Kuhnian interpretation of the historical evolution of accounting

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A KUHNIAN INTERPRETATION
OF THE HISTORICAL EVOLUTION
OF ACCOUNTING

Abstract: Distinct parallels exist between the historical evolution of scientific disciplines, as explained in Thomas Kuhn's *The Structure of Scientific Revolutions*, and the historical evolution of the accounting discipline. These parallels become apparent when accounting's dominant paradigm is interpreted to be the double-entry bookkeeping model. Following this interpretation, the extensive articulation of the double-entry model over the past four centuries may be seen to closely resemble the "normal science" of Kuhn's theory. Further parallels become apparent when Kuhn's concept of the disciplinary crises that precede scientific revolutions is compared to developments in the accounting discipline over the past 25 years. This portrayal of accounting's evolution suggests an uncertain future for the accounting discipline.

The purpose of this paper is to examine the historical evolution of the accounting discipline from the perspective of Thomas Kuhn's classic, *The Structure of Scientific Revolutions* [1970a]. Kuhn's book offers profound insights into the evolution of scientific disciplines, and therefore may help us to better understand past and present trends in the accounting discipline. This paper cites many aspects of the historical evolution of accounting which may be interpreted in ways that are consistent with a detailed examination of Kuhn's theory. This exercise in historical interpretation offers a new and interesting perspective on the history of the accounting discipline, and is also suggestive of some alternative ways in which accounting might evolve in the future.

The historical evolution of scientific disciplines has been addressed by a number of philosophers in addition to Kuhn, including Lakatos [1970] and Feyerabend [1975]. This is not an appropriate forum for addressing the question of which of these

I wish to express my appreciation for helpful comments by seminar participants at Case Western Reserve University, Columbia University, McMaster University, Ohio State University, Penn State University, and the University of Utah. The specific comments of Haim Falk, Gary Previts, Bob Sterling, and Steve Zeff were particularly helpful.
works is more credible. However, Kuhn's work was chosen as the basis for this paper because it is more widely known, it has had a substantial influence on thinking in numerous other academic disciplines,1 and it has spawned a small body of literature (to be reviewed in the next section of the paper) examining its implications for accounting. I leave it to others to draw out the implications for accounting (if any) of the works of Lakatos, Feyerabend, and other historians of science.

According to Kuhn, the evolution of a scientific discipline, as practiced by members of a scientific community, may be characterized by the following stages:

1. Pre-paradigm stage, during which a body of phenomena is examined by scientists espousing competing schools of thought, with no common body of belief,

2. Development of paradigm consensus, or a common body of belief among practicing scientists within the field,

3. Normal science, in which the paradigm is further articulated to better explain the subject body of phenomena,

4. Crisis associated with anomalies, or observable facts that are unexplainable within the existing paradigm,

5. The appearance of a new paradigm incommensurable with the old, followed by debates between advocates of the rival paradigms,

6. Revolution, in which the consensus associated with the old paradigm is replaced by consensus on the new paradigm,

7. Resumption of normal science based upon the new paradigm,

8. Recycling through stages 4 to 7.

A slightly more extensive summary of Kuhn's thesis is presented by Wells [1976, pp. 471-2].

This paper is organized as follows. The first section reviews previous literature which has applied Kuhn's theory to accounting. The next section addresses the question of whether Kuhn's theory of disciplinary evolution in science may be usefully applied to accounting. Given an affirmative answer to this question, the third section addresses two closely related questions: (1) what is accounting's paradigm? and (2) at what stage in Kuhn's evolutionary cycle is accounting at this time? Based upon the answers to these questions, the fourth section interprets recent developments in accounting in terms of Kuhn's

1 For example, Gutting asserts that Kuhn's Structure "has had a wider academic influence than any other single book of the last twenty years" [1980, p. v].
theory of the crises and responses to crisis that occur in scientific disciplines prior to the emergence of a new paradigm. The fifth section examines possible future directions for accounting. A final section briefly summarizes the paper and its most significant conclusions.

LITERATURE REVIEW

References to Kuhn's work on the history of science first appeared in the accounting literature in 1966. Chambers [1966, pp. 373-376] suggested that "the development of accounting thought seems to have distinct parallels with the development of pre-Copernican astronomy" and expanded this idea with reference to Kuhn's *The Copernican Revolution*, published in 1957. The gist of Chamber's argument was that the ideas in his book, *Accounting, Evaluation and Economic Behavior*, could have an impact on traditional accounting thought analogous to the impact of Copernican ideas on astronomy. However, this analogy was not developed very far, and furthermore the scope and power of the ideas presented in *The Structure of Scientific Revolutions* were only dimly apparent in *The Copernican Revolution*.2

The first edition of Kuhn's *The Structure of Scientific Revolutions* was published in 1962, and this work was first referenced in the accounting literature by Sterling [1966, 1967, 1970a, 1970b]. Sterling's works during this period frequently make brief references to Kuhn's ideas in order to support a line of argument such as "a new theory usually arises as a result of 'anomalies' in the old theory" [1970a, p. 444]. However, Sterling did not attempt to more fully draw out the analogy that he so often suggested between developments in accounting theory and Kuhn's ideas.3

The first relatively comprehensive attempt to interpret developments in the accounting discipline in terms of Kuhn's theory was provided by Wells [1976]. He suggests that paradigm consensus in accounting evolved during the period from 1900 to 1940, and coalesced with the publication of the classic works of

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3An important qualification to this statement is that Sterling's participation on the American Accounting Association Committee that prepared *Statement on Accounting Theory and Theory Acceptance* [1977] almost certainly accounts for the emphasis given there to Kuhn's theory as a way of interpreting the existing state of accounting theory.
Gilman [1939], Sanders, Hatfield and Moore [1938], and Paton and Littleton [1940]. The central feature of this accounting paradigm in Wells’ analysis is the historical cost basis of accounting valuation. The period from 1940 to approximately 1960 is treated by Wells as a period of normal science. A period of crisis then arose which he attributes to:

one class of anomaly that has proven to be intractable. The historical-cost based system fails to take account of changes in asset prices and changes in the purchasing power of the monetary unit [p. 476].

The accounting discipline’s response to this crisis included a period of professional insecurity accompanied by ad hoc modification of accounting rules, attempts to define the fundamental assumptions (postulates) and objectives of the discipline, and the emergence of alternative paradigms. Wells identifies four schools of thought associated with what might generally be referred to as accounting for changing prices, and concludes that “accounting is emerging from a state of crisis” [p. 480] which could be expected to lead to a shift of allegiances in favor of one of the competing schools of thought culminating in the emergence of a new paradigm.

A major theme of Wells’ analysis is his defense of a priori research in accounting from the increasing criticism it was receiving, for example, from Nelson [1973] and Gonedes and Dopuch [1974]. Kuhn’s theory predicts that a paradigm shift will be accompanied by attempts by advocates of competing paradigms to persuade their opponents to their view. Such attempts are usually unsuccessful due to the incommensurability of competing paradigms — that is, each paradigm assumes standards of evaluation (of paradigms) that are not compatible with the standards of the competing paradigm. Thus, paradigm debates often appear to have abandoned the standards of scientific evaluation in favor of emotional appeals. As a result, paradigm debates invite criticism such as that cited by Gonedes and Dopuch [p. 50]: “it has seemed possible, using this [a priori] approach, to declare the superiority of just about any set of accounting procedures, depending upon the particular a priori model adopted.” In contrast, Wells defends a priori research in accounting by viewing it as an essential step in a Kuhnian paradigm shift which, according to his analysis, was in progress in accounting during the 1960s and 1970s.

Flamholtz [1976] develops the implications of Kuhn’s theory in a way that has some parallels to Wells. She equates the
period prior to 1930 to Kuhn's pre-paradigm stage, and identifies the 1930s as the period during which an accepted accounting paradigm was developed. However, her analysis, unlike that of Wells, has a heavy institutional flavor, in that she defines accounting's paradigm in terms of the pronouncements issued by the accounting profession and the SEC. Thus, normal science consisted of the continuing development and promulgation of accounting rules following the 1930s by the Committee on Accounting Procedure, the Accounting Principles Board, and the Financial Accounting Standards Board. According to her analysis, the existence of a crisis was apparent by 1970 in that the accepted accounting paradigm failed to reflect economic reality in a variety of ways, including a failure to deal adequately with price-level changes, with the increasing complexity of economic transactions, and with the need to account for human resources. She suggests that a new paradigm which will address these issues is likely to emerge through a combined effort of government and the accounting profession, but does not describe the possible nature of such a paradigm.

The American Accounting Association's *Statement on Accounting Theory and Theory Acceptance* (SATTA) was published in 1977, but represented the culmination of a project begun in 1973 and intended to yield "a statement that would provide . . . [a] survey and distillation of current thinking on accounting theory" [1977, p. ix]. Instead, SATTA identified three alternative theory approaches and attributed the extant lack of consensus regarding the "correct" approach as attributable to the existence of a Kuhnian paradigm debate. The three alternative theory approaches identified by SATTA were labelled (1) classical approaches to theory development, (2) the decision-usefulness approach, and (3) information economics. SATTA does not attempt an historical interpretation of the evolution of accounting thought in terms of Kuhn's stages. Rather, in Chapter 4, it focuses on an interpretation of the existing lack of theory consensus in terms of one specific stage of Kuhn's theory — the stage of paradigm debate. Only briefly does the document imply that a paradigm consensus ever existed in the accounting discipline: "the apparent consensus on the 'matching and attaching' approach to theory formation is disintegrating" [p. 41]. SATTA does not describe the nature of normal science carried out under this paradigm, or explain the kinds of anomalies that may have led to the crisis of disintegrating consensus. Thus it is a static application of a specific Kuhnian concept, rather than a dynamic application of Kuhn's entire
theory. Of course the purpose of SATTA was to summarize current thinking on accounting theory. In that light, SATTA's failure to offer an account of the evolution of accounting theory is better understood.

SATTA was reviewed by Hakansson [1978] and by Peasnell [1978]. Hakansson expresses disagreement with SATTA's suggestion that its three "alternative theory approaches" might be treated as competing paradigms, and suggests instead that accounting's paradigm would seem to me to have to be closely related with the structure of modern corporate accounting: a focus on assets, on claims to these assets, and on periodic changes in both, with each dimension associated with a unique standardized number [p. 722].

In his view, the disenchantment of the 1960s should be attributed to "the shortcomings of relying on the single-number (nominal currency point) estimates to which the double-entry system naturally leads us" [p. 722] rather than to dissatisfaction with the prevailing matching-attaching paradigm. Hakansson interprets SATTA's three alternative theory approaches as attempts to resolve the anomalies of the existing accounting paradigm, which he asserts "has not come close to being overturned and may yet be repaired" [p. 722]. As Hakansson's objective is to critique SATTA, his Kuhnian interpretation of accounting's evolution goes no further than this. Despite its brevity, his interpretation is noteworthy in that it provides a quite different perspective than does SATTA, Wells, or Flamholtz.

Peasnell critiques SATTA from two points of view. First, he suggests that Kuhn's theory is not applicable to accounting because it "is intended to apply only to the sciences" [1978, p. 219] and "Accounting is not a science, it is a service activity" [p. 220]. Second, he argues that SATTA's identification of the classical and decision-usefulness approaches as competing paradigms cannot possibly be correct because, under Kuhn's theory, "there is little likelihood of an individual scientist accepting more than one conflicting (as contrasted with complementary) paradigm" [p. 221]. To support this view he argues that a number of prominent accounting scholars could easily be associated with either "paradigm" [pp. 222-223].

Previts [1980] applied Kuhn's concepts to his analysis of

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*This is the published version of Previts' 1972 Ph.D. dissertation at the University of Florida.*
the evolution in accounting thought from a pure historical cost paradigm to a modified cost paradigm early in the 20th century. According to Previts, the pure historical cost paradigm "rested almost exclusively upon the concept of historical cost qua exchange price, as found in the doctrines of prominent Classical economists" [p. 192]. This paradigm was challenged and eventually transformed "into a modified cost paradigm characterized by important formulations of theories for depreciation, amortization and appreciation" [p. 192].

Laughlin [1981] presents a critique of the Kuhnian analyses of both Wells and SATTA in an attempt to show that Kuhn's theory "just does not fit the present accounting phenomena" [p. 330]. Like Peasnell, he questions whether accounting is a science suitable for analysis using Kuhn's theory. His answer consists of an assertion that

it seems to be somewhat fanciful to suggest that the practice of accounting since the 1940's could, in any way, be classified as normal science. Or that the double-entry equality, the realization and matching principle etc. can be considered to be the contents of a paradigm/disciplinary matrix of accounting science [p. 335].

According to Laughlin's interpretation of Kuhn, "the main hallmark of normal science is the making of 'good predictions' from the 'practice of the field'" [p. 335]. He reviews the literature dealing with the prediction of corporate failure, as well as the efficient markets literature, and argues that these fail to qualify as normal science. He then suggests that the natural sciences may be a poor model for accounting scholars to follow in attempting to make the accounting discipline more scientific. The anarchistic theory of knowledge proposed by Feyerabend [1975] is a better model for the evolution of the social sciences, Laughlin asserts, than is Kuhn's theory. The remainder of his paper pursues the implications of this view.

Glautier [1983] uses Kuhn's concepts of paradigm and crisis to present a broad theory of how the nature of accounting at various stages of history has been determined by the degree of concentration or dilution of political power. He examines four periods of history, (1) the world of antiquity predating the invention of money, (2) the Roman world, (3) the Middle Ages, and (4) the Modern Age. He hypothesizes that strong forms of centralized power are associated with accounting systems having a paramount concern with control, while the dilution of centralized political power tends to be associated with multiple
accounting systems designed to achieve different objectives. His analysis supports these hypotheses. Glautier's work is noteworthy in the following respects, (1) he examines a much broader period of history than any other author cited here, (2) he suggests that accounting has gone through several stages of paradigm consensus and revolution, and (3) he implies that double-entry bookkeeping is the central feature of accounting's extant paradigm. One limitation of his analysis, however, is that he does not attempt to describe the evolution of accounting in terms of the specific benchmarks of Kuhn's theory; indeed, he makes only one tangential reference to Kuhn's work.

Butterworth and Falk [1986] suggest that much of the accounting literature of the past 60 years reflects a controversy between a "valuation paradigm" and a "stewardship paradigm." The valuation paradigm, associated with the works of Canning [1929], Chambers [1966] and Sterling [1970b], "assumes that the primary role of accounting is to provide investors and other interested parties with an estimate of the collective value of the rights to future services owned by a specific accounting entity" [p. 12]. In contrast, the stewardship paradigm, associated with such authors as Paton [1922], Sanders, Hatfield and Moore [1938], Mattessich [1964], and Ijiri [1967], views the accountant "as a processor of market values who is not concerned with their prediction" [p. 13]. Butterworth and Falk suggest that the recent capital markets research literature in accounting has its roots in the valuation paradigm, whereas the recent agency research literature in accounting has parallels with the stewardship paradigm. The implication is that accounting is presently in a stage of paradigm debate. To reconcile the conflict between these two paradigms, they propose a "contracting paradigm," which assumes "that a principal objective of accounting reports is to provide an efficient basis for financial contracts between management of a business enterprise and the firm's owners and creditors" [p. 22]. Their analysis is noteworthy in that its primary focus is on the evolution of accounting research paradigms.

In summary, the literature provides a variety of views concerning how the evolution of accounting corresponds to Kuhn's ideas about the evolution of scientific disciplines. There is no agreement on the nature of accounting's current paradigm, on the nature of "normal science" in accounting, or on the possible features of a future paradigm. It is interesting that most of the authors cited suggest that accounting is presently in a state of paradigm debate or crisis.
This paper attempts to augment the existing literature by drawing upon a much more detailed analysis of Kuhn’s ideas. While other authors provide only a limited number of references to his work, this paper uses over 30 specific quotations from Kuhn [1957, 1970a, 1970b] to build an interpretive framework within which the historical evolution of accounting may be critically examined. This approach provides more persuasive evidence of the correspondence between the evolution of scientific disciplines and the evolution of accounting. It also offers a unique perspective on the past, present, and possible future of accounting.

DOES KUHN’S THEORY APPLY TO ACCOUNTING?

Is it appropriate to apply Kuhn’s theory of the evolution of scientific disciplines to accounting? Specifically, if Kuhn’s theory is based upon the historical evolution of scientific disciplines, can it say anything pertinent about other disciplines supposedly not within its purview, such as accounting?

It is first necessary to define what is meant by “accounting” as the term is used in this paper. Because revolutions in a Kuhnian sense often result in fundamental shifts in the nature of a discipline, it is necessary to use a very broad definition that will not inhibit thinking about the possible future evolution of accounting. With this in mind, accounting is considered here to deal with making sense out of the economic performance of individuals or groups who are responsible for the utilization of economic resources, for the purpose of exerting control over those utilization activities. When references are made to “the accounting discipline,” as it was constituted during a particular era, this refers to the body of knowledge about accounting held in common by leading accounting thinkers of that era. At various times in the past, these accounting thinkers may have been merchants, textbook writers, practicing accountants, teachers, scholars, or a mixture of these.

If this definition of accounting is accepted, then Peasnell’s contention that accounting is not a science because it is a service activity must be rejected. Making sense out of reality is very much a scientific activity, and is also often performed for the purpose of controlling certain features of reality. An example is the field of medicine, which is a service activity that is solidly based in scientific research. Therefore, given the definition of accounting used here, the resemblance between accounting and other scientific disciplines may be sufficient to permit the use of
Kuhn’s theory to learn something useful about the evolution of accounting.

However, Kuhn appears to believe that his theory has meaning only for a special category of disciplines he calls sciences: “My methodological prescription is, however, directed exclusively to the sciences . . .” [1970b, p. 243]. Furthermore, he clearly intends to exclude social sciences, such as accounting, from his thesis,

I claim no therapy to assist the transformation of a proto-science to a science, nor do I suppose that anything of that sort is to be had. If . . . some social scientists take from me the view that they can improve the status of their field by first legislating agreement on fundamentals and then turning to puzzle solving, they are badly misconstruing my point [1970b, p. 245].

But the objective of this paper is not inconsistent with these views. This paper seeks neither a “methodological prescription” nor an “improvement in status” for accounting. The objective of this paper is to enhance our understanding of accounting’s evolution, and Kuhn’s ideas may contribute to this objective.

Kuhn also asserts that,

though scientific development may resemble that in other fields more closely than has often been supposed, it is also strikingly different . . . One of the objects of [this] book was to examine such differences and begin accounting for them [1970a, p. 209].

Thus even Kuhn would acknowledge that the evolution of accounting may resemble that of the sciences in some ways. But the rest of this passage is puzzling, because Kuhn’s book does not systematically examine the historical evolution of “other fields” (e.g., non-sciences). Furthermore, it does devote a chapter (Chapter II) to the transition of fields to sciences, a subject that would seemingly be very relevant to many “other fields.” Thus, Kuhn apparently offers no support for his position that his theories cannot be usefully applied to forms of intellectual inquiry other than those he calls sciences.

In assessing, Kuhn’s work, philosopher Larry Laudan asserts that,

there is no fundamental differences in kind between scientific and other forms of intellectual inquiry. All seek to make sense of the world and of our experience. All theories, scientific and otherwise, are subject alike to empirical and conceptual constraints . . . The quest for a specifically scientific form of knowledge, or for a
demarcation criterion between science and non-science, has been an unqualified failure [1981, p. 153].

Following this line of thought, it is concluded here that accounting as an intellectual discipline may resemble Kuhn's "sciences" in important ways. As pointed out above, even Kuhn would acknowledge this. Therefore, Kuhn's theories may be pertinent to an understanding of the historical evolution of the accounting discipline.

Evidence that Kuhn's theories may be usefully applied to intellectual disciplines other than the "sciences" abounds in the recent literature of such disciplines. Philosopher Gary Gutting has assembled an enlightening anthology of articles from a variety of disciplines, each of which examines the discipline's history from the perspective of Kuhn's *Structure*. In addition, Gutting's bibliography lists 119 "Works About Thomas Kuhn" in the fields of sociology, political science, economics, psychology, history, theology, art and literature, and education. If Kuhn's ideas have been enlightening to scholars in such diverse disciplines as these, then surely they must have some relevance to the accounting discipline.

Kuhn's *Structure* helps put the accounting discipline in perspective by creating an awareness that it may have important similarities with other intellectual disciplines. For example, progress in the accounting discipline may be noncumulative; accounting thinkers may be influenced in their views of the nature of accounting by dominant ideas that they are only dimly aware of; and there may be times in the development of the accounting discipline when it is necessary to identify these dominant ideas, question them, and perhaps discard them in order to assure that the discipline will achieve further progress.

**WHAT IS ACCOUNTING'S PARADIGM?**

A serious obstacle to those who seek to use Kuhn's thesis to identify the paradigm of a particular discipline is that he never defines exactly what a paradigm is. In a paper discussing the first edition of *Structure*, Margaret Masterman identifies 23 different ways in which Kuhn uses the term [1970, pp. 61-65]. Kuhn's response [1970b], which was partially incorporated into the postscript of the second edition of *Structure* [1970a], is helpful and is probably a good place to start.

In his postscript Kuhn says that "a paradigm is what the members of a scientific community share" [1970a, p. 176], and a "scientific community consists ... of the practitioners of a sci-
ente scientific specialty” [p. 177]. Thus the way to identify a paradigm is to identify the practitioners of a particular specialty and then scrutinize their behavior. However, “communities in this sense exist, of course, at numerous levels” [p. 177]; thus at one level are all natural scientists, at a slightly lower level are physicists, chemists, and other major groupings, at the next lower level are subspecialties such as organic chemistry and high-energy physics, within these subspecialties are smaller groups working on relatively specific problems. “Paradigms are something shared by the members of such groups” [p. 178]. But if the groups exist at different levels, then paradigms also exist at different levels.

With respect to accounting, it would be a simple matter to develop a taxonomy of specialties and subspecialties analogous to Kuhn’s. However, this is not necessary, because the purpose here is to identify an accounting paradigm that encompasses the entire discipline, and that deals with the subject matter of accounting at its most elementary level. If such a paradigm exists, it must be one that, to paraphrase Kuhn, all members of the accounting community share. Note that this assumes that accounting does have a paradigm that is agreed upon by all members of this community, and is not in the pre-paradigm stage which Kuhn believes is characteristic of many social sciences. If this assumption is incorrect, then readers should have no difficulty in falsifying it by identifying subgroups within the community of accountants who do not accept the paradigm. The accounting paradigm that is identified here passes this test.

In identifying the paradigm shared by a scientific community, Kuhn cautions against equating paradigm with theory: “Scientists themselves would say they share a theory or set of theories . . . however, ‘theory’ connotes a structure far more limited in nature and scope than the one required here” [1970a, p. 182]. He also states that the members of a scientific community may at times diverge into separate “schools” that “approach the same subject from incompatible viewpoints” [p. 177], suggesting that the views held by such schools are not paradigms. These comments suggest that, in isolating a discipline’s paradigm, it is necessary to examine the subject matter of the discipline; that is, the body of phenomena of concern to its practitioners.

Against this backdrop, it appears that none of the previous literature that attempts to apply Kuhn’s theory to accounting has succeeded in capturing the essence of his concept of a
paradigm. Specifically, the competing paradigms identified by Wells, SATTA, Previts, and Butterworth and Falk all represent theories or schools of thought that approach the same subject matter from incompatible viewpoints. Thus, none of these are paradigms in a Kuhnian sense. Flamholtz equates accounting's paradigm with the accounting rules promulgated by accounting regulatory bodies, but it is hard to imagine that consensus ever existed with respect to these. Glautier's association of the nature of accounting with the degree of centralization of political control in society perhaps comes closest to Kuhn's meaning, but Glautier never fully enumerates the specific features of an accounting paradigm.

Kuhn's attempts at clarification finally lead him to substitute the term *disciplinary matrix* for paradigm. The disciplinary matrix of a field, according to Kuhn [1970a, pp. 182-7], has four components, (1) symbolic generalizations, which are expressions, deployed without question by group members, in a logical form such as an equation, (2) shared commitments to certain fundamental beliefs about the subject matter of the discipline, (3) shared values for judging theories, predictions, etc., and (4) exemplars, or shared examples of problem-solutions encountered by students of the discipline as a means of learning-by-example how their discipline is practiced.

Accounting's paradigm is identified here by following the guidelines suggested by this discussion. First, the community of interest is defined as consisting of all accountants. Second, in order to avoid equating schools or theories of accounting with accounting's paradigm, the subject matter of the accounting discipline is broadly defined as that body of phenomena associated with the economic performance of individuals or groups responsible for the utilization of economic resources. Third, Kuhn's more precise definition of a paradigm as a disciplinary matrix consisting of four major components is used.

Following these guidelines, accounting's paradigm is identified as a set of symbolic generalizations, shared commitments, shared values, and exemplars associated with the double-entry bookkeeping model. As defined here, double entry refers to a bookkeeping system in which (1) data concerning property and equity are recorded according to the rules of debit and credit [Paton, 1917], (2) an equilibrium of debits and credits is constantly maintained, (3) a capital account is used to record owner's equity, and (4) nominal accounts (revenues, expenses, etc.) are used to record changes in capital, whether or not there is a periodic calculation of income [Winjum, 1971].
The double-entry bookkeeping model is rich with symbolic generalizations. Perhaps the most basic, dating back at least to Pacioli [1494], is:

Debits = Credits

As accounting evolved, other symbolic generalizations became pervasive, such as:

Assets = Liabilities + Net Worth

which is often first attributed to Sprague [1908], and:

Net Income = Revenues − Expenses

which is more contemporary. At a less general level, a variety of additional symbolic accounting generalizations exist and are readily formalizable as equations. All accountants understand them and can easily develop them and apply them to the solution of accounting problems.

The exemplars of accounting consist of the standard accounting problems that all students encounter in the introductory accounting course. As we all know these take on a variety of forms. Their primary objective is to familiarize the student with the terminology of accounting, with the interrelationships among accounting variables within the framework of the double-entry model, and with the manipulations of those variables that are necessary to the solution of accounting problems.

The shared values of accounting are easily identified, for they are a common subject of accounting literature. They include such familiar concepts as “relevance” and “objectivity”. Accounting students are usually formally introduced to such values early in their intermediate accounting course by a chapter in their text discussing ‘accounting principles’ or ‘accounting theory’. An excellent taxonomy of accounting’s shared values appears in Snavely [1967].

Accounting’s shared commitments represent the fundamental assumptions underlying the double-entry bookkeeping model. As these assumptions became generally accepted hundreds of years ago, it is not necessarily easy to identify them. Some are readily found in the literature, for example “accounting data are based on prices generated by past, present or future exchanges which have actually taken place or are expected to” [Moonitz, 1961, p. 53]. Others are generally unstated. For example, it is implicit in double entry that the accounting process is inherently prone to error, and therefore that the redundancy of debits and credits is necessary in order to provide opportunities for checking and rechecking the accounting data at various stages in the accounting process. It is also implicit in double entry that the primary purpose of a commercial venture is to
enhance the wealth of its owners, and therefore that the primary social role of accounting is to provide the owners with measures of wealth and changes in wealth.

These three fundamental assumptions — that exchange transactions represent accounting's primary data source, that internal check is critical to the accounting process, and that accounting exists primarily to serve owners' interests — seem entirely appropriate for the age in which double-entry bookkeeping developed. But are they appropriate for the age we now inhabit? And if not, then should the appropriateness of the double-entry accounting paradigm itself be reevaluated? A major purpose of this paper is simply to raise this question. But first the correspondence between the historical evolution of the double-entry accounting paradigm and Kuhn's general theory of disciplinary evolution is examined.

Most accounting historians accept the view that double-entry bookkeeping was developed in Italy during the 14th century [de Roover, 1955; Lee, 1973; Nobes, 1982]. It is more difficult to establish when a consensus emerged that the double-entry system represented the cornerstone of accounting. According to de Roover, by the date of publication of Pacioli's _Summa_ [1494], double entry was well developed and widely used in the Italian city-states. According to Chatfield,

In the first 100 years after its appearance the _Summa_ was translated into five languages, and books by Italian, English, Dutch, and German authors presented descriptions of double entry bookkeeping based on [it], spreading knowledge of the "Italian Method" throughout Europe [1974, p. 49].

Thus the 16th century could be taken as the time when a consensus on the double-entry accounting paradigm began to emerge. The best evidence that paradigm consensus was firmly established consists of the failure of the new system of bookkeeping proposed as a direct challenge to double entry by Edward Thomas Jones in 1796. According to Brown [1905, p. 168], "The complete failure of Jones' 'English Book-keeping' has established double-entry once and for all as the only method of recording commercial transactions with completeness."5 By 1911, Hatfield would state that,

Accounting in all the modern world has developed from the same simple beginnings. Pacioli's _Tractatus_,

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5For more on the failure of challenges to double entry bookkeeping by Jones and others, see Yamey [1980].
either in the original or in translations or adaptations, spread through all Europe, and is the basis upon which modern accounting rests [p. 170].

Kuhn's theory says that paradigm consensus is followed by a period of “normal science” that continues until the discipline enters a “crisis”. It is suggested here that, after the 16th century, leading accounting thinkers were engaged in activities analogous to the “normal science” of Kuhn. The year 1960 will be taken as the approximate point of transition from normal science to crisis, but more will be said about accounting’s crisis in the next section of the paper.

If the double-entry model is to be taken as accounting’s paradigm, and if it is to be acknowledged that paradigm consensus in accounting was achieved approximately four centuries ago, then it is necessary to establish that the historical evolution of accounting during the past four centuries resembles Kuhn’s concept of normal science. To accomplish this, superficial interpretations of what Kuhn meant by normal science, such as that embodied in Laughlin’s assertion that it is fanciful to suggest that accounting could have been engaged in anything resembling normal science, must be avoided. Certainly accountants were not engaged in anything remotely resembling the practice of physics or chemistry, but leading accounting thinkers were engaged in activities very closely resembling Kuhn’s concept of normal science. This becomes clearer upon examination of what Kuhn meant by the term.

According to Kuhn,

Normal science consists in . . . extending the knowledge of those facts that the paradigm displays as particularly revealing, by increasing the extent of the match between those facts and the paradigm’s predictions, and by further articulation of the paradigm itself [1970a, p. 24].

In chapter IV, Kuhn equates normal science with “puzzle-solving,” for example:

Bringing a normal research problem to a conclusion is achieving the anticipated in a new way, and it requires the solution of all sorts of complex instrumental, conceptual, and mathematical puzzles. The man who succeeds proves himself an expert puzzle-solver, and the challenge of the puzzle is an important part of what usually drives him on [p. 36].

A brief review of the history of accounting following the development of double-entry bookkeeping reveals that the
double-entry model has evolved in ways that closely resemble these descriptions of normal science by Kuhn. These include the following:

1. Development of special journals for recording different types of transactions, around the 16th century [Yamey, 1962, pp. 26-27].
2. Evolution of the practice of periodic income determination and financial statement preparation, during the 16th and 17th centuries [Littleton, 1933, pp. 123-140].
3. Extension of the application of double-entry to organizations other than mercantile firms, such as monasteries and states, between 1559 and 1795 [Peragallo, 1938, p. 54].
4. Development of separate accounts to keep track of different types of merchandise inventory, around the 17th century [Yamey, 1962, pp. 28-29].
5. Application to corporations with many shareholders, beginning with the East India Company in the 17th century [Irish, 1947; Littleton, 1933, Chapter XIII; Winjum, 1972, Chapter X; Chatfield, 1974, Chapters 7-8].
6. Emergence of alternative methods of valuation of fixed assets, in the 18th century [Yamey, 1962, p. 34].
7. Development of depreciation accounting, evidenced as early as 1588, but maturing in the 19th century [Littleton, 1933, Chapter XIV].
9. Development of systematic means of accounting for pre-payments and accruals to enable careful calculation of periodic profit, in the latter half of the 19th century [Yamey, 1962, pp. 36-37].
10. Development of funds statements, in the latter 19th and early 20th centuries [Rosen and DeCoster, 1969].

Each of these developments contains elements that represent a "further articulation" of the double-entry accounting paradigm by its application to new sets of facts, or "extending . . . knowledge of those facts" by continual refinement of ways in which they are represented within the double-entry model. In addition, the term "puzzle-solving" seems a particularly apt description of the process by which these extensions of double-entry book-
keeping arose and were refined. Furthermore, these developments represent a more or less continuous evolution and refinement of the double-entry bookkeeping model over the past four centuries. It is therefore concluded that, during this period, accounting evolved in ways that closely resemble "normal science" as that term is defined by Kuhn.

Reflecting on this, one cannot help but be struck by the resiliency of the double-entry accounting paradigm. Over a period of four centuries, as the very nature of business enterprises changed and the complexity of business transactions increased, accountants were able to incorporate all of these developments within the framework of the double-entry paradigm. Every new development provided a puzzle requiring further articulation of the paradigm, and the paradigm provided the means to solve every such puzzle. The account by Lee [1975] of the development of British accounting, in response to the industrial revolution and the rise of the limited liability company between 1760 and 1900, provides a classic example of this point.

This interpretation of accounting's history is also consistent with a number of Kuhn's views about the nature of the paradigm. For example, consider his definition of paradigms as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners" [1970a, p. viii]. The double-entry model has certainly come to be universally recognized and accepted among the international community of accountants (recall Hatfield's reference, cited above, to Pacioli's work as the source of accounting "in all the modern world"). Moreover, the double-entry model provides a framework for defining the nature of accounting problems and a method for approaching the solution of those problems.

Furthermore,

Effective research scarcely begins before a scientific community thinks it has acquired firm answers to questions like the following: What are the fundamental entities of which the universe is composed? How do these interact with each other and with the senses? What questions may legitimately be asked about such entities and what techniques employed in seeking solutions? [pp. 4-5].

The double-entry model provides accountants with universally accepted answers to these basic questions. The "fundamental entities" of accounting's universe are assets, liabilities, revenues
and expenses. They interact with each other according to the rules of the double-entry model. They interact with the senses through the observation and recording of transaction data. Legitimate questions involve such matters as recognition, valuation, and classification; and the double-entry model both identifies these as relevant questions and suggests the nature of the techniques that must be used in seeking answers.

Kuhn continues in this vein:

answers (or full substitutes for answers) to questions like these are firmly embedded in the educational initiation that prepares and licenses the student for professional practice. Because that education is both rigorous and rigid, these answers come to exert a deep hold on the scientific mind... [normal] research [may be described] as a strenuous and devoted attempt to force nature into the conceptual boxes supplied by professional education [p. 5].

The parallels between these statements and contemporary accounting education and accounting practice are apparent. Regarding accounting research, parallels exist with respect to the development of the double-entry accounting paradigm over the past four centuries, as outlined above. That such parallels are not as apparent with respect to contemporary accounting research is indicative that accounting is no longer in a normal science stage, but has instead entered a crisis stage.

Kuhn also describes how a paradigm limits the boundaries of a discipline in the minds of its practitioners:

one of the things a scientific community acquires with a paradigm is a criterion for choosing problems that, while the paradigm is taken for granted, can be assumed to have solutions. To a great extent these are the only problems that the community will admit as scientific or encourage its members to undertake. Other problems... are rejected as metaphysical, as the concern of another discipline, or sometimes as just too problematic to be worth the time [1970a, p. 37].

The double-entry accounting paradigm provides such a criterion. Within the framework of the double-entry model, the only problems that are relevant involve accounting for exchange transactions between the business entity and another independent entity, or for events that can be interpreted as analogous to exchange transactions (e.g., depreciation, accruals, or cost allocations).
Kuhn elaborates on this point as follows,

A paradigm can, for that matter, even insulate the community from those socially important problems that are not reducible to the puzzle form, because they cannot be stated in terms of the conceptual and instrumental tools the paradigm supplies. Such problems can be a distraction... [p. 37].

For example, accountants paid no attention to the problem of accounting for human resources until it was shown how this problem could be addressed within the framework of the double-entry system [Flamholtz, 1974].

In summary, this section has compared the historical evolution of double-entry bookkeeping to Kuhn's description of the nature of paradigms and normal science. It is concluded that the double-entry bookkeeping model has the features of an accounting paradigm, as that term is used by Kuhn, and that the historical evolution of accounting from approximately the 16th century until about 1960 resembles the normal science of Kuhn's theory. It has also been suggested that accounting has recently entered a crisis stage. In the next section, this interpretation of accounting's evolution is further articulated by comparing current developments in accounting thought with Kuhn's description of the crisis stage of the evolutionary cycle.

ACCOUNTING'S CRISIS AND RESPONSE

According to Kuhn, the crises that eventually lead to scientific discoveries and revolutions begin "with the awareness of anomaly, i.e., with the recognition that nature has somehow violated the paradigm-induced expectations that govern normal science" [1970a, pp. 52-53]. The role of expectations is crucial. The paradigm induces all scientists to expect that any new problem can and will eventually be solved through the puzzle-solving process of normal science. It is the violation of such expectations that represents an anomaly and that, if not resolved in some way, will eventually plunge the discipline into a state of crisis.

The description of accounting's crisis and response to crisis presented here resembles Kuhn's general theory in many ways; these are made explicit in this section. However, there is one fundamental difference that must be made clear at the outset. Kuhn's theory focuses on how a discipline's crisis is resolved through the emergence of a new paradigm and the occurrence of a revolution. However, no competing paradigm for accounting
has yet emerged, and no other potential solution to accounting’s crisis is being pursued. This divergence of accounting’s evolution from the path Kuhn describes presents some problems of interpretation. Kuhn simply doesn’t discuss how a discipline’s crisis might deepen when no competing paradigm emerges.

While the interpretation presented here follows Kuhn’s theory as closely as possible, it has been necessary to improvise somewhat. Specifically, it is suggested that accounting’s crisis has consisted of two separate stages. The response to the first stage of its crisis was a failure. Gradual recognition of this failure precipitated a deeper and more fundamental crisis. Accounting is presently in this second stage of crisis, which is growing more severe and showing no signs of eventual resolution. In the remainder of this section, an attempt is made to build a case in support of this interpretation.

By the early part of the twentieth century, accountants had established a firm set of expectations concerning how any accounting problem would be resolved. Specifically, practicing accountants would experiment with various alternative accounting methods, and then they (or those who employed them) would select whatever such methods best suited their purposes. Over time new methods would become more widely known, and some alternative methods might be discarded while others became more popular. Accounting writers would explain the more commonly used methods, thus legitimizing them and causing them to be viewed as generally accepted. Virtually all of the historical developments in accounting listed in the previous section occurred in a manner similar to this.

A natural byproduct of this approach to solving accounting problems was the proliferation of alternative methods of accounting for similar phenomena. This would generally not be an acceptable result of puzzle-solving in a scientific discipline, but accountants then gave no thought to emulating the pure sciences. Indeed the flexibility of the double-entry accounting paradigm was one of its greatest strengths — it offered accountants and business managers numerous choices, and provided a framework within which most such choices could be reasonably explained and justified.

As it evolved in this manner, a central feature of accounting was that it existed almost exclusively to provide the managers of businesses and other organizations with information relevant to

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6For example, see the descriptions by Chandler [1977] of the development of railroad accounting [pp. 109-120] and cost accounting [pp. 278-9, 464-5].
managing the daily operations of their enterprises. Thus, accounting methods were chosen primarily to satisfy the needs of management.

This pattern of resolution of accounting problems started to collapse in 1907 when the Interstate Commerce Commission (ICC) began to prescribe uniform methods of accounting for railroads. Other regulatory bodies were soon created, and these followed the ICC's lead. According to Hendriksen, "regulation and the demand for uniformity have brought about a stifling of independent research and experimentation by the independent companies" [1977, p. 44].

The establishment of the corporate income tax in 1913 also had a significant effect on accounting. Businessmen were required to prepare financial statements as prescribed by the tax law for the purpose of determining taxable income. According to Chatfield, "for the first time accounting options and accounting theory became important to many outside the profession" [1974, p. 207].

By 1934 the Securities and Exchange Commission had been created and given the authority to prescribe accounting procedures for corporations under its jurisdiction. The SEC generally has not exercised this authority directly, but rather has deferred to standard setting bodies established by the profession, such as the Accounting Principles Board and the Financial Accounting Standards Board. The idea that uniformity of accounting procedures is desirable carried over from the industry regulatory agencies to the general standard setting bodies. Commenting on the formation of the Accounting Principles Board, Spacek [1961] fiercely attacked flexibility in accounting and defended uniformity as essential to fairness. That this view of accounting standard setting has come to be generally accepted is reflected in the AICPA's discussion of comparability [1973, pp. 59-60], together with their assertion that comparability is a qualitative characteristic that financial reporting "should possess", and that this was "obvious" and "implicit in any intelligent reporting of information" [p. 57].

The idea that accounting standards should be established by society, should be imposed upon business organizations, and should be relatively uniform, represented a violation of the paradigm-induced expectations that had previously governed accounting's evolution; that is, it was an anomaly. Though it was not immediately apparent, the impact of this development was profound, for it meant that accounting would no longer evolve in the way that it had for the previous four centuries.
Both the purpose of accounting, and the people who assumed responsibility for its development, had been radically transformed. The development of accounting concepts and techniques would no longer be primarily an activity engaged in by corporate accountants and managers to serve their own ends, but became an activity dominated by standard setting bodies seeking to serve social ends.

The combination of government regulation and the commitment to uniformity has led to a buildup of unresolved accounting issues that perhaps more closely resemble the anomalies of Kuhn's theory. These include accounting for leases, pensions, foreign currency translation, inflation, deferred credits, executory contracts, and numerous other topics addressed but not adequately resolved by accounting standard setters during the past 20 years or so. Over the previous four centuries, in the absence of a uniformity constraint, accountants had proven capable of resolving issues of this sort within the framework of the double-entry accounting paradigm. That such issues can no longer be resolved effectively is evidence that the discipline is presently in a crisis stage.

The accounting discipline's response to accounting regulation has been examined by Watts and Zimmerman [1979]. Regulation created a demand for accounting theories justifying alternative accounting methods; accounting scholars responded to this demand by creating "accounting theory." The U.S. Securities Act of 1933-34 had two major effects on the accounting literature, according to Watts and Zimmerman [pp. 295-300]. First, the importance of management as a primary user of financial statements began to be downplayed, and the primary objective of accounting was taken to be providing information for external users of financial statements. Second, the acts stimulated a "search for accounting principles," commencing with discussions in the literature of the nature of accounting principles and leading to theoretical attempts to derive such principles from a philosophical base with little reference to existing practice (for example, Chambers [1966]).

The search for accounting principles has continued beyond the period cited by Watts and Zimmerman. In the 1960s its focus was the development of principles based upon postulates, as exemplified by the works of Moonitz [1961] and Sprouse and Moonitz [1962]. In the 1970s the focus shifted to establishing the objectives of financial statements, beginning with AICPA [1973, 1974]. The search continues to this day with the conceptual framework project of FASB [1985]. Most of the important
milestones in this process are summarized from an institutional perspective by Pacter [1983].

In summary, government intervention into the centuries-old process by which accounting methods developed and evolved represented an anomaly that radically changed the purpose of accounting and its manner of development. Never before had the business community been instructed by a central authority on how to keep its accounts. The occurrence of this anomaly, and the accounting discipline's response, in the form of the search for accounting principles, represents the first stage of the accounting discipline's crisis. This stage possesses several of the characteristics of the crisis stage of a scientific discipline identified by Kuhn. These are now enumerated.

First, Kuhn suggests that a discipline's crisis is often aggravated by external social pressures. For example, he cites the social pressure for calendar reform in the 16th century as a factor contributing to the urgency of the crisis in astronomy that eventually culminated in the Copernican Revolution [1970a, p. 69]. In the 20th century society has placed an analogous demand upon accounting. Society demands measures of income and wealth that can provide an objective basis for performance measurement, taxation, contracting, and related activities that are essential to our economy. The search for accounting principles has been accounting's response to this demand. In the 16th century it gradually became apparent that effective calendar reform could not be achieved by further ad hoc modification of the Ptolmaic geocentric view of the universe. Today it is gradually becoming apparent that effective reform of accounting will not be accomplished by the search for accounting principles.

The parallel between accounting's 20th century crisis and astronomy's 16th century crisis is striking in other ways. In The Copernican Revolution, published in 1957, Kuhn describes in detail attempts by astronomers over many centuries to explain the movements of celestial bodies through an ever more complex series of ad hoc adjustments to the methodology of the Ptolmaic paradigm. In the modern era, it may be observed that the Financial Accounting Standards Board, and its predecessor, the Accounting Principles Board, have sought to reform accounting by means of an increasingly complex series of ad hoc

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7The assertion that regulation triggered a crisis in the accounting discipline is not intended to represent a criticism of regulation per se, which may have been a perfectly appropriate societal response to the prevailing conditions. The point is that accounting regulation led to fundamental and profound effects on accounting as a discipline.
adjustments to the methodology of the double-entry accounting paradigm. According to Kuhn, "Copernicus himself wrote in the Preface to the *De Revolutionibus* that the astronomical tradition he inherited had finally created only a monster" [1970a, p. 69]. Evidence that contemporary accountants have similar reservations about our present accounting tradition is found in the following statement recently made by two accountants involved in standard setting, "Wide segments of the business community and the accounting profession have become increasingly concerned about, and critical of, the proliferation over the past several years of complex and detailed accounting standards" [Hepp and McRae, 1982, p. 52].

The parallel continues: "Throughout the Middle Ages and much of the renaissance the Catholic church was the dominant intellectual authority of all Europe. . . . before the tenth century and again after the sixteenth the church's influence was, on balance, antiscientific" [Kuhn, 1957, p. 106]. Similarly, accounting thought has been dominated over the past 25 years by institutions such as the AICPA, the SEC, and now the FASB. Although these institutions have been anything but antiscientific, their approach to accounting reform is influenced much more heavily by political considerations than by scientific theory or evidence.

There are other parallels between Kuhn’s general theory of crisis and accounting’s contemporary crisis. According to Kuhn, wherever an anomaly is highly resistant to attempts to resolve it, "More and more attention is devoted to it by more and more of the field’s most eminent men. If it still continues to resist, as it usually does not, many of them may come to view its resolution as the subject matter of their discipline" [1970a, pp. 82-83]. This description easily fits the accounting discipline of the 1960s and 1970s. The search for accounting principles came to be viewed by many accounting scholars as the subject matter of financial accounting. Eminent scholars whose works reflected a strong commitment to the quest for a theoretical foundation for accounting included Bedford [1965], Chambers [1966], Devine [1960, 1985], Ijiri [1967, 1975], Mattessich [1964], Moonitz [1961], Sprouse [with Moonitz, 1962], Staubus [1961, 1977], Sterling [1970b, 1979], and many others.

Still another parallel is that "proliferation of versions of theory is a very usual symptom of crisis" [Kuhn, 1970a, p. 71]. Accounting theories certainly proliferated during this era. Wells [1976, p. 478] identifies four schools of thought that are essentially different versions of accounting theory: price-level ad-
justed accounting, replacement cost accounting, deprival value accounting, and net realizable value accounting. Wells mentions a fifth possibility, present value accounting. Together with historical cost accounting, this provides a total of six versions of accounting theory.

A final parallel stems from Kuhn's assertion that "frequent and deep debates over legitimate methods, problems, and standards of solution . . . recur regularly just before and during scientific revolutions" [1970a, pp. 47-48]. Debates of precisely this kind in accounting are documented by SATTA; the three "paradigms" it identified were not paradigms at all, but alternative approaches to accounting theory development. These debates have been underway in the accounting literature for many years, according to SATTA [Chapter 2], beginning with the split between deductivists and inductivists in the 1920s and 1930s, and becoming much more pronounced with the emergence of behavioral accounting, capital markets research and information economics in the 1960s and 1970s. These debates certainly are concerned with the legitimacy of alternative methods of theory development and standards of solution of the theory development issue.

In summary, the first stage of accounting's contemporary crisis, labelled here (following Watts and Zimmerman [1979]) the search for accounting principles, has a number of parallels with the crises in scientific disciplines described by Kuhn [1957, 1970a]. The effects of the search for accounting principles on the accounting discipline are now examined.

One important byproduct of the search for accounting principles has been a commitment on the part of many accounting scholars to a more scientific approach to their discipline. This was perhaps first manifested by the deductivist-inductivist debates mentioned above. It gathered momentum in the 1960s and early 1970s as prominent accounting scholars such as Mautz [1963] and Sterling [1975] advocated a more scientific approach to accounting. And it has culminated in the past 20 years with an explosion of empirical research in accounting, research that attempts to emulate as closely as possible the methods followed by more mature sciences. It is clear that today's most active accounting researchers identify with the ideals of science and would like to be considered as scientists.

In other important respects, however, the search for accounting principles has been a failure. As this search proceeded through years and then decades with few signs of a successful
outcome, two things gradually became apparent to accounting scholars. The first is that even if an ideal set of accounting principles or standards could somehow be derived from "theory" or "science," it was very unlikely that these would be implemented. The establishment of accounting principles and standards had become firmly entrenched in the realm of politics [Solomons, 1978]. The clash of competing interests would often determine the outcome [Zeff, 1978]. The role of traditional accounting theories was merely to provide excuses or propaganda that competing interests could use to advance their causes [Watts and Zimmerman, 1979]. Indeed, in this environment, rational selection of normative accounting standards was impossible [Dems, 1973, 1974].

Another thing that became apparent to accounting scholars was even more unsettling, and contributed to the deepening of accounting's crisis. It was that accounting was inherently arbitrary. Generally accepted accounting principles had grown into a network of rules, increasingly resembling income tax regulations in length, complexity, and arbitrariness. Traditional approaches to the selection of accounting principles lacked rigorous theoretical underpinnings [Gonedes and Dopuch, 1974]. Thomas [1969, 1974] argued convincingly that the allocations central to conventional financial accounting are irremediably arbitrary. If these things were true, then the attempt to forge a link between science and accounting theory could not succeed! Accounting scholars aspired to be scientists, but there could be no science of accounting for them to practice!

These conditions — the politicization of accounting, the impossibility of accounting standards within the existing milieu, the inherent arbitrariness of accounting, and the interpretation of the role of accounting scholars as manufacturers of excuses — represented fundamental anomalies for accounting scholars by the mid-1970s. They gradually led accounting scholars to realize that the development of accounting concepts and techniques within a regulatory context dominated by political considerations was incompatible with the application of scientific methodology to accounting.8 In essence, the further development of accounting thought along traditional lines was now irreconcilable with the ideals of science that accounting scholars had fervently embraced. The malaise engendered by

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8Kuhn makes the same point: "One of the strongest, if still unwritten, rules of scientific life is the prohibition of appeals to heads of state or to the populace at large in matters scientific" [1970a, p. 168].
this realization was exacerbated by growing discontent with the increasingly complex and arbitrary labyrinth of official accounting pronouncements. These conditions led the accounting discipline into a deeper and more severe state of crisis, which is here labelled the second stage of accounting's crisis. This stage resembles in some ways Kuhn's description of a scientific discipline's response to crisis [1970a, Chapter VIII]. These are now enumerated.

According to Kuhn, "All crises begin with the blurring of a paradigm and the consequent loosening of the rules for normal research" [1970a, p. 84]. Accounting has certainly experienced a change in the rules for normal research during the past 25 years. In the 1960s normal accounting research involved articulating the double-entry paradigm, often referred to as a priori research (Nelson, [1973]). In the 1980s the rules concerning what constitutes "normal" accounting research are certainly much looser, encompassing behavioral experiments, information economics, and empirical studies of capital markets. The relationship of such research to the double-entry accounting paradigm is also less clear than it was for the research of the 1960s.

Kuhn goes on to say that "research during crisis very much resembles research during the pre-paradigm period" [p. 84]. Earlier in Structure he had described research during the pre-paradigm period as follows:

all of the facts that could possibly pertain to the development of a given science are likely to seem equally relevant. As a result, early fact-gathering is usually restricted to the wealth of data that lie ready to hand. The resulting pool of facts contains those accessible to casual observation and experiment together with some of the more esoteric data retrievable from established crafts [p. 15].

Contemporary accounting research bears some resemblance to pre-paradigm research as described here. It uses readily accessible data, such as that obtained from published financial statements, security prices, surveys, and experiments. All such data seem equally relevant, because there is no scientifically accepted accounting paradigm that identifies certain kinds of data as most relevant.

Kuhn elaborates on the work of a scientist during a disciplinary crisis:

He will, in the first place, often seem a man searching at random, trying experiments just to see what will happen, looking for an effect whose nature he cannot
quite guess. Simultaneously, since no experiment can be conceived without some sort of theory, the scientist in crisis will constantly try to generate speculative theories . . . [1970a, p. 87].

If one examines empirical accounting research studies published within the past 20 years, one often observes a discussion of "theory development" that provides a rationale and a framework for the empirical work. An American Accounting Association publication on research methods includes theory development as one of eight steps that should be performed in empirical work on an accounting research problem [Abdelkhalik and Ajinkya, 1979, p. 10]. Thus there is a resemblance between contemporary accounting research and Kuhn's description of research during crisis.

One other effect of crisis, according to Kuhn, is that "some men have undoubtedly been driven to desert science because of their inability to tolerate crisis" [1970a, pp. 78-79]. This comment gives rise to an important insight concerning the nature and depth of the accounting discipline's current crisis. Contemporary academic accountants have not deserted science, but they have in a fundamental sense deserted accounting. The majority of the research in today's leading academic accounting journals applies the research paradigms of economics and psychology within the institutional setting of accounting. Accounting scholars have committed themselves to science, but having come to realize that accounting has no scientifically valid paradigm to provide a basis for scientific research, have chosen to practice other sciences that do have such paradigms.

This assertion is supported by a comparative analysis of the papers published in the 1988 and 1960 volumes of The Accounting Review. Of the 19 research papers appearing in the "Main Articles" section of the 1988 volume, none could be classified as based primarily upon an accounting research paradigm, as compared to twelve that applied an economics paradigm, and three that applied a psychology paradigm. A comparable analysis of the 1960 volume of The Accounting Review identified

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For purposes of this analysis, a paper was classified within an accounting research paradigm if it purported to contribute to a theory explaining the economic performance of business entities. A paper was classified within an economic research paradigm if it purported to contribute to a theory explaining the behavior of market participants subject to resource constraints. A paper was classified within a psychology research paradigm if it purported to contribute to a theory explaining the behavior of individuals in terms of their personal characteristics and environmental influences.
34 of 40 major articles as associated with an accounting research paradigm.\footnote{Vasarhelyi, Bao and Berk [1988] present results of a similar, but more comprehensive, trend analysis. They report a significant decrease in published articles dealing with an accounting theory "school of thought" over the period 1963-1984, but a significant increase in published articles using accounting as a "foundation discipline." Because they do not explain their classification criteria, it is difficult to interpret their results with respect to the issue addressed here.}

Thus, many contemporary accounting scholars appear to believe that scientific accounting research involves the application of scientific research paradigms from related fields to the study of accounting practices and institutions. The epitome of this approach to accounting research is seen in the statement by Watts and Zimmerman that "The objective of accounting theory is to explain and predict accounting practice" [1986, p. 2]. Years ago, Sterling referred to such an approach as the "anthropological theory of accounting" and properly criticized it as "not a theory about accounting or a theory about the things to be accounted for; instead it is a theory about accountants" [1970a, p. 449].\footnote{More recently, Christenson [1983, pp. 3-6] makes precisely the same criticism of Watts and Zimmerman and other positive accounting theorists.} Watts and Zimmerman's positive accounting theory utilizes the paradigm of neoclassical economics, rather than an accounting paradigm. Positive accounting research has certainly yielded some interesting, and perhaps important, insights regarding the behavior of practicing accountants, but it tells us little about the behavior of the phenomena that accounting has traditionally been concerned with: the economic performance of business enterprises.

This interpretation is helpful in explaining why accounting's crisis does not resemble certain key features of Kuhn's disciplinary crises. For example, Kuhn describes the crisis period as "a period of pronounced professional insecurity" [1970a, pp. 67-68]. This description may have been applicable to the accounting discipline in the late 1960s and early 1970s when many leading accounting scholars were committed to the search for accounting principles but were also unsure of its ultimate success. However, it does not seem equally applicable today. The reason is that the majority of contemporary accounting scholars have acknowledged that accounting is inherently unscientific, have chosen to practice other sciences instead, and have experienced some success. Accounting scholars have shed their insecurity along with their discipline; they have found...
security by practicing normal science within the more highly
developed paradigms offered by other disciplines related to
accounting.

Similarly, Kuhn argues that a scientist in crisis "will push
the rules of normal science harder than ever to see . . . just
where and how far they can be made to work" [1970a, p. 87].
Recall that what formerly passed for normal science in ac-
counting was the manipulation of the double-entry model to fit
new kinds of transactions or conditions. Again, Kuhn's descrip-
tion may fit what many accounting scholars were doing until
approximately 1970, and it may also describe what the FASB is
doing today, but it certainly does not describe what the
majority of today's leading accounting scholars are doing. For
the most part, today's accounting scholars have gone beyond the
point of attempting to solve accounting's problems within the
framework of the double-entry accounting paradigm.

In summary, the second stage of accounting's crisis has two
key features. First, most leading accounting scholars have em-
braced a scientific approach to research. Second, this has led
many of them away from studying the phenomena of traditional
concern to accounting (e.g., the economic performance of busi-
ness enterprises), in favor of research within the normal science
paradigms of disciplines related to accounting. Thus the disci-
pline's leading scholars no longer display a paramount interest
in the fundamental issues that distinguish accounting from
other fields. This suggests that accounting's present crisis is not
only severe, but possibly fatal to accounting as a viable branch
of knowledge.

THE LESSONS OF HISTORY:
HOW CAN ACCOUNTING RESOLVE ITS CRISIS?

Kuhn offers some insightful observations concerning how
the crises in scientific disciplines are resolved. This section
offers some reasoned speculation concerning how the lessons of
Kuhn's history of science may provide insight to the possible
future evolution of the accounting discipline.

It could be argued that even the FASB has deserted the traditional
accounting paradigm, in that more and more accounting issues are resolved by
recommending additional disclosures (as recommended by Beaver [1973])
rather than by imposing one of many alternative methods of reporting a
transaction within the conventional financial statement framework.
Kuhn asserts that,

all crises close in one of three ways. Sometimes normal science ultimately proves able to handle the crisis-provoking problem despite the despair of those who have seen it as the end of an existing paradigm. On other occasions the problem resists even apparently radical new approaches. Then scientists may conclude that no solution will be forthcoming in the present state of their field. The problem is labelled and set aside for a future generation with more developed tools. Or . . . a crisis may end with the emergence of a new candidate for paradigm and with the ensuing battle over its acceptance [1970a, p. 84].

Each of these three possible ways of resolving accounting's crisis is now briefly examined.

First, is it possible for accounting to resolve its problems within the framework of its existing normal science paradigm, the double-entry model? One possibility is to reform the accounting standard-setting process to provide greater participation by management, and to permit greater flexibility in accounting method choice. This has been proposed by Flegm [1984], whose explanation of how regulation triggered accounting's current problems is similar to the analysis presented in this paper. This is a reactionary solution that would attempt to solve the crisis by restoring the conditions that existed prior to it. There is no reason to expect that any such "reform" of accounting standard-setting is likely.

Another possibility is to adapt scientific methodology to the double-entry model. Specific proposals for doing this have been put forth by Mattessich [1964] and Sterling [1979]. Mattessich suggests that accounting should be a management science, and presents a set of eighteen basic assumptions which he asserts are "rigorous enough to form the key to a general theory of accounting" [p. 426]. Sterling suggests that a science of accounting must "adopt the objective of reporting figures that represent empirical phenomena" [p. 213], and recommends accounting for exit values as a means of accomplishing this.

A third possibility is for accountants to focus their attention on the design of accounting systems to serve management. Such an approach has been suggested by Johnson and Kaplan, who argue that management accounting systems have been subverted by attempting to extract information for management planning and control from the financial accounting system that is designed to satisfy external reporting and auditing require-
ments [1987, p. 261]. This approach is promising because it offers accountants an opportunity to develop useful accounting methods without concern for the political constraints imposed by the standard-setting process. Taken to its extreme, this approach would view financial accounting standards in much the same way that tax accounting rules are now viewed — as important for a narrowly defined purpose, but as essentially unrelated to accounting’s central role of providing useful information to management.

A fourth possibility is to implement the “data-base approach to corporate financial reporting” proposed by Beaver and Rappaport [1984, p. 16]. Under this approach, public corporations would record the data needed to prepare conventional financial statements and other analyses in a data base accessible to external users, who could then employ their own individual methods of valuation, aggregation, etc., in order to evaluate the corporation’s activities. By vastly expanding the empirical data set available to public examination, this approach would make it possible to address many fundamental accounting issues on a scientific basis. This approach therefore has much promise as an avenue for accounting to emerge from its present crisis, though its implementation may not be politically feasible.

A second matter in which a crisis may end, according to Kuhn, is for the problem to be set aside for future generations. In the previous section of this paper, it was argued that accounting’s crisis is not only severe, but possibly fatal to accounting as a viable branch of knowledge. Therefore, this would not seem to be a satisfactory way to deal with the crisis.

Finally, Kuhn says that a crisis may end with the emergence of a new candidate for paradigm. Recent accounting literature furnishes two possible candidates to replace the double-entry accounting paradigm. One is Ijiri’s [1982] triple-entry bookkeeping. However, Ijiri frequently refers to his proposal as an extension of double-entry bookkeeping, and so it probably lacks the essential features of a competing paradigm.

Another possible candidate is matrix accounting, as suggested by Mattessich [1957], Corcoran [1964] and Koshimura [1988]. This approach proposes to alter much of the traditional double-entry processing methodology. However, it retains the

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13 The theoretical basis for this proposal was provided by Sorter [1969]. The possible consequences of such an approach have recently been examined by Cushing [1989].
fundamental logic of the double-entry accounting paradigm, including the treatment of transactions as the phenomenon of primary interest, the equality of debits and credits, and the use of the balance sheet and income statement equations as an underlying framework for analysis of the economic performance of business entities. Thus it is also properly viewed as an extension of double entry, rather than as a competing paradigm.

If the double-entry bookkeeping system is the basis of accounting's current paradigm, then presumably a new paradigm would not be based on double entry. But is it possible to conceive of accounting without the double-entry bookkeeping system? Double-entry ledgers certainly provide a suitable method for keeping track of cash, receivables, payables, and other similar items, and it is likely that they will continue to be used to account for such items. But is double entry the only way to address accounting's more general problem of making sense out of the economic performance of individuals or groups responsible for the utilization of economic resources?

Double entry may have been well-suited to the bookkeeping problems of 16th century merchants, but is it equally well-suited to the accounting problems of large, complex corporate enterprises in the 20th century? Do the concepts of net worth and net income that are the focus of contemporary application of the double-entry accounting paradigm have any meaning for large, complex corporate enterprises? Or do they more nearly resemble what Kuhn [1970a, p. 104] refers to as the "occult qualities" often associated with dying paradigms? The latter view is consistent with the conclusions of Beaver and Demski, who suggest that the case for the accrual concept of income is "problematical" [1979, p. 45]. Does the logic of the double-entry model reflect a general scientific truth underlying business operations, as suggested by Mattessich [1984, p. 408], or does it more nearly resemble the "metaphysical speculation" that Kuhn [1970a, p. 103] also associates with dying paradigms?

It is helpful in answering these questions to note that the double-entry model is not essential to the proposals of Johnson and Kaplan [1987] or those of Beaver and Rappaport [1984]. Both of these proposals imply that the data most relevant to managers or external users will be processed in whatever way makes the most sense to those users. The relevant data may be obtained in transactions and other economic events, but transactions would not necessarily be the dominant source of data. Furthermore, the method of processing these data could employ scientifically valid methods of explaining and predicting
phenomena of interest to management. Thus, either of these proposed approaches would enable accounting scholars to apply their newly embraced skills in scientific methodology to the development of a new accounting paradigm that would supersede the double-entry bookkeeping model. Accounting scholars wishing to practice as scientists would then no longer have to settle for refining the paradigms of related disciplines within an accounting context.

To pursue this idea one step further, accounting may be redefined in scientific terms as the science that attempts to explain and predict the economic performance of individuals or groups responsible for the utilization of economic resources. In the context of a public corporation, relevant performance variables would include cash flows, stock prices, dividends, bankruptcies, mergers and acquisitions. Relevant explanatory variables would encompass various features of the corporation's human, physical, and financial resources, its environmental context, and its managerial strategies and policies. The science of accounting would employ the tools of scientific research methodology, including logic, mathematics, controlled observation, and statistical inference. A primary criterion for judging the relevance of research variables to the science of accounting would be whether or not they represent real and empirically verifiable phenomena. Because traditional accounting constructs such as net income or net worth do not meet this test, the double-entry bookkeeping model could not be the central focus of this accounting science.

Is this definition of accounting consistent with accounting's traditional objective of providing useful information to management? Is it consistent with accounting's contemporary objective of providing useful information to investors and creditors for such purposes as predicting cash flows and evaluating management stewardship and performance? Of course! Surely a science that could offer accurate explanations and predictions of the performance of managers and corporate organizations would be of great relevance to accounting's traditional and contemporary objectives.

Kuhn offers the following insight to the transition from old to new paradigm:

the reception of a new paradigm often necessitates a redefinition of the corresponding science. Some old problems may be relegated to another science or declared entirely "unscientific." Others that were previously non-existent or trivial may, with a new
paradigm, become the very archetypes of significant scientific achievement [1970a, p. 103].

If the double-entry paradigm were to be displaced by a new science of accounting, the traditional accounting problems of recognition, allocation, classification, valuation, etc., would be recognized as unscientific and would fade in importance. Research using traditional accounting variables such as net income, net worth, depreciation, goodwill, and allocated costs would no longer be accepted as scientifically valid, because these variables do not correspond to any real, empirically verifiable phenomena. Instead, a new constellation of accounting variables would be defined, perhaps encompassing some of the variables now incorporated into the double-entry model, but also going beyond double-entry to include such factors as organization structure, reward systems, leadership styles, competitive strategies, corporate cultures, and related variables that may contribute to explaining the economic performance of individuals or groups responsible for the utilization of economic resources.

Describing the 19th century revolution in chemistry, Kuhn identifies one of the primary effects of a scientific revolution as follows: "The data themselves had changed. That is the last of the senses in which we may want to say that after a revolution scientists work in a different world" [1970a, p. 135]. This suggests that an accounting revolution in which the dominance of the double-entry paradigm is overthrown is not only possible, but is also consistent with the pattern of evolution of other scientific disciplines documented by Kuhn.

SUMMARY AND CONCLUSIONS

Careful study of The Structure of Scientific Revolutions to identify the essence of Thomas Kuhn's concept of a discipline's paradigm leads to the conclusion that the accounting concept which most closely resembles a paradigm is the double-entry bookkeeping model. By exploring the implications of this insight, the following conclusions are obtained.

First, a brief examination of accounting's history indicates that the double-entry model has been remarkably resilient. It has proven capable of assimilating major changes in economic conditions and patterns of commercial activity over a period of four centuries. In the absence of the government intervention into accounting standard setting that has characterized the 20th century, the double-entry model may well have been capable of
assimilating current and future developments for an indefinite period.

Second, the advent of accounting standard-setting radically transformed the nature of accounting, and precipitated a crisis in the accounting discipline. Accounting's initial response to this crisis was the "search for accounting principles." This was followed closely by a growing commitment to empirical science on the part of leading accounting scholars. The failure of the search for accounting principles led to a more severe crisis that presently holds sway. This crisis is characterized by four fundamental problems that cannot be resolved in a scientifically acceptable manner within the context of the double-entry accounting paradigm. These are that (1) accounting is inherently arbitrary [Thomas, 1969, 1974], (2) accounting has been politicized [Solomons, 1978; Zeff, 1978], (3) rational selection of normative accounting standards is impossible [Demski, 1973, 1974], and (4) the role of accounting scholars has been to supply "excuses" to competing groups seeking to influence accounting standards to further their own interests [Watts and Zimmerman, 1979]. The most devastating effect of these conditions has been that many of today's leading accounting scholars no longer display an interest in addressing the fundamental issues of accounting, but have instead gravitated toward the more scientifically satisfying study of paradigms in other disciplines that are related to accounting.

Third, there exist some promising avenues by which accounting's present crisis could be resolved. Many of these are already being explored. But perhaps the most intriguing possibility is the occurrence of a revolution in which the double-entry bookkeeping model would be discarded as the central feature of accounting's paradigm, and accounting would be redefined as a true scientific discipline.

Fourth, it is concluded that Kuhn's *Structure of Scientific Revolutions* is profoundly relevant to accounting, indispensable in helping us to understand the history of the accounting discipline and to comprehend how it might evolve in the future.

REFERENCES


