Introduction

A story is told of the poet William Blake's friend, who overheard someone remark that Blake was cracked. The friend's memorable response was, "Yes, but it is the sort of crack that lets in the light!" In this volume, we look at how the younger leading practitioners of the various branches of economics are examining the new directions of the economics discipline in the face of modern economic challenges. This collection of articles represents invention and discovery in the areas of information, trade, development, finance, business, law, gaming, and government as these areas of study evolve through the different phases of the scientific process. Because the authors are presenting new theories that conceptualize reality and values in different ways from their predecessors,[1] some essential background material on methodology will be discussed first.

Thomas Kuhn's description of the scientific process – as modified by Latsis (1976), Lakatos (1977), Laudan (1977), and others – seems to capture the dynamics of change in knowledge represented in this volume. Whereas Kuhn used the term "paradigm shift" to characterize change in the practice of "normal science," Lakatos used the term "problem shift." These two classifications also are empirically based in that they ask substantive questions about objects in the domains of their disciplines

[1] The authors exhibit here their natural ability to be original. Moving a discipline into new directions is equivalent to breaking the rules, which requires the innate ability to transform the subject matter. An anecdote from the world of music illuminates the point. Anton Halm, a minor composer, asked Beethoven for his opinion of the piece Halm had composed. Beethoven responded that the piece contained "errors." Halm then protested that Beethoven, too, disregarded rules. Beethoven's classic retort to Halm was: "I may do it, but not you." Beethoven's new paradigm resulted in the Ninth Choral Symphony.

(Laudan 1977, 15, 77), the concern being fitting theory to facts (Bechtel 1988, 53; De Marchi and Blaug 1991, 2). Another concern of both classifications is how practitioners solve problems. Kuhn's notion of a "puzzle-solving" solution is stated unambiguously, whereas Lakatos's desire for "proof" in problem-solving led him to a conversion experience (De Marchi and Blaug 1991, 11). Both views are somewhat alike in their treatment of anomalies. For Kuhn, normal science deals with questions as they come up. Particular articulations of a paradigm or a new direction "may well be criticized, falsified and abandoned; but the paradigm itself is unchanged. It remains so until enough 'anomalies' accumulate" (Laudan 1977, 73). For Lakatos, creative research can defend a paradigm from anomalies (Mayo 1996, 275); therefore, anomalies should not be a distractor (De Marchi and Blaug 1991, 5). However, Kuhn and Lakatos part company, particularly in their treatment of rationality. Although Kuhn relies mostly on "taste or persuasion" as the criteria for evaluating acceptance of new directions (Bechtel 1988, 57),[2] Lakatos sees changes through Popper's rational spectacle (Mayo 1996, 274).

According to Quine, "The falsity of the observation categorical does not conclusively refute the hypothesis. What it refutes is the conjunction of sentences that was needed to imply the observations. In order to retract that conjunction we do not have to retract the hypothesis in question; we could retract some other sentence of the conjunction instead" (Quine 1990, 13–14). This method is now called the Duhem-Quine's (DQ) "holistic" hypothesis. It imparts the lesson that one cannot appraise a single hypothesis, but only a joint distribution of hypotheses. For the economist, such a bundle of hypotheses contains familiar terms, such as core elements, auxiliary theories, *ceteris paribus* and other assumptions, definitions, statistical specifications, measurements, lag structures, identifications, error terms, and boundary conditions. This bundling of

[2] The same phenomenon can be observed in the literature. Morris Dickstein demonstrates how in the post–World War II period, once marginalized writers – writers who were Jewish, black, Southern, or homosexual (e.g., Norman Mailer, Philip Roth, Saul Bellow, Joseph Heller, Bernard Malamud, J. D. Salinger, Ralph Ellison, James Baldwin, Jack Kerouac, Truman Capote, and John Barth) – would gradually "be integrated" into the once-decorated rites of American literature and ultimately "would become American literature and viewed as literary icons." See his *Leopards in the Temple: The Transformation of American Fiction: 1945–1970* (Cambridge, MA: Harvard University Press, 2002). The title of the book is taken from the once outsider-author Franz Kafka's parable: "Leopards break into the temple and drink to the dregs what is in the sacrificial pitchers; this is repeated over and over again. Finally, it can be calculated in advance and it becomes part of the ceremony."

hypotheses makes it difficult to reject a movement toward new directions. For example, it is easy to change one of the "umpteen" assumptions and save the bundle from being rejected. This way any statement can remain true by making sufficient accommodation in the bundle of hypotheses. Kuhn and Quine, therefore, stand on the same ground in rejecting the analytic–synthetic concepts that is the justification of *a priori* concepts through empirical observations as a guide to new changes. For Kuhn, there is no neutral language to compare old and new directions (Bechtel 1988, 56), and therefore he relied on the art of persuasion to win people over in accepting a particular new direction.

Kuhn (1970) was keen in pointing out similarities between his and Popper's view. Among his comparisons, Kuhn finds that their observations were both theory-laden. But although they are in agreement that scientific knowledge grows through its accumulation, they disagree over the type of revolution that might take place. For Popper, science "grows by a more revolutionary method rather than accumulation – by a method which destroys, changes, and alters the whole thing" (Popper 1962, 129). Popper has taken a rather broad-based approach to scientific revolution that not only involves falsification, but also notions of excess content, verisimilitude, objective knowledge, discovery via evolution, and situational determinism (De Marchi and Blaug 1991, 2). We will revisit situational determinism through the works of Latsis (1972, 1976).

ANALYTIC AND SYNTHETIC ASPECTS OF NEW DIRECTIONS

Broadly speaking, Kuhn describes how traditional theories emerge from a pseudo to a normal scientific state. In the process, problems that have the potential to evolve into crisis points make their appearances. Over time, during crisis points, more and more skillful students who are members of an "invisible college" attempt to solve those problems. The likely scenario is that the practitioners have never met, but they know about each other's problem–solution through common sources such as books and journals in which they publish their findings. As a rule, they agree more than disagree about their commitment to a paradigm, and because a paradigm does put many theoretical problems to rest, it is hard to give it up even at sword's point. But anomalies can be tolerated only for a time, until a normal science prevails again in the form of a new direction or a new paradigm. The resolution may represent a paradigm shift, where an old paradigm may just drop dead, or, as Max Planck put it, "It is not that old theories are disproved, it is just that their supporters die out"

(Mohr 1977, 136). Paul A. Samuelson (1999, XI) rephrased it so vividly: "Science advances funeral by funeral." In this volume, we find examples of budding paradigms that usurped older ones, as well as examples of paradigms that represent only a partial break with their predecessors.

Following Thomas Kuhn, a paradigm represents a universally recognized achievement that would answer questions by way of new models, tools, standards, and methods. One problem with this concept is that it represents more than a particular theory or model, but economists have been accustomed to deal with those ambiguities. Much as the "invisible hand" concept in economics clears the market but cannot be precisely defined, the paradigm concept explains the scientific process but also cannot be precisely defined. Because of a lack of certain specific items in our vocabulary, Kuhn offers twenty-one definitions to characterize the concept (Masterman 1970). Therefore, we would like to focus more on how a paradigm explains new directions in economics.

A new direction in economics may start off with a very basic, fuzzy concept that holds out some potential for solving problems in a discipline. We are reminded of how the portfolio theory started. When Harry Markowitz first presented the theory as his dissertation in economics, Milton Friedman, a member of his defense committee, remarked that there is no room for portfolio theory in economics, whereupon Markowitz asserted that it did not have a role in the past, but is now part of economics (Varian 1993, 162). Similarly, in the hands of Hume, Fisher, Marshall, and Keynes, the quantity theory of money suffered a long gestation period, but it was not until it was revised by Tobin and Baumol and restated by Friedman that it explained facts well and became a universally accepted pillar of the monetarist paradigm.

Economists are interested in new directions in their discipline because there is something for practitioners to learn, even from their rudimentary phase. They are given a set of instructions on how to extend and articulate the concepts that enables their research with the promise that it will potentially solve their problems. For instance, "The study of exemplars enables one to acquire the ability to apply symbolic generalizations to nature" (Suppes 1977, 486). If someone were to look at a group of swans and describe or point ostensibly to a swan, that individual would tend to observe such common features as whiteness and length and curvature of the neck. Exemplars tell us how to apply symbolic generalizations to natural phenomena and single out which law or symbolic generalization is applicable. We not only apply them to nature, but such generalizations, when manipulated, can also lead to newer techniques or new discoveries. Also, we can have opportunities and occasions to use auxiliary generalizations; as Kuhn (1970, 274) observes,

> similarity–dissimilarity relationships are ones that we all deploy every day, unproblematically, yet without being able to name the characteristics by which we make the identifications and discriminations. They are prior . . . to a list of criteria which, joined in a symbolic generalization, would enable us to define our terms. Rather they are parts of a language-conditioned or language-correlated way of seeing the world. Until we have acquired them, we do not see the world at all.

Kuhn further explains, starting from a law-sketch (Newton's Second Law of Motion: $f = ma$), that we manipulate the model into one form for freely falling bodies, another for the pendulum, and yet another for coupled harmonic oscillators. We learn how to use words, as well as what entities are in the world and how these entities behave. During the learning process, we acquire the ability to reason from words like "duck" to "there is a duck swimming." Only one step remains in the application of law-sketches like Newton's law of nature; namely, to figure out how to pair mass with force and acceleration (Suppes 1977, 503–4).

For Kuhn, we make progress when we can explain observations using a theory. With theory, scientists fit models to nature or explain facts. Quine (1990, 7) maintains that our research is theory-laden; even a simple observation of a sentence with the word "water" has the theory H_2O behind it. In addition to theory, we need to keep one eye on beliefs and the other on rationality. When a problem cannot be solved, a crisis period develops. Scientists use their imagination to come up with new theories, new paradigms to resolve the crisis. Many new competing schools may develop, each trying to make its paradigm dominant. They may do so by converting many practitioners to their paradigm, which gives it social dominance, much like a state developing power through hegemony. This is a new ingredient in the scientific process. The new direction – the process of a paradigm change – does not rely on logic, reason, or axioms, making several things hard to accept. We would like to know whether the theoretical and empirical values of the new path carry any of the "genes," so to speak, of the older path. In spiritual and religious undertakings in which beliefs are central, we are told not to compare things, not to covet. Yet, Kuhn's position is that two paths cannot be compared even if we wish to do so. The paths may be "incommensurable" because no neutral language is available to enable such comparison. The observation may be reported in different ways, or the same word as used in different paths may have different meanings.

The movement toward new directions is central to this volume and therefore deserves to be illustrated. First, Kuhn points to the theory of combustion to illustrate the discontinuity between paths, where, for example, the oxygen paradigm took over the phlogiston theory. In the case of Einstein's theory of relativity, Newton's laws dominated. Although the latter were subsumed within the new view, the lives of scientists who studied classical mechanics became overturned. This is tantamount to a revolution taking place. Oftentimes, in order to converge to a universal agreement regarding a scientific revolution, we may be required to grasp concepts that lie not only beyond our senses, but also beyond reason itself. Kuhn views the scientist's decision to persuade or convert others to follow the scientist's point of view as integral in accepting a new direction (with social and belief baggage). To emphasize the latter, Kuhn offers a new and more encompassing term: namely, "disciplinary matrix" – "disciplinary" because the practitioners share common beliefs in a discipline and "matrix" because it is composed of ordered elements of various sorts, each requiring further specification (Kuhn, in Suppes, 463).

Also, we would like to know whether or not one or several new directions would dominate in a normal scientific environment and when the actual dominant process is affected. Kuhn originally advocated the naive falsification process in which one path is replaced with another just when it is confronted with a wrong prediction. However, his thoughts for the replacement of a path with "disciplinary matrix" changed things quite a bit. In the latter view he redescribed "theoretical change in science as comprising an unending sequence of smaller revolutions or 'micro-revolutions'" (Toulmin 1972, 114).

FROM KUHN TO LAKATOS: "PARADIGM SHIFT" VS. "PROBLEM SHIFT"

Lakatos emphasized that scientists are "thick-skinned" people, in that they do not give up their cherished beliefs in any immediate fashion. Rather, they stay with their degenerating theories in the hope of turning them around from a scientific point of view. Marxism comes to mind as a good example, as does Keynesian economics. For Lakatos, we will be armed not with a single path but with a series of paths. Lakatos preferred to use the term Methodology of Scientific Research Programme (MSRP) to evaluate the state of scientific knowledge. He considers the research states to be either "degenerating" or "progressive." In economics, beta risk coefficients, marginal propensity to consume, and elasticity coefficients – or what Ward calls the normal scientific activity of refining constants (1972, 10) – are continually being evaluated and appraised, yet no one will question the scientific practice of trying to refine constants.

While Lakatos's view of a research program has a home in the economic literature, we need to spell out what counts as progress and the different implications progress has for our volume. If scientists are willing to change ideas only in a "protective belt" without a willingness to change or replace elements of the cherished or blind beliefs that form the "hard core" of their research program, then progress can occur only in the protective belt, where promising new theories and empirical applications are accommodated. The "hard core" remains intact, particularly when we have a promising new program. Lakatos made it clear that we cannot test the "hard core." We must invent "auxiliary hypotheses" to form a "protective belt" around the hard core for the purpose of testing. In the process, we will "call a problem shift progressive if it is both theoretically and empirically progressive, and degenerating if it is not. We 'accept' problem shifts as 'scientific' only if they are at least theoretically progressive; if they are not, we 'reject' them as 'pseudoscientific' " (Lakatos 1970, 118).

Because we may witness swings between progressive and degenerative states of a research program in the "protective belt," an observed state of the program cannot be considered final enough to warrant the giving up of an acceptable path. On the contrary, a "budding" research program may require protection for a time. This version of sophisticated falsification replaces the naive one originally proposed by Kuhn that supports the rejection of a theory because it has failed to predict for the first time. For instance, the Keynesian model was not falsified when it failed to predict double-digit inflation in the 1970s. Rather, expectation elements in the protective belt were postulated. Macro textbooks now carry aggregate demand, which has displaced the IS and LM curves, along with aggregate supply curves. When IS and LM are now used, they have different meanings. In the introductory book by Taylor (2001), for instance, IS and LM demonstrate interest rate policies.

Latsis showed how to appraise economic theory through Lakatos's MSRP, by an appeal to Popper's "situational logic,"[3] meaning, a typical situation in which a person acts according to the aims and knowledge of

[3] "[T]he situational logic plays a very important part in social life as well as in the social sciences. It is, in fact, the method of economic analysis" (Popper 1945, 47).

the situation. He argued that basically perfect and monopolistic competition share the same "hard-core" elements, but the latter is distinguished by the use of a small modification of the situational assumptions of perfect competition (Latsis 1972, 214). Even with the new amendments to Lakatos, methodologists seem to be split about when a new direction occurs. On the one hand, Cross (1982) thinks it is helpful to explain new directions in macroeconomics. On the other hand, Hausman (1989) thinks it is still unsettled and advances a more eclectic view. We take the position in this volume that the methodology for Duhem-Quine through Popper, Lakatos, and Latsis is still useful to observe and that it explains changes in the modern branches of economics.

IMPLICATIONS OF PARADIGMS

This volume makes general and specific implications of Kuhn's and Lakatos's view of new directions for economics. Some, including Kuhn, consider the social sciences as still in their immature stage. If one were to visit Keynesian economics for the first time, one might not perceive any general agreement or harmony between the hydraulic Keynesians[4] and post-Keynesians. Yet these schools form an "invisible college" in which practitioners all over the globe share their research in a designated journal such as the *Journal of Post Keynesian Economics*. But no universal agreement about the Keynesian revolution has been reached. Therefore, we may only be at the doorstep of the first stage of the new directions of Keynesian economics. From one point of view, economics may very well be at the "data gathering" stage, comparable to the Kepler state of the physical sciences, waiting for its Newtonian characterization. From another point of view, Adam Smith might have achieved such a characterization through his principle of the maximizing individual in society (Gordon 1965).

Kuhn and Lakatos have methodological implications for the use of mathematics in economics, and some of the contributors in this volume have not hesitated in applying math. Kuhn spoke of law-sketches, Lakatos of methodology from the side of mathematics. However, if we are to look for a representative mathematical or research program in economics, all fingers point to Paul A. Samuelson, who is said to be the first to advocate

[4] Hydraulic Keynesians is a term that refers to the Keynesian system of the 1940s and 1950s. It assumes stable macroeconomic aggregates – such as expenditures, output, and income – but not prices or quantity per unit of time. The government, under this system, can make deliberate policy choices to steer the economy.

the use of mathematics to explain, predict, and explore economic phenomena (Puttaswamaiah 2002, 10).

In a description of his methodology, Samuelson wrote, "Always when I read new literary and mathematical paradigms, I seek to learn what descriptions they imply for the observable data," emphasizing his preference for inductive over deductive science (Samuelson 1993, 242). We learn early on that his use of words like "literary" could mean the use of a differential equation as well as prose (Samuelson 1966, 1771). The official Palgrave dictionary considers the "descriptive" aspect of Samuelson's methodology, and sets it apart from what Samuelson calls the "F-Twist" theory, Friedman's brand of positivism that emphasizes "instrumentalism." The distinction is that economic theories can describe data, or they can be used as instruments to predict or measure data (Eatwell et al. 1987, 455). Machlup mentions, however, that Samuelson's methodology has undergone dynamic changes over time (Samuelson 1972, 758).

Latsis' work on the microeconomic front (1972, 1976) has extended Karl Popper's view of situations and situational logic, which according to Popper forms "the method of economic analysis" (Popper 1971, v. II, 97). According to Latsis, on the one hand, economic agents act in social situations that constrain their rational choices, minimizing the role of psychological assumptions in explaining their actions. On the other hand, "behaviour is animated by the principle that rational agents act appropriately to the 'logic of the situation'" (Latsis 1972, 208–9). The term "situational determinism" has evolved to represent the neoclassical program. Profit maximization is similar to a person running out of a "single exit" available in a burning cinema. The course of action in such a straitjacket situation allows the agent to reach a unique equilibrium from objective conditions such as cost, demand, and technology (Latsis 1972, 210–11). Latsis' concern with whether to include or exclude psychological assumptions in the theory of a firm splits research into three areas: (1) "Situational Determinism," where psychological assumptions are situational minimal; (2) "Economic Behavioralism," where psychology plays a role; and (3) "Organizational Approach," which sheds light on the firm's internal structure and decision making.

A. Informational Implications

The incorporation of information into economic theories and models has taken new directions. The change has not been quite parallel to the development in the physical sciences, which has moved from a data-gathering stage up to Kepler to a model-incorporating stage with Galileo and Newton. Rather, in economics, we have witnessed price-seeking alongside price-taking markets since the time of Adam Smith. The main paradigm of price-taking is that information is self-centered, promulgating the doctrine that only the market can gather the information efficiently and not a central or social planner. This doctrine reached its climax with the work of Hayek's "The Sensory Order" (1952), where it was postulated that information resides in the brain cells of each individual, and therefore cannot be organized, except via the spontaneous order of the market mechanism.

Today, the tools of the marginal revolution are invoked to depict equilibrium within a search domain; that is, the agent will search until the marginal cost of the search equals the marginal benefit of the search. But we can discern changes in new directions implicit in that process. We list here at least four major strands of changes: (1) Adaptive agents are allowed to adapt information about their past errors into current decisions. (2) Rational agents are assumed to use rational information, conditioning their decision on a full information set. (3) Signaling agents can signal in a game-theoretic environment their expected security level with regards to cooperation or noncooperation with one another. (4) Efficiency agents are efficient decision makers. As such, this can involve paying a wage rate that is greater than the marginal product of labor.

B. Behavioral Implications

When John Watson (1913) introduced the subject, behavioral facts were limited to reflexes and conditioned reflexes obtained mostly from the study of animals, such as rats and dogs. This view of behavioralism did not draw on the fully capable mind of the economic agent in his or her study of market rules or rivals' reactions. Rabin proposes that through modern surveys and experiments, the cognitive, conative, and affective aspects of individual economic agents (consciousness, feelings, and state of mind) can be better understood. Standard neoclassical economics does not incorporate such subtle factors, which may have contributed to its decline.

Behaviorists propose that predictions that consider the conduct of economic agents will outperform those that have only structural premises.[5]

[5] Structural premises refer to traditional models such as perfect competition and monopoly. In behavioral models, such as in Cournot, Bertrand, and Nash, behavioral assumptions are assumed to reach a market solution.