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HAYEK AND BEHAVIORAL ECONOMICS

Edited by

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Hayek and Behavioral Economics

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Hayek and Behavioral Economics

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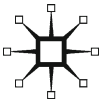

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Foreword

My connection to Hayek – and his intellectual opponents – goes at least as far back as my undergraduate days. As a senior, I took an economics course and found it very intriguing – you could actually learn something about the economic principles underlying the claims of socialism, capitalism, and other such "-isms." Curious about advanced economics, I went to the Caltech library, stumbled upon two books: Samuelson's *Foundations*, and von Mises' *Human Action*. From the former, it was clear that economics could be done like physics, but from the latter there seemed to be much in the way of reasoning that was not like physics.

I also subscribed to the *Quarterly Journal of Economics*, and one of the first issues (November, 1949) had a paper by Hollis Chenery on Engineering Production Functions. So, economics was also like engineering! I had not a hint then as to how much those first impressions would be changed in my thinking over the decades to follow. But in 1962, my book *Investment and Production* would have a chapter on engineering production functions.

After graduating in engineering I went to the University of Kansas to get an M.A. in economics as a vehicle for allowing me to decide if I wanted to continue in economics. At KU I took classes from Dick Howey: price theory, math economics, imperfect competition – but significantly, a full year course in the Development of Economic Thought. Howey was a surviving member of an endangered species, a History of Economic Thought scholar, but it was from him that I learned what scholarship really meant. To be good at whatever you did, you needed to acquire knowledge of all the supporting structure, tools, and primary sources of inspiration. If you were Howey, that meant knowing mathematics and being fluent in French, German, and Italian. As one who just barely knew English, he much impressed me. His model seemed just right and it generalized to whatever might interest you. With Dick as a mentor, I decided economics was for me, and I continued by pursuing an economics Ph.D. at Harvard beginning in 1952.

At Harvard, I had macroeconomics from Alvin Hansen – the foremost American Keynesian, but he was also very eclectic. You read everything from Foster and Catchings to Hayek, and not only Keynes, his interpreters and critics – Hicks, Samuelson, Metzler (also a student of Howey at

the University of Kansas), Friedman, et al. The Keynesian economics was tempered by the dry wit of Gottfried Haberler, the sarcasm of Wassily Leontief, Guy Orcutt's deeply serious search for the messages hidden in all data, Alexander Gershenkron who lectured on "ven Breetan vas ze voikshop of ze woild," and a coterie of graduate students trying to make sense of it all for their own careers. When Fritz Machlup visited, I wondered how the two polite Austrians – he and Haberler – would determine which one would get through a door first. Schumpeter was no longer alive, but his ghost was lurking in the halls, with Haberler countering any claims that inflation ("ze monster" to Schumpeter), if not too large, was good for the soul and spirit of the economy. In Autumn 1955, I taught Principles of Economics (at Purdue University) and found it a challenge to convey basic microeconomic theory to students. Why/how could any market approximate a competitive equilibrium? I resolved that on the first day of class the following semester, I would try running a market experiment that would give the students an opportunity to experience an actual market, and me the opportunity to observe one in which I knew – but they did not know – what were the alleged driving conditions of supply and demand in that market experiment.

But let me backtrack to 1952. Many generations of Harvard graduate students had been exposed to E. H. Chamberlin's initial graduate course in Monopolistic Competition. On the first day he would set the stage for the semester using a classroom demonstration experiment which showed that competitive price theory was an unrealistic idealization of the real world. He gave half the class buyer reservation values, and the other half seller reservation costs. The value/cost environment was like the treatment of market determination in Bohm-Bawerk's (*Positive Theory of Capital*, 1891, Online Library of Liberty, book III, 203–213) representation of supply and demand in a horse market with multiple buyers and sellers in two-sided competition – perhaps Chamberlin's source of inspiration. I knew Bohm-Bawerk because of Dick Howey's course, but I did not pick up on this similarity until much later. Chamberlin, unlike Bohm-Bawerk's description, had the buyers and sellers circulate, form pairs, and bargain over a bilateral trade; if successful the price was posted on the blackboard; if not successful, each would seek a new trading partner. This continued until the market was closed. The prices in sequence were volatile and failed to support the equilibrium prediction. Chamberlin used this first-day exercise to set the stage for his theory of monopolistic competition. I decided to use the same value/cost setup but changed the institution. Secondly, I decided to repeat the experiment for several trading periods to allow the traders to obtain experience

and to adapt over time, as in Marshall's conception of the dynamics of competition. At Kansas I had been thoroughly versed in Marshall by John Ise who owned all eight editions of *Principles:* the eighth, that he brought to class, was like a huge stack of loose sheets – the binding had been obliterated by use! I had been particularly impressed by Marshall's treatment of price determination in a local corn market (Marshall, *Principles of Economics*, 332–336) where "the price may be tossed hither and thither like a shuttlecock" but will settle pretty close to the (clearing price) by the end of the market.

For the institution, I reasoned that if you were going to show that the competitive model did not work, then you should choose a more competitive trading procedure, so that when the competitive model failed to predict the outcomes you would have a stronger case than had been made by Chamberlin. I went to the Purdue Library and found a book by George Leffler, *The Stock Market* (1951), giving details on the bid/ask double auction used in the stock and commodity exchanges. In January 1956 I carried out my plan. To my amazement the experimental market converged "quickly" to near the predicted equilibrium price and exchange volume, although there were "only" 22 buyers and sellers, none of whom had any information on supply and demand except their own private cost or value. I thought perhaps that it was an accident of symmetry in the buyer and seller surpluses. I shot that idea down with an experiment later using a design in which the seller surplus was much greater than that of the buyers. Thus, I seemed to have stumbled upon an engine for testing ideas inside and outside traditional economic theory.

No one understood the exchange process better then Frederick Hayek, when he said, and here I quote one of my favorites: "*Nobody can communicate to another all that he knows because much of the information he can make use of, he himself will illicit only in the process of making plans for action. As he will not merely make use of given knowledge he discovers what he needs to know in order to make appropriate actions*." This is precisely what the participants in an experimental market implement so naturally and effectively.

The editors of this volume have produced a book that is a continuation and extension of some of these themes. These chapters represent a fascinating in-depth treatment of the unexpected confluence of two recent developments: how Hayek and experimental economics inform each other on the nature of human behavior and the creation of institutions for human betterment.

Vernon L. Smith
Nobel Laureate in Economics

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Introduction

Friedrich Hayek's archival material both informs and restricts our understanding of the seminal contributions of this remarkable polymath. As a young man Hayek produced (in German) a draft of what 30 years later became *The Sensory Order: An Inquiry into the Foundations of Theoretical Psychology* (1952). His contributions to economics were informed by these early interests: indeed, according to Kurt Leube (2003, 14, n5) Hayek explained in a letter to a Swedish neurologist that it was the political atmosphere in Europe after WWI that motivated him to study the social sciences.

Yet scholars are restricted: some apparently pivotal material is yet to be delivered to the Hayek archives. For example, Leube's (2003, 12, n1) insights are apparently informed by numerous tapes "in my possession" of "conversations and interviews with Hayek I, Salzburg, 1971–77." Remarkable conclusions have been drawn: for example, Ludwig Mises and the young Hayek initially favored *Anschluss* with Germany (Leube 2003, 13).

Archival material needs to be embedded in an appropriate context. The Austrian School of Economics emerged (or evolved) from the Classical School of Economics with one strand of the (simultaneous) discovery of the principle of marginal utility associated with the publication of Carl Menger's *Principles of Economics* (1871). Simultaneously, Austrians were excluded from the Second Reich (1871–1918) which emerged from Prussian victories against Austria (1866) and France (1870–1871).

Prussia was predominantly Protestant; the ruling House of Hohenzollern favored the "Lesser Germany" solution to the "German question." Austria was predominantly Catholic; the ruling House of Hapsburg favored the "Greater Germany" solution – in which they were included. There were other complications: the Hapsburg territory included non-Germans (such as Czechs, Magyars, Romanians and Croats).

The Austrian School was born amid these inter-German tensions. Menger's (1883) *Investigations into the Method of the Social Sciences with Special Reference to Economics* attacked the methods of the German Historical School; Gustav Schmoller's unfavorable review initiated the *Methodenstreit* (the battle over method). Schmoller's term "Austrian school" was apparently designed as a slur – reflecting the new excluded status of "backward" Austria compared to "modern" Prussia.

The Nobel Prize for Economic Sciences both reflects and shapes the professional agenda. The Austrian branch of the Neoclassical School (unlike other branches) tends to stress limited knowledge and limited computational ability. Four Nobel Prizes are especially relevant to the both the topics of limited knowledge and limited computational abilities, and to the chapters in this volume: Hayek (1974), Herbert Simon (1978) plus Vernon Smith and Daniel Kahneman (2002).

Simon's Prize was awarded for his "pioneering research into the decision-making process within economic organizations." In his Nobel lecture Simon emphasized that economists were moving into domains "that were thought traditionally to belong to the disciplines of political science, sociology, and psychology." Smith's Prize was awarded for "having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms"; Kahneman's "for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty."

The chapters that follow are inspired – and informed – by Hayek's contributions to what may become a new paradigm in economics: behavioral economics. Our understanding of the associated interrelationships will presumably become clearer when the "missing" Hayek archives become available for scholarly inspection.

Roger Frantz (Chapter 1) provides an historical context to the chapters that follow by examining the similarities between the use of concepts such as rationality and methodology in Hayek and "first generation" behavioral economists (Simon, George Katona, Harvey Leibenstein, Richard Nelson and Sidney Winter). Also examined are the similarities between Hayek and Vernon Smith (although Smith should be classified as both a first generation and "new" behavioral economist).

Deirdre Nansen McCloskey (Chapter 2) examines the similarities and complementarities between Israel Kirzner and Hayek (for example, Kirzner's concept of alertness and Hayek's concept of non-routine knowledge). According to Hayek, an economist who is only an economist can never be a good economist: McCloskey is not only an economist but also an authority in History, English, and Communication. McCloskey reflects on her own journey from her initial rejection of Kirzner and Hayek to her eventual acceptance and appreciation of both.

Walter E. Block (Chapter 3) argues that categorization is the first basic element of science; if we cannot classify, we cannot even have the beginning of science. It is, therefore, important to classify the views of economists and their philosophies. In some ways Hayek was an Austrian

economist, in other ways, he was not. But Hayek was not a praxeologist. Block expresses this notion in part as a fantasy or made-up conversation between Block and an "eminent Austrian economist."

Peter Boettke, W. Zachary Caceres, and Adam Martin (Chapter 4) argue that behavioral economics scrutinizes the limitations of individual cognitive abilities. Hayek likewise famously questioned the cognitive abilities of real world actors; for Hayek, market institutions rather than individual agents bear the primary cognitive burden in coordinating economic activity. Vernon Smith's distinction between ecological and constructivist rationality provides powerful support for the Hayekian position from which it draws its inspiration.

Herbert Gintis (Chapter 5) uses Hayek's critique of the methodological postulates of the German Historical School to undermine the methodological individualism that underpins modern economic theory – and game theory in particular. Gintis outlines an agenda through which a full Walrasian economy could incorporate this Hayekian critique.

Chiara Chelini and Sonia Riva (Chapter 6) attempt to provide a bridge between Jean Piaget's epistemological works in psychology and Hayek's psychological and philosophical theories about knowledge formation and evolution of cognitive structures. They also analyze how these issues have been integrated into cognitive economics. Hayek's role, they argue, has been widely recognized; however, the importance of *Piagetian* epistemology has not yet been fully appreciated.

Francesco Di Iorio (Chapter 7) focuses on the similarities between Hayek's *The Sensory Order* and Merleau-Ponty's *The Structure of Behaviour.* Both books share an original standpoint: they criticize the assumptions of sociological holism on the basis of the idea that the mind is both an interpretative device and a self-organized system. Hayek and Merleau-Ponty are often considered quite distant from each other. However, unlike Merleau-Ponty, Hayek explicitly acknowledges the existence of analogies between his conception of mind and that of the French author. Di Iorio argues that Hayek's concept of the "primacy of the abstract" is "very similar" to Merleau-Ponty's idea of "the primacy of perception."

Taiki Takahashi and Susumu Egashira (Chapter 8) argue that progress in the field of neuroscience is an example of "tool-driven" scientific revolutions which arise in relation to the invention of new instruments (tools) designed to investigate nature and discover new facts that challenge previous concepts. In contrast, "concept-driven" revolutions display a different driving force. The authors focus on the role that Hayek's *Sensory Order* has played in the concept-driven revolution in cognitive and behavioral neuroscience.

Leslie Marsh (Chapter 9) argues that, for Hayek and Simon, the concept of the mind is constrained in its computational capacity to detect, harvest, and assimilate "data" generated by the infinitely fine-grained and perpetually dynamic characteristic of experience in complex social environments. For Hayek, mind and sociality are co-evolved spontaneous orders, allowing little or no prospect of comprehensive explanation, trapped in a hermeneutically sealed – i.e. inescapably context-bound – eco-system. For Simon, it is the simplicity of mind that is the bottleneck, overwhelmed by the ambient complexity of the environmental. The key insight in both is that "perfect" knowledge is unnecessary, impracticable and indeed irrelevant if one understands the mechanism at work in complex sociality.

Morris Altman (Chapter 10) notes that one of Hayek's fundamental propositions is that individuals can't know everything, nor can any one individual know and plan what is in the best interest of another individual: the world is just too complex. Aspects of Hayek's analytical framework are consistent with Simon's decision-making framework: individuals do not behave as predicted or proscribed by conventional economic theory. But such non-conventional behavior is arguably the most rational or intelligent approach to decision making. However, the Hayek perspective is contrary to the more dominant approach to behavioral economics advanced by Daniel Kahneman and Amos Tversky, who argue that the non-conventional heuristics that characterize average human behavior are often biased and error-prone, yielding choice and economic inefficiencies.

Stefano Fiori (Chapter 11) argues that, in Hayek's theory, subjectivism constitutes the methodological basis for the understanding of human behavior and of agents' interactions which unintentionally engender social orders, while the "explanations of the principle" are invoked in consequence of the practical impossibility of knowing all the events which determine the rise of abstract orders.

Peter E. Earl (Chapter 12) argues that Simon's view of decision making as a satisficing process has typically been applied in relation to understanding limits to the extent of search that people undertake. In contrast, Earl focuses on the need for the processes of cognition that Hayek sought to understand in *The Sensory Order*, to employ satisficing mechanisms in order for lightning-fast judgments to be made about incoming sets of stimuli. Earl also argues that hierarchical decomposition facilitates the processes by which the mind finds matches between stored sets of neural connections and sets activated by incoming stimuli: by first assessing the context at hand, the mind can rapidly compress

the set of stored patterns within which an acceptable match may be found. The role of context is considered for "old" and "new" behavioral economics.

Salvatore Rizzello and Anna Spada (Chapter 13) analyze the relevance of Hayek's insights about information and knowledge for economic behavior in the context of the evolution of behavioral economics during the 1950–1960s, and then again during the 1990s.

Gerald R. Steele and Hamid Hosseini (Chapter 14) focus on the nature of complexity within Hayek's research and behavioral economics in general, discussing concepts such as knowledge, degeneracy, connectionism, social connectivity, and consciousness.

Note

We are grateful to Hardik Gupta for excellent research assistance.

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1

Frederick Hayek's Behavioral Economics in Historical Context

Roger Frantz

I Introduction

In history of economic thought and comparative economic systems classes my lectures include Hayek's *Road to Serfdom* and his part in the socialist-planning debate. Hayek gained much renown for his work on the socialist calculation debate, including his book *The Road to Serfdom* (1944). *The book* gained Hayek much notoriety but his belief that the book was too popular (there was a Readers Digest edition) and not rigorous enough led him to pursue something more "scientific" and "rigorous." The result was *The Sensory Order* (1952), an investigation into the relationship of the brain and memory, and the nature of the human mind.

I knew that Hayek was an Austrian Economist and that he had a theory of the business cycle, and that he won a Nobel Prize in 1974 which he shared with Gunnar Myrdal for their work "for their pioneering work in the theory of money and economic fluctuations and for their penetrating analysis of the interdependence of economic, social and institutional phenomena." For years it did not occur to me that an "analysis of the interdependence of economic, social and institutional phenomena" was where much of his behavioral economics was embedded.

All in all, I knew very little about his work. However, he was always a curiosity, someone whose work I had wanted to research but always put off. Then I began re-reading his book *Individualism and Economic Order* for my History of Thought class. On almost every page there were similarities between what he was saying, and that of first generation[1] behavioral economists – Herbert Simon, George Katona, Harvey Leibenstein, Richard Nelson, and Sidney Winter. In many cases Hayek wrote about behavioral economic themes before them. The more of his works I

read the more I was convinced that Hayek was also a first generation behavioral economist. For example, he contrasted the complexity of the economy and society with the "simple" phenomena studied by natural science. He thus rejected the notion that economists can mimic the method used by the natural sciences. Using the methods of the natural sciences in economics is an example of what he called scientism. The complexity of the economy also led him to reject the idea of *homo economicus* in favor of limited rationality and the use of customs and abstract, informal, unwritten, or abstract rules whose origins no one knows. He maintained that the most important aspect of knowledge is "unorganized," or tacit: the knowledge of "particular circumstances of time and place." This knowledge is widely distributed among the population and can't be known or communicated by a central planning board. Hayek is also considered one of the founders of evolutionary economics, Richard Nelson and Sidney Winters being two very prominent evolutionary, and behavioral, economists.

So, there are large similarities between Hayek's views on, say, human rationality, the nature of knowledge, and the best methodology for economics and those of the first generation behavioral economists.

The implications of Hayek's research span not only (behavioral) economics, but politics, social theory, theory of mind, and philosophy (Gray, 1982). It is the contention of this paper that Hayek's writings on these topics place him in the tradition of first generation behavioral economists George Katona, Herbert Simon, Harvey Leibenstein, Richard Nelson, and Sidney Winter.

II An introduction of Hayek's behavioral economics

Let me discuss here two central aspects of Hayek's behavioral economics: his definition of rationality, and his belief that economics should not try to mimic physics. On the topic of rationality, Simon says that Hayek was indispensable in the development of the concept of bounded rationality. Hayek's defense of limed rationality was based primarily on the limits of the inner environment – the computational limits of human beings. The assumption of rationality is one of the cornerstones of modern economics. The first generation behavioral economists, including Hayek, attacked this assumption ferociously.

Computational limits rule out the ability to understand, master, and coordinate all the variables necessary to create and manage an institution such as the economy, or society itself. Hence, in *The Sciences of the Artificial* (Simon, 1996) Simon stated that "No one has characterized

market mechanisms better than Friedrich von Hayek" (Simon, 1996, p. 34). In rejecting the rationality assumption, Hayek rejects the notion that any person or group is rational enough to organize and maintain society. The institutions of Western society, including the market system or economy, are thus "the result of human action but not the result of human design" (Hayek, 1945). The economy and society are simply too complex to be the product of human design. The information requirements for creating social order through a rational plan is unavailable to a single mind or the minds of a relatively few. The required amount of knowledge can only be obtained by decentralized human interaction through the trial-and-error process which is the market system.

Hayek and Gestalt Psychology: An Aside. The German word gestalt means to "put together" but is often translated as pattern or configuration. Ernst Mach's theory of sensations is said to be the origin of gestalt theory (DeVecchi, 2003). Mach's theory included the idea that humans perceive "wholes" or aggregates of sensory elements which can't be reduced to the individual sensory elements. In other words, the whole is greater than the sum of its parts.

Hayek identifies the economy and society as complex phenomena. As such the whole of the economy or society is not identical with the parts from which the economy or society is derived. Again, the whole is greater than the sum of the parts. Society and the economy are spontaneous orders, more than the sum of the individuals involved. What we perceive as a movie theater is not simply the material which comprises both the outside and inside of the theater. We perceive something more – a movie theater as a whole, not merely the plastic, glass, lights, popcorn stand, etc.

Gestalt psychologists ask: why do the things of the world look to us as they do? One answer is that a given stimulus or set of stimuli affect our sensations in a pattern, not as individual stimuli. Our perception of things depends on their context. We perceive the "organized whole" rather than the parts. In *The Sensory Order*, perception is all about the placement of individual stimuli within the neural network.

According to Joaquin Fuster, a neuroscientist at U.C.L.A., "The first proponent of cortical memory networks on a major scale was neither a neuroscientist nor a computer scientist but, curiously, a Viennese economist: Frederick von Hayek ... A man of exceptionally broad knowledge and profound insight into the operation of complex systems ... Considering the neurobiological knowledge available even at the time of its publication, there is nothing dilettantish about that scholarly work ... By postulating that all perception – and not just a part – is

a product of memory, Hayek carries ... one of the basic tenets of modern psychophysics" (Fuster, 1999, p. 87).

Cortical memory theory postulates that it is the connections among brain cells which creates specific perceptions. In other words, when it comes to perception, the whole is greater than the sum of the parts and not reducible to the parts. According to Hayek, every sensation we have is based on a prior experience(s), even if that experience was had by another person in the past and handed down from generation to generation via inheritance. Perception is about context – the placement of a specific perception within the neural network.

Hayek agrees that gestalt psychology has developed the idea of an "organized perceptual field," but nothing about the "organizing capacity" of the mind (De Vecchi, 2003). The organizing capacity of the mind, according to Hayek, is "a kind of pre-sensory experience" (ibid.). Hayek attributed gestalt psychology with his ability to answer some of the questions he asked in *The Sensory Order*.

Hayek expresses his ideas on rationality in his distinction between true and false individualism. Individualism false derives from the Rationalist tradition of Rene Descartes, the French Encyclopedists, and Rousseau. In *Discourse on Method*, Descartes (1999) expresses the power of reason or rationality when he says that "a single human mind can comprehend as much as a much larger group and use their knowledge to organize society" (Hayek, 1945, p. 9). Descartes denies cognitive limits, an idea which Hayek calls "the fatal conceit" (Hayek, 1988) – a conceit which leads not to efficiency and equity but to socialism.

Individualism true, the "antirationalist" view of Mandeville, Smith, Hume, Edmund Burke, Adam Furgeson, and Josiah Tucker, regards man "not as highly rational (in the traditional economic sense) and intelligent, but as a very irrational and fallible being whose individual errors are corrected only in the course of a social process, and which aims at making the best of a very imperfect material ..." (Hayek, 1945, pp. 8–9; Hayek, 1967d). Despite being irrational and not highly intelligent, humans can achieve a significant amount through freedom and the market process, in which individuals know only about one or two things and rely on many others, each of whom also knows only a relatively few things. The workings of the market in creating social order is not intelligible to the human mind, but the market system is not irrational.

Foretelling perhaps the behavioral economic work of Kahneman and Tversky (Kahneman and Tversky, 1979; Kahneman, Slovic, and Tversky, 1982), Hayek says that "It may indeed prove to be far the most difficult

and not the least important task for human reason rationally to comprehend its own limitations" (Hayek, 1979, p. 162).

Hayek's second definition of rationality is the ability to be understood by others, to have behavior patterns which are predictable. Having patterned or predictable behavior allows others to have foresight about your behavior. The importance of this ability is that it is essential to the attainment of a multiple-person equilibrium. Human interaction and time are essential in economic affairs, including the attainment of equilibrium.

Equilibrium is attained when all participants appear to be part of a single plan. This requires that individuals have perfect foresight about the actions of others and that each person's actions can be understood by others. "Every person's plan is based on the expectation of just those actions of other people which those other people intend to perform and that all those plans are based on the expectation of the same set of external facts ... Correct foresight is then ... the defining characteristic of a state of equilibrium" (Hayek, 1945, p. 42).

> "When there is only one person in the society then equilibrium is assured. When there are two or more participants equilibrium requires that the actions of one person are consistent, in agreement with, the actions of others. This, means that each person correctly anticipates, has correct foresight about, the actions of others." Therefore, foresight is essential because "For Hayek the assumption of perfect knowledge, perfect foresight about the future with respect to the actions of every other participant, assumes away the nature and purpose of the market, that being a process of discovery taking places over time." In addition, each person must base their behavior on the same external circumstances as the others so that their expectations are the same. For Hayek, "the passage of time is essential to give the concept of equilibrium any meaning" (Hayek, 1945, p. 37). This is because "equilibrium is a relationship between actions, and since the actions of one person must necessarily take place successively in time."(ibid.)[2]

The emphasis on foresight is part of Hayek's wider point that the data or "facts" in social sciences including economics "are merely opinions, views held by the people whose actions we study" (Hayek, 1979, p. 47). Being subjective they are mental, not physical. In *The Counter-Revolution of Science* (Hayek, 1979) he says that "Neither a 'commodity' or an 'economic good,' can be defined in physical terms but only in

terms of views people hold about things" (Hayek, 1979, p. 53). What is important in economic affairs is mind-reading – one person knowing what others are thinking. Further, "Unless we can understand what the acting people mean by their actions any attempt to explain them ... is bound to fail" (Hayek, 1979, p. 53). Economic facts, therefore, can't be described by exact formulae. Exhaustive descriptions or exact predictions in economics are, therefore, impossible. Enter behavioral economics.

A second aspect of Hayek's behavioral economics is his insistence that economics should not try to mimic physics.[3] For Hayek, the nature of the world which matters most to economists – economic and social phenomena – are complex phenomena. The degree of complexity is measured by the "minimum number of distinct variables a formula or model must possess in order to reproduce the characteristic patterns" discovered (Hayek, 1967a, p. 26). The number of distinct variables necessary to understanding patterns in the social sciences is very large, "often insurmountable" (ibid., p. 27). By contrast, physics deals with simple phenomena. While prediction is clearly possible in physics, in social and economic affairs, "the ideal of prediction and control must largely remain beyond our reach" (ibid., p. 34). Because the number of relevant variables and their interaction are often insurmountable, our conscious minds are not equipped to deal with an analysis of the phenomena. We must, therefore, use our unconscious mind – what Hayek refers to as the "supra-conscious,"[4] – intuition, know-how, tacit knowledge, and physiognomy perception. Because we make use of the supra-conscious, the rules we use in decision making are rules we don't consciously understand. This limits our ability to understand economic phenomena. What we can understand is general patterns of economic behavior, but not particular events at a particular time. Hayek calls this an "explanation of the principle" (Hayek, 1976, pp. 42–43).

In a short paper, "Two Types of Mind" (Hayek, 1978b), Hayek distinguished "master of his subject" from "puzzlers" or "muddlers." Hayek considered himself a puzzler/muddler. The characteristics of a puzzler are that they make use of "wordless thought" and "submerged memories," i.e., the supra-conscious. Hayek quotes Alfred North Whitehead who said that being a muddler, or "muddleheadedness" is a necessary condition for original thought. Hayek then goes on to say that "being forced to find their own way of expressing an accepted idea, they sometimes discover that the conventional formula conceals gaps or unjustified tacit presuppositions" (Hayek, 1982b, p. 53). Puzzlers seem particularly reliant on their intuition.

III Vernon Smith

Although this chapter focusses on similarities between Hayek and "first generation" behavioral economists – Harvey Leibenstein, Herbert Simon, George Katona, Richard Nelson, and Sidney Winter – the link between Hayek and behavioral economics extends to the present generation of behavioral economists. Here I will give one example – that of Vernon Smith, winner of the 2002 Nobel Prize in Economic Science. However, Vernon Smith is not only a "new" behavioral economist, to use Esther-Mirjam Sent's adjective (Sent, 2004), he is also an "old" behavioral economist – again using Sent's adjective. Smith published an article on experimental economics in 1962 in the *Journal of Political Economy* (Smith, 1962). This places him in the same time frame as the other first generation behavioral economists. In 2011 he had a publication in press at the *History of Political Economy* with the very Hayakian-sounding theme, "Exchange, Specialization, and Property as a Discovery Process" (Smith, 2011 Summer 2011, Vol. 43 Issue 2, p317-337).

At CalTech Smith was an electrical engineering major. Upon reading Mises he decided to switch to economics. It was Mises's "science of exchange" – his work on property rights, the primacy of the individual, the efficacy of markets – which excited Smith. Fifty years or more later Smith says that "Mises' basic message as to how economies function is as good today as it was then" (Smith, 1999, p. 195).

Returning to Hayek, Smith says that "No one understood that exchange process better then Frederick Hayek, when he said, and here I quote one of my favourites: '*Nobody can communicate to another all that he knows because much of the information he can make use of, he himself will illicit only in the process of making plans for action. As he will not merely make use of given knowledge he discovers what he needs to know in order to make appropriate actions'"* (Smith, 2008). Smith, similar to Hayek, believes that most knowledge is tacit, and the process of competition is a process of discovery, including knowledge.

Smith praises Hayek's theory of the price system as an information system coordinating the action of neighbors and strangers from all parts of the world into a cooperative venture. The coordination occurs because knowledge is dispersed, but all the individual bits of information add up to individuals' willingness to pay as buyers or willingness to accept if they are sellers. The dispersion of knowledge is not new. The "process of knowledge specialization has been going on for some 50,000 years when our Cro-Magnon ancestors first walked out of Africa and migrated all over the globe" (Smith, 2005, p. 139). Coordination is

spontaneous: undetectable to buyers and sellers (journalists and academics). Smith asserts that his and others' experiments since 1956 verify Hayek's insight.

The title of Smith's 2008 book is *Rationality in Economics*: *Constructionist and Ecological Forms*. He begins several chapters and books with quotes from Hayek, illustrating the topic at hand. In this book Smith discusses two forms of rationality, corresponding to the two forms of individuality discussed by Hayek in his 1945 Findley Lectures, "Individualism True and False" (Hayek, 1945). Smith says that "In our time it was Hayek who articulated forcefully the idea that there are two kinds of rationality" (Smith, 2008, p. 25). Constructionist rationality – false individualism in Hayek's lexicon – comes from the "standard social science model" of Descartes (Bacon, and Hobbes), which contends that only a conscious process based on reason should decide the form and course of society and its institutions. Hayek says that constructionist rationality gives us "a sense of unlimited power" (ibid., p. 27), while Smith says that "We naturally recognize only one rational order because it is so firmly a part of the humanness of our reason and our mind's anthropocentric need to think it is in control" (ibid., p. 25). Smith seems to be channeling Hayek in his rejection of constructivist rationality when he says that "no one can express in thoughts, let alone words, all that he or she knows, and does not know but might call upon or need to discover, for some purposive action" (ibid., p. 32).

Ecological rationality or a "rational social order" is "designed by no one mind, that emerges out of cultural and biological evolutionary processes" (ibid., p. 36). Ecological rationality is the result of people following rules "without being able to articulate them, but they may nevertheless be discoverable. This is the intellectual heritage of the Scottish philosophers and Hayek" (ibid., p. 37). This heritage also includes Herbert Simon: Smith says that the difference between constructivist and ecological rationality is related to Simon's distinction between substantive (objective) rationality, and procedural (subjective) rationality. Smith claims that the existence of ecological rationality can be seen in economic experiments:

> What we learn from such experiments is that any group of people can walk into a room, be incentivized with a well-defined private economic environment, have the rules of the oral double auction explained to them for the first time, and they can make a market that usually converges to a competitive equilibrium, and is 100 percent efficient-they maximize the gains from exchange-within two

> or three repetitions of a trading period ... Yet knowledge is dispersed, with no participant informed of market supply and demand, or even understanding what that means. (Smith, 1999, p. 198)

It doesn't seem much of a "stretch" to say that Vernon Smith – 2002 winner of the Nobel Prize in Economics – is an admirer of the work of Frederick Hayek, the 1974 winner of the Nobel Prize in Economics.

IV Memory traces (George Katona) and the sensory order (Hayek)

Hayek believed that an economist who is only an economist cannot be a good one. Hayek was not only an economist. One major example of this is Hayek's book *The Sensory Order.* According to Nobel Prize winner Gerald Edelman – 1972 Nobel Prize in Physiology (Medicine) – "Hayek made a quite fruitful suggestion, made contemporaneously by the psychologist Donald Hebb, that whatever kind of encounter the sensory system has with the world, a corresponding event between a particular cell in the brain and some other cell carrying the information from the outside world must result in reinforcement of the connection between those cells. These days, this is known as a Hebbian synapse, but von Hayek quite independently came upon the idea. I think the essence of his analysis still remains with us" (Edelman, 1987, p. 25).

Another economist who was not only an economist was George Katona. Katona was a pioneer in behavioral economics. His Ph.D. was in experimental psychology (from the University of Goettingen). He was in Germany during the German hyperinflation of 1922–23, and wrote a paper about inflation being a manifestation of mass hysteria. He wrote *War Without Inflation* in 1942, arguing that certain attitudes – cooperation and patriotism – could allow for a successful anti-inflation program. Working for the Cowles Commission he directed a study about business reactions to price control, using surveys of businesspeople as the data source. Katona used survey research at the University of Michigan Survey Research Center, beginning in 1946, studying expectations and attitudes about economic affairs, including consumer sentiment, finances, spending, and saving.

Memory traces

Twenty six years before Hayek published *The Sensory Order* (Hayek, 1976), Katona published *Organizing and Memorizing* (Katona, 1940). Katona discusses two major ways of learning: "meaningful learning"

and "senseless learning." Meaningful learning yields "understanding of a procedure," "insight into a situation," and "apprehension of relations" (ibid., p. 5). The words understanding, insight, and the expression "apprehension of relations," taken together, reveal that – like Hayek – Katona was attracted to *gestalt* psychology. The German word *gestalt* means the apprehension of a thing's complete or whole form rather than simply the parts from which the thing is constituted. The phrase "the whole is greater than the sum of the parts" is a familiar phrase expressing gestalt psychology. Senseless learning, on the other hand, is merely the result of memorization. Katona's research led him to conclude that forgetting occurs faster with senseless learning.

How does learning take place? Chapter 8 is titled "Memory Traces." He begins the chapter by saying, "In this attempt to understand the process of learning, I propose to go a step further and to resort for a short while to what is often called speculation ... What takes place between the learning period and the recall?" (ibid., p. 193). Katona's explanation involves a gestalt perspective. When a person sees a cat for the first time it creates a pattern in the brain; the creation of the pattern is the creation of a memory. When the experience ends a trace of the experience remains in the brain. This is a *memory trace*. The next time we see a cat, the memory trace interacts with the pattern in the brain created by the new experience to produce the conscious experience of the cat. Katona says that a memory trace is a "carrier of the connection between events A and B ..." (ibid., p. 194). He gives an example of George meeting Herbert for the first time: event A. The second time they meet, George recognizes Herbert (event B), or George remembers Herbert's name (event B1). Events A and B (or B1) are related because event A leaves a "trace" which creates the relationship between George and Herbert.

For Katona, a trace is simply "the carrier of the connection between events A and B (or B1)" (ibid.). Some believe that a trace is a "true picture or a true copy of the event itself" (ibid.). Some also believe that each trace is "stored in definite locations" (ibid.). Katona subscribes to neither proposition.

Memory traces "are not copies of the perceptions," and perceptions are not "summative copies of the external world" (Katona, 1940, p. 197). In other words, we do not perceive the external world as it is in reality, and what remains of the experience is not exactly identical with the experience. This is an important point because it is similar to Hayek's thesis in *The Sensory Order*, that we do not perceive the real world as it is.

Under what conditions do expectations or perceptions of a situation change? Katona says that expectations change when pressure demands change, "as the result of major new developments which make habitual behavior questionable or inappropriate" (Katona, 1972, p. 553). Deviating from habitual behavior is "one of the major features of genuine decision making" (Katona, 1975, p. 221). Katona's theory of a change in expectations or perceptions is similar to Leibenstein's theory of (selective) rationality. In Leibenstein's theory it is pressure which results in a higher level of rational behavior.

The sensory order

The *Sensory Order*[5] is a much more sophisticated analysis of the nervous system and memory than that found in Katona's *Organizing and Memorizing*. Both are about the inner mechanics leading to decision making. For Hayek human action is indeterminate – it is not a mechanical response to any stimuli from the external environment. This is because the individual does not passively take in stimuli from the external world. The individual does not "read" the external environment the way an engineer reads a set of blueprints. The individual does not perceive the reality which is the external environment. Instead, the mind interprets stimuli from the external environment. Hayek divides the environment into three orders: the physical order, the neural order, and the sensory order. The physical order is the material world. The neural order is the human nervous system, which is part of the physical order. The sensory order is created by the neural order and our experience – our interpretation – of reality.

The mind classifies all in-coming data from the external environment into an appropriate category based on the similarity of the in-coming data with all previously received data. Salvatore Rizzello (1999) explains this process in his book *The Economics of the Mind*.

> Past *experience* plays a key role; it creates a system of links which records the situations when – in the history of the organism – the different groups of stimuli have worked together ... Everything we perceive is immediately compared to other classes of recorded events. Every perception of a new stimulus or class of stimuli is influenced by the already existing classifications. A new phenomenon is always perceived in association with other events it shares something with. (ibid., p. 28)

Current perception or experience is, therefore, "path-dependent," based on past perceptions or experiences by the individual or by the human