, Lewis Carter, T. Michael Carter, Anne T. Cleary, James S. Coleman, Herbert L. Costner, Robert L. Crain, Richard F. Curtis, Phillips Cutright, James A. Davis, Robert Dubin, Richard C. Dumont, Beverly Duncan, O.D. Duncan, Glen H. Elder, Jr., Doris Entwisle, David Featherman, James Fennessey, Galen Glockel, Arthur Goldberger, Robert A. Gordon, Walter R. Gove, Archibald O. Haller, Albert Halter, Michael Hannan, Robert M. Hauser, Thomas Heberlein, David Heise, Clinton Herrick, Robert W. Hodge, Elton F. Jackson, Karl Joreskog, Sheila R. Klatzky, Robert E. Klein, Klauss Krippendorff, Kenneth Land, Angela Lane, Robert K. Leik, Robert Lew, Robert L. Linn, Morgan Lyons, Ariffinbir Marzuki, Robert Mason, William Mason, Edward McDill, Alden Miller, Karen Oppenheim, James A. Palmore, Donald Pelz, Alejandro Portes, Richard A. Rehberg, Donald B. Rosenthal, Peter Rossi, Zick Rubin, Walter E. Schafer, E. Schild, Allan Schnaiberg, Karl Schuessler, Robert Scott, Lauren Seiler, William H. Sewell, Vimal Shah, Paul M. Siegel, Joe L. Spaeth, Arthur Stinchcombe, John L. Sullivan, Gene Summers, James Sweet, Donald Treiman, Harry Upshaw, Thomas L. Van Valey, G. William Walster, Bruce Warren, Caryll Wells, Charles E. Werts, David E. Wiley, James A. Wiley, Thomas Wilson, William J. Wilson, Joseph Woelfol

Structuralists

Bert N. Adams, Harriet Berkowitz, Steven Berkowitz, Paul Bernard, Phillip Bonacich, Scott Boorman, J.P. Boyd, Richard Boyle, Ivan Chase, Robert Crain, James A. Davis, Morris F. Friedell, Mark Granovetter, Leslie Howard, Charles Kadushin, Fred E. Katz, Nancy Howell Lee, Samuel Leinhardt, Joel H. Levine, Francois Lorrain, Judah Matras, Nicholas C. Mullins, Michael Schwartz, Michael Useem, Barry Wellman, Harrison C. White

Radical-critical sociologists

Charles Anderson, Norman Birnbaum, Robin Blackburn, John M. Cammett, David Colfax, Marlene Dixon, David W. Eakins, Henry Etzkowitz, George Fischer, Richard Flacks, Todd Gitlin, Jurgen Habermass, Richard Hamilton, Tom Hayden, Eric J. Hobsbawm, Henri LeFebvre, John Leggett, Leo Lowenthal, Staughton Lynd, Herbert Marcuse, Louis Menashe, Samuel M. Miller, Barrington Moore, Martin Nicolaus, James O'Connor Carl Oglesby, Martin Oppenheimer, Robert Moses Parris, Gerald Schaflander, Trent Schroyer, Alain Touraine, Norbert Wiley, John S. Williams, Irving M. Zeitlin, Maurice Zeitlin, Howard Zinn

Source: Mullins, Nicholas C. 1973. *Theories and Theory Groups in Contemporary American Sociology*. New York: Harper & Row Publishers.

most highly cited authors included in Mullins' schemata might show that social institution affiliation is a key defining characteristic for sociological subcultures. In addition, one or several dimensions would most probably be based on author's intellectual concerns, such as those which define subcultural divisions in the present analysis. In fact, Mullins' categories include three of the authors who are subjects in the present analysis--Blau, Merton and Bayer. A comparison of the subcultural affiliations of these authors based on the dimensional and cluster criteria in an analysis of Mullins' work and the present study would be enlightening. As a start, it would be necessary to explain why Blau and Bayer are in the same subculture according to Mullins (1973), while Blau and Merton share subcultural affiliation in the present analysis.

Several of Mullins' subcultures have divisions within them which could be analyzed further with cocitation analysis. Of particular interest is his Small Groups subculture, which is analogous to a traditional social psychology subculture. An in-depth author cocitation analysis could provide quantitative confirmation of the validity of separation of sociologists into these categories.

Social Psychology

While Mullins (1973) differentiates between different types of social psychology as a part of his classification of sociological theories, other scholars have addressed this issue in greater depth. The classic article by James S. House (1977) suggests that there are three distinct academic subcultures within the

discipline of social psychology: psychological social psychology and two versions of sociological social psychology, specifically symbolic interactionism and psychological sociology (or social structure and personality). In fact, House's categories are quite similar to Mullin's subcultural classifications of the discipline. Table 5.8 indicates the subcultural categories into which House places many of the authors in social psychology. In his "Psychological Social Psychology" classification, House indicates that particular journals can be used as units of analysis in addition to the career writings of authors in order to gain greater understanding of the nature of the subcultures. If House's classifications were to be subjected to a study similar to the present one, a combination of both author and document cocitation analyses could be utilized to discern key subcultural characteristics which would validate or refute House's schema.

House believes that the subcultures within social psychology are so distinct that they are "largely unaware of or uninterested in the concerns of the others." (1977: 162) Interestingly, House (1977) suggests that institutional affiliation (e.g. in what academic department the scholar can be found) and personal self-definition are sometimes less helpful in typifying authors than are their intellectual characteristics and their methodology. Thus, although structural characteristics such as institutional affiliation can serve as useful background data, he might agree that an analysis such as the one undertaken herein, in which the dimensions suggest close cognitive similarities, would be more likely to illuminate the intellectual connections of the members of the subcultures.

TABLE 5.8

Categorization of Authors in Social Psychology
in
House: "The Three Faces of Social Psychology"

Psychological Social Psychology

Floyd Allport, Kurt Lewin, Edward Jones and Harold Gerard, Kenneth R. Ring, Daniel Katz, William J. McGuire, Kenneth J. Gergen, Robert Helmreich, Philip E. Converse, Rae Carlson, Hanna Levenson, Dorwin Cartwright and Alvin Zander, major journals in the field: *Journal of Personality and Social Psychology, Journal of Experimental Social Psychology, Journal of Personality, Journal of Applied Social Psychology*

Symbolic Interactionism

George Herbert Mead, Charles Horton Cooley, W. I. Thomas, Manford Kuhn, Arnold Rose, Herbert Blumer, Everett Hughes, Alfred Lindesmith, Tamotsu Shibutani, Erving Goffman, Barney Glaser and Anslem L. Strauss, John Kinch, Ralph Turner, Howard Becker, Thomas Scheff, Jerome G. Manis and Bernard Meltzer, John Hewitt

Psychological Sociology

Karl Marx, Emile Durkheim, Max Weber, Talcott Parsons, Robert Merton, Morris Rosenberg, Melvin Kohn, Alex Inkeles, Alejandro Portes, Claude Fischer, David L. Featherman, William H. Sewell and Robert M. Hauser, Alan Kerckhoff, Louis Wirth, Herbert J. Gans, Jonathan Freedman

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Source: House, James S. 1977. "The Three Faces of Social Psychology." *Sociometry*. 40: 161-177.

House (1977) also suggests that a time factor is essential to understanding the discipline of social psychology, in that after World War II, the culture of the discipline seems to become fragmented into growing subcultures. Thus, the discipline of social psychology appears to be a prime candidate for an author cocitation analysis to determine whether multidimensional scaling and cluster analysis, in conjunction with supplementary background information and temporal classification data, supports the classification as proposed by House (1977). In addition, an analysis of House's scheme could address the similarities and differences among the authors included in Mullins' parallel classification.

Feminist Scholarship

A third academic culture which could offer fruitful ground for author cocitation analysis is that of feminist scholarship. This field includes not only the great number of feminists who have published in the last few decades, but also their mentors and the foremothers and forefathers of scholarship on women. The authors who are identified as contributors to feminist scholarship have been divided into a variety of categories by several people studying the discipline. These categories seem to have their orientation primarily in the political underpinnings of each author's work. For example, Tables 5.9 and 5.10 show how two publications, which either compile the original writings of feminist scholars or summarize their works, have identified the following common subcultural categories within feminist scholarship: liberal feminists, Marxist feminists, radical feminists,

TABLE 5.9

Categorization of Feminist Scholars
in
Jaggar and Rothenberg: *Feminist Frameworks*

Conservatism	Sigmund Freud, Edward Wilson, Lionel Tiger and Robin Fox, Bruno Bettleheim, Anthony Storr
Liberalism	John Stuart Mill, Joyce Trebilcot, NOW, Hardy Jones, Lin Farley, Alix Kates Shulman, Ann Crittenden Scott, Shere Hite, Letty Cottin Pogrebin
Traditional Marxism	Frederich Engels, Evelyn Reed, V. I. Lenin, Margaret Benston, Karl Marx, Cuban Family Code, Clara Zetkin
Radical Feminism	Shulamith Firestone, Charlotte Bunch, Monique Wittig, Jennifer Woodul, Maida Tilchen, Sheila Cronan, Janice Raymond, Ti-Grace Atkinson, Kathleen Barry, Adrienne Rich
Socialist Feminism	Charlotte Perkins Gilman Chapter of the New American Movement, Gayle Rubin, Heidi I. Hartmann, *The Progressive*, Natalie J. Sokoloff, Nancy Hartsock, Jane Flax, Nancy Chodorow, Linda Gorden and Allen Hunter, Ann Ferguson, Sheila Rowbotham
Feminism and Women of Color	Elizabeth F. Hood, Combahee River Collective, Norma Steele, Barbara Ehrenreich and Annette Fuentes, Bell Hooks, Mina Davis Caulfield, Angela Davis, Audre Lorde

Source: Jaggar, Alison M. and Paula S. Rothenberg. 1984. *Feminist Frameworks*. NY: McGraw-Hill Book Company.

TABLE 5.10

Categorization of Feminist Scholars
in
Tong: *Feminist Thought: A Comprehensive Introduction*

Liberal Feminism
Mary Wollstonecraft, John Stuart Mills, NOW, Betty Friedan, Harriet Taylor, Elizabeth Holtzman, Bella Abzug, Eleanor Smeal, Pat Schroeder, Patsy Mink, Women's Equity Action League, Mary Beard

Marxist Feminism
Friederich Engels, Jane Flax, Margaret Benston, Mariarosa Dalla Costa, Selma James, Shiela Rowbotham

Radical Feminism
Shulamith Firestone, Marge Piercy, Andrea Dworkin, Margaret Atwood, Gena Corea, Robyn Rowland, Adrienne Rich, Ann Oakley, Jeffner Allen, Kate Millet, Marilyn French, Mary Daly, Audre Lorde, Charlotte Bunch, Catharine MacKinnon, Carolyn M. Schafer and Marilyn Frye (these last three worked with Marxist concepts too), Jill Johnstone, Susan Brownmiller

Psychoanalytic Feminism
Sigmund Freud, Alfred Adler, Karen Horney, Clara Thompson, Dorothy Dinnerstein, Nancy Chodorow, Carol Gilligan, Sherry Ortner, Juliet Mitchell (also socialist), Simone de Beauvoir (also existentialist)

Socialist Feminism
Clara Zetkin, Alison Jaggar, Heidi Hartmann, Juliet Mitchell (also psychoanalytic), Iris Young

Existentialism Feminism
Simone de Beauvoir (influence of Sartre)

Postmodern Feminism
Helene Cixous, Luce Irigaray, Julie Kristeva (all influenced by Jacques Lacan and Jacques Derrida)

Source: Tong, Rosmarie. 1989. *Feminist Thought: A Comprehensive Introduction*. Boulder: Westview Press.

and socialist feminists. The tables show that, in addition to these common categories, both Tong (1989) and the team of Jaggar and Rothenberg (1984) include other subcultural categories unique to their own content analyses of the scholars' writings.

In this case, the task at hand would be to use author cocitation analysis to 1) confirm that the most highly cited feminist scholars tend to be differentiated from one another along the lines of a political dimension, or perhaps along the lines of their contributions to literary tradition or historical analysis, and 2) whether the feminist writers cluster in a manner which reflects any of the categories used by either Tong or Jaggar and Rothenberg.

There are a few feminist scholars who are thought to be equally in one category as another--such as Juliet Mitchell (psychoanalytic and socialist subcultures); the cluster analysis would necessarily place her in one subculture rather than the other (or perhaps a new one altogether!). Regardless of whether the quantitative analysis suggests subcultural clusters similar to or different from those proposed over the last decade, a more in-depth comparison of author background information might uncover information to substantiate the suggested categorizations.

The time dimension as employed in the present analysis could be quite useful in characterizing the wider culture of the discipline of feminist scholarship because of contributions of historical figures such as John Stuart Mills and Frederich Engels (for whom writings about women were just a small part of their overall work) as well as Mary Wollstonecraft, who was writing two centuries before

many of the other authors in the field.

A FINAL NOTE

Indeed, sociologists are scientists who are intrigued by the environment in which they live and work; it has been said that they are never divorced from their subject matter, but are ever immersed in it. Their task is to gather information which helps them gain a greater understanding of the cultural milieu of the social systems they study.

The norms of science, the values as to what is crucial for scientific investigation, the methodological practices, the artifacts in the form of published works--all are a part of the culture of research, and thus are the subject matter of sociologists of science. Research is carried out through building social and intellectual connections. The connections can take different forms over time as careers shift and new issues within the discipline arise; thus an analysis of temporal changes is essential to truly understanding an academic culture.

The present analysis outlines the intellectual connections built among a group of the most highly cited authors in one particular area of scientific research: those scholars who study the field of higher education. This study also begins to explore the social connections which have aided in the creation of the distinct subcultures within this particular research discipline. The results provide an affirmative answer to whether it is possible, through author cocitation, to gain greater understanding of the key intellectual and social connections which form a

web of interrelationships among scholars.

The success of author cocitation in illuminating the nature of the discipline of higher education research raises expectations that the methods utilized herein can be used to answer Zuckerman's questions about intellectual and social connections within countless academic disciplines, whether the primary subjects are the researchers, the theoreticians or even the practitioners. Each discipline has cultural characteristics--norms, values, methods, practices and organizational structures--which make it distinct from other academic disciplines. Each mature academic culture has within it a pattern of subcultures which reflects the richness of the field of study in terms of the intellectual and social connections of the scholars associated with it. Science can only progress through these linkages among scholars. Author cocitation analysis is one tool by which sociologists can learn about those cultural and subcultural elements which make academic inquiry, the creation and sharing of knowledge, possible.

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Appendix A: Basic SocSciSearch Retrieval Strategy

Standard Procedure

The following data statements were used to access the data from the SocSciSearch database, using the DIALOG access software.

limitall/00806513:02065637
s cr = feldman k?(s)cy = 1976:1989
t s1/1/all

The first statement limits the citing articles to those entered into the data base from 1980 to 1989. The accession number which would limit articles from 1980 forward is AN = 00806513; AN = 02065637 is the ending accession number for 1989. The command which limits the citing articles by date is "limitall".

In order to obtain the accession numbers for the articles which cite an author's work during a particular time period, a search statement is entered; the statement essentially reads "search all cited references which represent the works by K. Feldman published within the 1976 and 1989 time span." The "?" indicates that citations for all authors named K. Feldman are included. Limiting the citations further by including authors' second initials is not necessary because the process of matching accession numbers will adequately eliminate the coupling of unrelated authors with the same names. The third statement asks that all the accession numbers for the appropriate citing articles be printed.

Problem Cases

In some cases, the number of accession numbers to be processed for one author was too large for the software to handle. In those cases, a message came back indicating the point at which the processing had ended (e.g. "stopped at CR = Cohen MM, 1983, v54,0338, AVIAT SPACE ENVIR." In these cases the following statements were entered:

s cr = cohen m?(s)cy = 1968:1972
[message comes back "stopped at CR = Cohen MM . . ."]
s (cr = cohen mm, 1983?:cr = cohen mz?)(s)cy = 1968:1972
s s1 or s2
t s3/1/all

These data statements tell the processor to consider the accession numbers prior to the "stop" as set one, and those in the remainder of the M. Cohen list as set two; set three represents the combination of these two sets. The accession numbers are then listed for set three.

Appendix B: Letter to Higher Education Researchers

On the following page is the template for the letters sent to the authors in the sample. For those authors who were deceased, similar letters were sent to colleagues in the department in which they last served.

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Department of Sociology
College of Arts and Sciences
Blacksburg, Virginia 24061-0137
(703) 231-8971 Fax: (703) 231-3860

Date

Author's Name
Authors Address
" "
" "

Dear Dr. _____:

I am currently conducting a co-citation study of the most frequently cited authors in higher education research. As you may know, you were included among this group of scholars by John Budd in his 1990 article in the Journal of Higher Education (61:84-97).

I need complete information that will provide me with a much richer understanding of the breadth and depth of your research than I can ascertain through most of the documents that are available to me in the public domain. Consequently, I am writing to request a copy of your full vita, including as complete a list of your career publications as you have available. It would be most helpful if you could send your vita to me at my home address as follows:

Susan V. Mead
Route 4, Box 130
Floyd, VA 24091

Thank you in advance for your time, attention and prompt response. I look forward to including your work in my analysis. I will be in touch to let you know of my progress, and I will send you details of my citation analysis of your work.

Sincerely,

Susan V. Mead
Ph.D. Candidate in Sociology

Appendix C: Proposed Draft of Interview Schedule

As you may know, in author cocitation analysis, those authors who tend to be cited together repeatedly are considered to have close affinity within one another and those who are rarely or never cited together are considered to have the least affinity.

The authors with whom you have the closest affinity (based on frequency of cocitations) are AUTHORS A, B, . . .

1) Are you familiar with the work of Author A? of Author B? . . .

2) Have you ever cited the work of Author A? of Author B? . . .

3) Have you ever corresponded with Author A? with Author B? . . .

4) Have you ever worked at the same institution as Author A? as Author B? . . .

5) Have you ever collaborated with Author A? with Author B? . . .

6) Have you interacted with Author A at professional meetings? with Author B? . . .

7) Are you surprised that you and Author A have a close affinity in higher education literature? Why or why not?

8) Feel free to elaborate on the nature of your professional or social interaction with with any of the authors mentioned above.

(Those authors who are in different clusters at different times in their careers will be asked this battery of questions for the people with whom they cluster in each of their time periods. The questions will be prefaced by the following statement:)

You cluster with one set of authors in the early part of your career--from 19?? to 19??--and a different set of authors in the latter part of your career. For the period from 19??-19??, the authors with whom you have closest affinity are ...

In addition, they will be asked the following question:

9) What, if any, comments do you have about the differences in cocitation relationships identified across your career?

SUSAN V. MEAD

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Department of Sociology
and Anthropology
P.O. Box 6948
Radford University
Radford, Virginia 24142
(703) 831-6220

EDUCATION:

September 1987- May 1993	**Virginia Tech, Blacksburg, Virginia** **Ph.D. in Sociology**
September 1983- July 1987	**Virginia Tech, Blacksburg, Virginia** **M.S. in Sociology**
September 1978- June 1982	**Agnes Scott College, Decatur, Georgia** **B.A. with honors, Sociology and Art**
September 1973- June 1978	**Lexington High School, Lexington, Virginia** **Graduated with honors**

EMPLOYMENT:

August 1992-present — **Department of Sociology/Anthropology, Radford University, Radford Virginia**

Full-Time Instructor--primary instructional responsibility for four classes (200 students) each semester, representing required coursework for majors in sociology and anthropology, social work, criminal justice and adult degree programs

August 1991-May 1992 — **Department of Social Work and Sociology, Ferrum College, Ferrum, Virginia**

Adjunct Faculty Member--primary instructional responsibility for courses required in the social work major and sociology minor

April 1991-January 1992 — **Coalition for Justice in Central America, Blacksburg, Virginia**

Coordinator--recruitment and training of volunteers to implement educational, political and fundraising events promoting peace and justice locally, nationally and internationally

EMPLOYMENT (continued):

August 1990-
August 1991

Center for Survey Research, Virginia Tech,
Blacksburg, Virginia

Graduate Research Assistant--administrative and research duties including participation in project design and management of survey data collection

September 1984-
July 1990

Department of Sociology, Virginia Tech
Blacksburg, Virginia

Graduate Teaching Assistant and Instructor-- teaching duties including text selection, lectures, test construction, tutorial and administrative duties; ten terms as primary instructor for classes ranging in size from 7 to 101 students from all undergraduate levels

August 1988-
May 1989

Office of the Provost, Virginia Tech
Blacksburg, Virginia

Graduate Research Assistant--primary responsibility for the coordination, implementation and analysis of qualitative focus group research for the University's Outcomes Assessment Plan; technical assistance for quantitative survey research

September 1986-
August 1987

Office of Institutional Research and Planning Analysis
Virginia Tech, Blacksburg, Virginia

Graduate Research Assistant--research involving editorial, statistical and computer data processing skills; collection and analysis of group interview data

January 1987-
April 1987

Extension Division/State 4-H Office,
Virginia Tech, Blacksburg, Virginia

Consultant--creation and field testing of self-esteem enhancement workshop with written documentation to be used by State Extension Agents who train middle-management 4-H volunteers

September 1982-
September 1984

Women's Resource Center of the New River Valley
Radford, Virginia

Coordinator of Volunteers--recruitment, training and supervision of a pool of 60 crisis intervention volunteers; counseling and on-call responsibilities; administrative duties including public speaking, publicity and research in accordance with state grants

TEACHING EXPERIENCE:

RADFORD UNIVERSITY:

Spring 1993:	*Introduction to Sociology* (3 sections)
	Minority Groups
	The Oppression of Our Peoples: An Examination of Social Institutions and the Media (Independent Study)
Fall 1992:	*Introduction to Sociology* (3 sections)
	Minority Groups

FERRUM COLLEGE:

Fall 1991	*General Sociology* (2 sections)
	Social Welfare Policy I
	Social Work Senior Seminar (Independent Study)
Spring 1992	*General Sociology*
	Social Welfare Policy II

VIRGINIA TECH:

Summer I 1990	*Deviant Behavior*
Spring 1990	*Deviant Behavior*
Fall 1989	*Deviant Behavior*
Summer II 1989	*Social Organization and Social Problems*
Spring 1988	*Social Stratification*
Winter 1988	*Individual in a Changing Society* (2 sections)
Fall 1987	*Deviant Behavior*
Summer II 1986	*Contemporary American Society*
Winter 1986	*Contemporary American Society*
Fall 1985	*Contemporary American Society*

HONORS:

1987-88	Commonwealth Fellowship, State Council for Higher Education in Virginia
1987	Martha Sharitz Hamill Award for Outstanding Junior Clubwoman in the Blue Ridge District
1986	Outstanding Clubwoman, Junior Woman's Club of Radford
1986	Elected to Phi Kappa Phi Honor Society
1984	Elected to Alpha Kappa Delta Honor Society
1983	Outstanding Young Woman of America
1982	Who's Who Among American Colleges and Universities
1982	Louise McKinney Book Award
1981	Elected to Agnes Scott College Chapter of Mortar Board
1981-82	Marie L. Rose Huguenot Scholarship
1980	Most Valuable Student Admissions Representative, Agnes Scott College
1979-82	Charles A. Dana Scholarship

PUBLICATIONS, MONOGRAPHS, PAPERS AND PRESENTATIONS:

1993 Susan V. Mead. "Identifying Academic Subcultures Within Higher Education Research: An Examination of Scholars' Careers Through Author Cocitation" Unpublished Dissertation, Virginia Polytechnic Institute and State University, April 1993.

George A. Hillery, Susan V. Mead, Robert G. Turner. "Sorokin After Fifty Years: An Empirical Assessment of His Theory of Social Change," in *Sorokin and Civilization: A Centennial Assessment* edited by Michel P. Richard and Joseph B. Ford. New Brunswick, NJ: Transaction Books (Forthcoming).

Susan V. Mead. "Assessing Differences in Achievement Levels of Public and Non-Catholic Private High School Students," (Paper in Progress).

1990 Susan V. Mead. "Insights from Costa Rica and Nicaragua," *The Green Branch*, Vol. II, No. I, January, 1990.

1989 Susan V. Mead. "Costa Rica and Nicaragua: A Question of Faith," *Presente*, No. 45, December 1989.

Susan V. Mead. "Qualitative Research Techniques Used in Outcomes Assessment at Virginia Tech," presented at the Annual Meeting of the Association for Institutional Research, Baltimore, Maryland, May 1989.

1988 George A. Hillery, Susan V. Mead, Robert G. Turner. "Sorokin After Fifty Years: An Empirical Assessment of His Theory of Social Change," presented at the Seventeenth Annual Meeting of the International Society for the Comparative Study of Civilizations, Hampton University, Hampton, Virginia, May 1988.

1987 John A. Muffo, Susan V. Mead, Alan E. Bayer. "Using Faculty Publication Rates for Comparing 'Peer' Institutions," *Research in Higher Education*, Vol. 27, No. 2, 1987.

Susan V. Mead. "Achievement of Public and Non-Catholic Private High School Students Within a Matched Sample," Unpublished Master's Thesis, Virginia Polytechnic Institute and State University, August 1987.

John A. Muffo, Susan V. Mead, Alan E. Bayer. "Publication Rates in the Sciences, Social Sciences, and Humanities for Virginia Tech and Four Peer Institutions," Institutional Research Research and Planning Analysis Series, Vol. 86-87, No. 60, Virginia Tech, Blacksburg, Virginia.

Susan V. Mead. "Opportunities to Enhance Self-Esteem," presented at the Spring Conference of the Virginia Association of 4-H Volunteer Leaders, Williamsburg, Virginia, March 1987.

PUBLICATIONS, MONOGRAPHS, PAPERS AND PRESENTATIONS (continued):

1986 Susan V. Mead. "Achievement of Public and Non-Catholic Private High School Students Within a Matched Sample," presented at the Third Annual Graduate Research Symposium Poster Session, Virginia Tech, Blacksburg, Virginia, November 1986.

1983 Susan V. Mead. "Volunteerism in a College Town," presented at the Region III Social Services Conference on Volunteerism in Family Services, Philadelphia, Pennsylvania, August 1983.

1982 Susan V. Mead. "The Effects of Public, Private and Parochial Secondary Education in the South on College Achievement," presented at the Emory University Undergraduate Sociology Symposium, Atlanta, Georgia, April 1982.

COMMUNITY LEADERSHIP POSITIONS:

Women's Resource Center of the New River Valley, Inc.

1990-91 *President*, Board of Directors
1989-90 *Vice-President/President-Elect*, Board of Directors
1989 *Special Interests Chair (Funding)*, Board of Directors
1987-88 *Montgomery County Representative*, Board of Directors

Parents Anonymous of Virginia, Inc.

1989-90 *Charter Member*, Montgomery County Chapter Board of Directors
1990 *Executive Committee Member*, State Board of Directors
1989 *President*, State Board of Directors
1986-87 *Funding Committee Chairperson*, State Board of Directors

Department of Sociology, Virginia Tech

1988-89 *Graduate Student Representative*, Curriculum Committee
1987-89 *Sociology Department Representative*, Graduate Honor System Review Board
1987-88 *Graduate Student Representative*, Graduate Committee
1987-88, *Treasurer*, Alpha Kappa Delta
1985-86 Sociology Honorary Society
1987 *Treasurer*, Sociology Graduate Student Association
1985-86 *Vice-Chairperson*, Sociology Graduate Student Association
1985-86 *Graduate Student Representative*, Departmental Executive Committee
1984-85 *Chairperson*, Sociology Graduate Student Association

COMMUNITY LEADERSHIP POSITIONS (continued):

Episcopal Diocese of Southwestern Virginia

1989-91, 1976-78	*Parish Delegate*, Annual Council of the Episcopal Diocese of Southwestern Virginia
1989-90	*Secretary/Vestry Member*, Christ Episcopal Church, Pearisburg, Virginia
1988-90	*New River Convocation Representative*, Bishop's Commission on Ministry with Youth
1989	*Diocesan Representative*, North/South Dialogue Trip to Nicaragua and Costa Rica

Virginia Federation of Women's Clubs

1988-90	*State Arts Department Junior Chairperson*
1988-90	*Public Relations/GFWC Centennial Junior Chairperson*, Blue Ridge District
1987-88	*President*, Blue Ridge District Junior President's Council
1984-86, 1986-88	*Arts Department Junior Chairperson* Blue Ridge District
1989	*Public Affairs/Safety Chairperson*, Junior Woman's Club of Radford
1989	*Courtesy Chairperson*, Junior Woman's Club of Radford
1988	*Historian*, Junior Woman's Club of Radford
1986-87	*President*, Junior Woman's Club of Radford
1985	*Arts Department Chairperson*, Junior Woman's Club of Radford
1985	*Community Improvement Project Chairperson*, Junior Woman's Club of Radford

Agnes Scott College

1987-97	*Vice-President*, Alumnae Class of 1982
1981-82	*Chairperson*, Arts Council
1981-82	*Vice-President/Elections Chairperson*, Mortar Board
1981-82	*Charter President*, Agnes Scott Circle K Club
1981-82	*Representative-at-Large*, Ad Hoc Committee on Women and Scholars
1980-81	*President*, Student Admissions Representatives
1979-80	*Vice-President*, Class of 1982
1978-79	*Freshman Chairperson*, Junior Jaunt Fund Drive

Other

1990	*Board of Directors Member*, Coalition for Justice in Central America
1989-90	*District Alternate*, Montgomery County Democratic Party
1989	*VFWC Representative*, International Very Special Arts Festival, John F. Kennedy Center for the Performing Arts
1986-89	*Steering Committee Member*, Very Special Arts Festival, Radford University
1987	*Ex-Officio Member*, Board of Directors, Radford Chamber of Commerce
1985-88	*Charter Member*, National Museum for Women in the Arts