



University of KwaZulu-Natal
College of Law and Management Studies
School of Accounting, Economics & Finance

The Ontological Foundations of Modern Economics and Islam: How Do They Compare?

Abdulkader Cassim Mahomedy

SAEF Working Paper No. 2016/01/13

December 2016

The Ontological Foundations of Modern Economics and Islam: How Do They Compare? *

Abdulkader Cassim Mahomedya#

* The author would like to acknowledge the financial support received for this research from the National Research Foundation of South Africa (Unique Grant No: 92674). The NRF shall not be liable to any person for inaccurate information or opinions contained herein.

Lecturer, School of Accounting, Economics and Finance, University of KwaZulu-Natal
Private Bag 54001, Durban, KwaZulu-Natal, Rep. of South Africa
E-mail: mahomedya@ukzn.ac.za

Abstract

The ineptitude of the economics profession to pre-empt several crises in the global economy recently has exposed the deep intellectual malaise within the discipline. Muslim economists have attempted to overcome these problems by crafting their own sub-specialty within this area, which they called Islamic Economics. Notwithstanding their concerted efforts, this exercise has yielded little by way of offering any fresh insights on how to approach economic issues. The failure of both mainstream and Islamic economists to effectively address the difficulties bedeviling their discipline(s) is due to their unwillingness to interrogate the underlying onto-epistemic assumptions of their field(s) of enquiry. In this paper, I explain how economics, ever since its birth as a standalone discipline, has embraced the physicalist paradigm of modern science. Consequently, its matrix of concepts and methodology has remained firmly embedded within this framework. I show how each of the key propositions of modern physicalism viz. materialism, mechanism, determinism, and atomism has had an indelible impact on economic thinking, and, as result, has rendered the discipline largely unable to fulfil its purpose. I then juxtapose this philosophical outlook against the Islamic worldview and demonstrate how its ontology and epistemology are fundamentally divergent to those of modern science. I argue that the *Tawhidi* precept of Islam, i.e. its primal ontology of the Oneness of God, has significant implications for any conception of Islamic science (and economics). It unequivocally calls for a process-oriented methodology that is able to integrate not only the different modes of intellectual enquiry, but one that equally stresses the importance of multi- and inter-disciplinarity. I conclude by pointing out that it is only within such a unitary framework that the ethical and value system of Islam will concord with its methodology. There will otherwise always remain a disjuncture between the two.

Keywords: Modern Science, Economics, Ontology, Epistemology, Islam

1. Background to the Problem

The advent of modern mechanistic science,¹ and its consequent impact on all branches of socio-scientific enquiry, has perhaps been unparalleled throughout human history. For many, it marked an epochal shift, in particular for European society (Prigogine & Stengers 1985; Giddens 1990), for it had to bear the first birth pangs of this new creature entering and then preponderating over human reflection on life and existence. It fundamentally altered perceptions of how people relate both to themselves and the cosmos they inhabit. On the practical side, the triumph of modern science became firmly entrenched in the popular mind when it delivered a vast array of technological innovations that has forever changed how we live, work, travel and communicate. The pervasive changes that it continues to wrought upon the human experience are hardly resistible any longer, even by those communities that seek to conserve their traditions and culture in the face of modernity's overbearing pressures to adapt to the "new spirit of the times" (Latour 1998:209).

Given the scope and scale of this transformation, and society's embrace of the new philosophical outlook, the field of the humanities underwent profound changes in the way it approached its domain of study. Its previously unified methodology in understanding and explaining human behaviour had to give way to "the disciplinarization and professionalization of knowledge" (Wallerstein 1996:7). Out of this marriage of atomisation and institutionalisation of knowledge creation, the discipline of economics was born. Though a relative newcomer to the intellectual landscape, its scope of enquiry meant that it would play an increasingly important role not only in accounting, but also in shaping how society navigated the opportunities and challenges that modernity presented. Economics grew rapidly in mathematical sophistication when it adopted the mechanistic epistemology² of the physical sciences (Georgescu-Roegen 1971; Norgaard 1987). It soon surpassed its older sibling disciplines, and crowned itself the "Queen of the Social Sciences" (Heilbroner

¹ By most accounts, this is traced to the overthrow of Aristotelianism during the early 17th Century (see Toulmin 1990; Butterfield 1997).

² Refers to that branch of philosophy that explores how knowledge is generated, justified and conveyed to others. See Mahomedy (2016d) for a more detailed exploration of this topic.

1995:883). Not surprisingly, it became the envy of the other disciplines, all of which aspired towards attaining the level of rigour and scientification that economics was able to achieve.

Notwithstanding this impressive rise in the status of the discipline, several recent events have significantly dented its reputation and aura as the idealised social science. The ineptitude of the economics profession to predict and prevent a series of economic crises over the past four decades, beginning with the depression of the 1970s, has revived its earlier pejorative characterisation as a “dismal science”³ (Mäki 2002:3). The most recent global financial collapse of 2007-2009 has now aroused the suspicions of even the lay public and government officials that something is amiss within the profession.⁴ More generally, these multiple failures point to an intellectual crisis in the discipline that has been brewing for almost a century (Mahomed 2016a, Beker 2016), which ultimately worked its way through misconceived policies that now jeopardise the stability and future sustainability of both the real economy and the larger ecological environment (see Norgaard 1987; Kurz 2010; Kallis et al. 2009). Paradoxically, as explained later in this paper, the self-same methodology that elevated economics to its highpoint as a social science par excellence is now being blamed for its fall from grace as a distinguished area of intellectual enquiry.

The first barrage of warnings about the misdirected trends in economic theorising were sounded even before the onset of the recent spate of economic upheavals. Some of the highest-ranking economists in the profession such as Leontief (1971), Worswick (1972), Ward (1972), and Phelps-Brown (1972) had decried economic theorists’ proclivity towards excessive abstraction and mathematical formalism, at the expense of relevance and correspondence to reality (see also Coase 1992).⁵ There were others though, equally prominent in their own right, who attempted to blunt the sharpness of this critique. They argued that with the increasing availability of empirical data and refinement of econometric analyses, the subject was bound to become more technically oriented and model-focussed, which therefore marked a positive step for the discipline (Solow 1997; Baumol 2000; Dasgupta 2002; see also Kreps 1997). But given the severity of the recent financial meltdown

³ As once expressed by Thomas Carlyle (1849).

⁴ See, for example, Parrique (2013:29-30) for a full list of headline-grabbing articles from leading media outlets that slammed the economics profession for its alleged incompetence.

⁵ See Mahomed (2016a, 2016b) for a review of how this issue alone has deeply split the profession.

and the failure of profession in pre-empting and/or preparing for it, this defence of the status quo has done little to assuage concerns about the current malaise in the discipline.

There is now a growing realisation in the profession that a fundamental rethink is required if economics is to survive and play any meaningful role in the future. Renowned economists such as Richard Posner and the Nobel laureate Edmund Phelps openly acknowledge that events have forced them to reconsider their views on how the economy actually functions (Phelps 2009 as cited in Kurz 2010; Posner 2009). Even a towering figure like Allan Greenspan (2008) was forced to publically concede during a United States Congressional hearing, that his “view of the world, [and his] ideology [which] had been going for forty years or more with very considerable evidence ... was not right. It was not working”. These startling admissions expose the dysfunctionality of the profession in some key areas of its expertise, and they likewise belie the assertion by others, such as Lucas (2009), that no serious shift in thinking is required in economics and that “it is business as usual” (see Mattick 2011).

2. Contextualising the Present Study

At about the same time that the fault lines in mainstream economic thinking were being exposed, another relatively small group of economists began to craft an alternative conception of economic science. Largely unknown in Western academia but quickly gaining recognition in the Islamic tradition, these Muslim economists set out to *Islamise* economic science. They were motivated by the belief that the discipline, at least in the Muslim world, should explicitly incorporate Islam’s ethical values as encapsulated in its *Sha’riah*⁶ (see Chapra 1996). Because the “received view” in mainstream economics (ME henceforth) had abjured any role for overt normative considerations, the Islamic economists felt the need for a distinct discipline that reflected Islam’s value orientation. The Islamic economists’ project dovetailed remarkably well with a larger mission in contemporary Islamic scholarship that sought to Islamise all of the other social sciences, known as the “Islamisation of Knowledge (IoK)” (see Haneef 2005; Hussain 2006).

⁶ An Arabic word often (though limitingly) translated as “Islamic Law”.

Despite the Islamic economists' efforts to infuse economic theory with Islamic values, their project has yielded little by way of offering any fresh insights on how to generate cogent theories or to operationalise their outcomes in the real economy (see Mahomedy 2013). This is because they simply took the static equilibrium models of ME (with all of its implied assumptions) and exogenously imposed idealised ethical norms into agents' preferences, to predict optimised behaviour. The end-results were not much different to those found in the neoclassical framework. Consequently, Islamic economics (IE henceforth) has been criticised by both proponents (e.g. Sardar 1984, 1988, 1989; Asaria 1985; Nasr 1986, 1991; Choudhury & Nadwi 1992; Choudhury 1994, 1999a, 2000, 2008a, 2008b, 2011; Alatas 2006; Haneef 2007, 2009, 2012; Haneef & Furqani 2010; Zaman 2011; 2013; Mahomedy 2013, 2016a, 2016b, 2016c) and detractors (Philipp 1990; Haque 1992; Kuran 2004) for lacking any distinct identity to justify its claim to an independent status. Now, after almost three decades, the Islamic economists have also acknowledged that their project, at best, has stalled, but remain divided on what needs to be done to revive it (IRTI 2004; IEI 2012).

Like their counterparts in ME, there are also growing calls from a new generation of scholars within IE for a reconsideration of its foundational principles (Haneef 2005, 2007, 2009, 2012; Zaman 2005, 2009, 2011, 2013, 2015a, 2015b; Asutay 2007, 2008; Haneef & Furqani 2010; Aydin 2012a, 2012b, 2013; Iqbal 2012; Khan 2013). But how extensive and deep should this critique and analysis be? With the exception of Nasr (1986, 1989, 1991), Choudhury (1990, 1993, 1994, 1995, 1997, 1999a, 1999b, 2000, 2001a, 2001b, 2004, 2006, 2007, 2008a, 2008b, 2011), and to a limited extent, Chapra (2000a, 2000b) and Siddiqi (2001), the rest from among the pioneers in IE are sceptical of the value of interrogating the epistemic and/or ontological underpinnings of the discipline (see e.g. Kahf 2012). This is because they generally have no qualms in adopting the analytical apparatus of ME. They view it as being neutral, objective, and innocuous; hence the proverbial retort from them on this issue that "there is no need to reinvent the wheel" (Mirakhor 2006:13; Chapra 2007:108; Tag el-Din 2012:174; see also Limam 2004; Kahf 2004; Zarqa 2004; Ahmed 2014). This disdain towards methodological issues in IE, in particular, is symptomatic of the disregard, and at times hostility even, in ME generally, towards any attempt at (re)integrating philosophy within economics (see Caldwell 1990; Lawson 1994a, 1994b; Boland 2003;

Dauidsen 2008; Drakopoulos 2014; Frey 2001; Hands 1990; Hargreaves Heap 2000; Hoover 1995).⁷

Whilst this neglect of epistemic considerations in economics and its implications for both ME and IE have been discussed elsewhere (see e.g. Myrdal 1958; Shackle 1978; Hutchison 1996, 1997; and Choudhury 1995, 2011; Haneef & Furqani 2010; Mahomed 2016a; 2016b; 2016c, respectively), there is another element to this debate that hitherto has not received similar coverage in contemporary discourse: the link between methodology and ontology.⁸ In ME, Lawson (1994b, 1997, 2003, 2004, 2015), among others (Rosenberg 1995; Cartwright 2001; Mäki 2001, 2002; Dow 2002; Chick & Dow 2005), has perhaps written most extensively on this nexus, whilst Choudhury (2000, 2004, 2013, 2014) has done likewise for IE. These scholars have been emphasising that the highly rationalist-cum-deductivist methodology of modern economic theory presupposes an ontology which is hardly reflective of, nor responsive to, the economic world that it purports to explain. This disjuncture, consequently, is seen as constituting the crux of the problems besetting the discipline.

The central thrust in this genre of critique of contemporary economics is that by embracing the mechanistic philosophy of the physical sciences, economic theorists have foisted onto the discipline a conception of human agency that is culturally ahistorical, atomistically divisible, and driven by the impulse of self-interest alone. With the added assumptions of omniscient rationality, marginalism, and optimisation, this caricature aka *homo economicus* became the sole representative proxy for economic analysis. All phenomena had to be explained with reference to only those factors that were reducible to the simple one-dimensional relationships of this conceptual framework. Furthermore, any change or movement was deemed to occur through causal mechanisms that operated within a closed-systems process. Consequently, strict exogeneity between factors from within and without was preserved, which precluded any kind of recursivity between them.

⁷ See Mahomed (2016a) for a detailed exposition of how the neglect of philosophy has negatively impacted on the discipline.

⁸ Ontology: A study of the ultimate structure and constitution of reality (as opposed to appearance) (*Encyclopaedia Britannica* 2010). Lawson (1994b:257) describes it as an “enquiry into the nature of *being*, of what exists, including the nature of the objects of study”.

The usefulness of the above frame of reference for economics was always viewed with deep scepticism by economists for well over a century (Veblen 1898; see also Dugger 1979). But despite the efforts of alternative canons of economic theory to dislodge its hegemony (Kristol 1981; Lawson 2006, see also Mahomedy 2016b), it continues to inhere as the dominant theoretical system within ME. The profession still insists on it as a staple diet in the economics curriculum at universities, arguing that it should serve as the benchmark for any thinking whatever on economics (see Wren-Lewis 2014). There appears to be no appetite on the part of mainstream economists to support any move towards a paradigm shift in the subject. All that is needed, if at all, is for “the Naked Emperor ... to be re-clothed rather than dethroned” (Coyle 2014). One is therefore left perplexed as to the reasons for this persistence in the face of mounting criticism against the discipline and amid growing calls for its rehabilitation from first principles.

Given this resistance to change and the implications thereof, this paper sets out to achieve two related objectives. Firstly, it uncovers the key ideas about the nature of reality and knowledge that prevailed in the Western world at the time that economics sprang to life as a dedicated branch of enquiry. It thereby demonstrates that because of the wide appeal of this new *weltanschauung* and the predictive power it unleashed, economics embraced it *in toto* so that it continues to have a lasting impact on both its content and methodology. Secondly, this perspective is juxtaposed against the Islamic worldview, and its approach to knowledge likewise, to evaluate the degree of compatibility between both paradigms. The lessons that Islamic economists may draw from this comparison for the development of their own discipline are delineated. The paper then concludes.

3. Worldview of Modern Science and its Postulates

Much of modern Western philosophy and intellectual thought can be traced back to its ancient Greek-Hellenist origins (Russell 1945; Hetherington 1997; Cohen 2005; Dilworth 2007). But modern science, including economics, as we recognise it today took its shape and form from the confluence of ideas that took root within the revolutionary trinity of the Renaissance, the Reformation, and the Scientific Revolution. Though modern science took several centuries to evolve as it did, and furthermore, as a result of many related political, social, and religious factors (Mahomedy 2016c), its worldview was largely framed by the

cumulative (and at times conflicting) ideas of some of the most influential philosophers and scientists in the initial period of its founding.

The early prophets⁹ of the new science in the making, Francis Bacon (1561-1626) and René Descartes (1596-1650), clearly set out the first principles upon which would be constructed the entire edifice of modernist science (Parkinson 1993; Perry 2012). As explained hereunder, these axioms were to radically alter questions relating not only to knowledge justification, but equally to the attitude towards nature, reality, and life in general. To Descartes, all natural phenomena, including living organisms, could be explained in mathematical terms within a single system of mechanical principles (Capra 1982; Cottingham 1993; Lennon 2000). But for this to happen, he maintained, all knowledge claims had to be interrogated and reconstructed from scratch. This radical scepticism was expressed in his celebrated architectural metaphor that only by “demolishing everything completely and starting again right from the foundations” could certainty of anything be attained (Descartes 1985:17; see also Cottingham 1993). Although such knowledge would yield immense worldly benefits (Gaukroger 1993), the universe “out there”, for Descartes, was composed of inert and dead matter, a lifeless construct that could provide us with no knowledge of the divine (Armstrong 2001).

Bacon likewise, asserted that knowledge of the divine and of the natural are separate realms altogether; to each belonged its distinct methodology and the former should not in any way be induced to discover the latter (Bacon 1620). The aim of science, for Bacon, was to extract “nature’s secrets from her”, to have her “bound into service” and made a “slave”, so that “the narrow limits of man’s dominion over the universe” may be extended “to their promised bounds” (Merchant 1980:70, see also Easlea 1980). This thorough secularisation of the world, devoid of any sense of the sacred, cultivated the attitude that the pursuit of knowledge had just one overarching objective: to gain mastery of the world through the hegemony of power, expressed in his aphorism, where “knowledge and power meet in one” (Bacon 1620:3). It was this new fashion of science that became the seed-plot for the growth of economic imperialism and the materialist culture of those who embraced its values (Ravetz 1986; Rothbard 1995). It likewise provided the moral justification to fully exploit the

⁹ See also Walsh (2013) on how scientists have come to adopt a prophetic-like ethos is so much of their “preaching”.

opportunities of the emerging industrial capitalism that soon followed in its wake (Merchant 1980; see also Weber 1930).¹⁰

It was left to succeeding generations of scientists, the likes of Johannes Kepler (1571-1630) and Galileo Galilei (1564-1642) to continue and sustain the process of the complete mathematisation of nature, so that it reached its full consummation and ultimate triumph in the works of Isaac Newton (1642-1726) (Cohen 2005; Collins 1965; Russell 1945). Together, they formalised the conception of the universe as a complete mechanical entity, constituted of matter that is atomistic and homogenous, and whose essential features are quantitative, rather than qualitative in nature (Burt 1932; Capra 1982). For them, the entire universe was just a multitude of separate objects assembled into a huge cosmic machine that functions like a hermetically sealed clock, i.e. a closed system that has no environment (Ackoff 1993; Capra 1996). The movement and functioning of this “bare matter”, furthermore, was supposedly reducible to a simple aggregation of its infinitesimal parts that were composed of elementary building blocks (Guenon 1953; Smith 2006). Most importantly, in the step-up or step-down transition from one level of composition to the next, i.e. in the bringing together or separation of the parts, there was no accommodation for “emergent properties” to arise nor for the origination of new laws of symmetry (see also Anderson 1972; Fuenmayor 1991). Simply, the whole was equal to the sum of its parts, neither more nor less.

The adoption of this new physicalist-cum-mechanistic conception of nature marked a watershed and epochal shift in the history of human thought (Tarnas 1993). Its matrix of concepts together with the values espoused earlier by Descartes and Bacon synthesised and coalesced to form the “modernist” worldview from which is constituted the most fundamental categories of modern scientific thought. Subsequently, with the “wholesale extension of (its) ideas, attitudes and activities to other domains” (Olson 1991:8), its pervasive influence continued to shape all of our intellectual development right up to this day. Given the profundity of the paradigmatic shift, its postulates were to have a corresponding impact on every facet of existence for both humankind and nature.

¹⁰ That technology and science are so closely intertwined and seeking, with an ever-increasing appetite, to harness the forces of nature to achieve greater control is therefore no coincidence.

Firstly, the embrace of a mechanical philosophy, around which was centred the materialistic qua atomistic characterisation of matter, marked a radical shift away from the erstwhile view of an ecological/holistic conception of reality (Sheldrake 2012). Previously, the entirety of the universe was considered a “living being” and humankind an integral part of that organismic whole (Capra 1982, 1996). This conception not only enabled people to empathise with the natural world around them (Bateson 1973), but critically also, it sustained within themselves the recognition of the vital interdependency between humankind and nature. Both needed each other to nurture, protect, and preserve the other.¹¹ But Descartes’ radical mind-body dualism and his (and Bacon’s) quest to conquer nature and subjugate it henceforth, only served to sever humanity’s umbilical cord with nature, and to estrange it from the rest of the natural world. Humankind now saw itself as distinct from, and independent of, everything else; the individual was now consciously alone but physically surrounded by a purposeless, soulless, and desacralised cosmos.

This denouement of modern philosophy was aptly captured by Russell (1917/1959:48) when he wrote:

Such, in outline, but even more purposeless, more void of meaning, is the world which Science presents for our belief...That Man is the product of causes which had no prevision of the end they were achieving; that his origin, his growth, his hopes and fears, his loves and his beliefs, are but the outcome of accidental collocations of atoms; that no fire, no heroism, no intensity of thought and feeling, can preserve an individual life beyond the grave; that all the labours of the ages, all the devotion, all the inspiration, all the noonday brightness of human genius, are destined to extinction in the vast death of the solar system, and that the whole temple of Man's achievement must inevitably be buried beneath the debris of a universe in ruins--all these things, if not quite beyond dispute, are yet so nearly certain, that no philosophy which rejects them can hope to stand.

Given such an alien and hopeless end for humanity, it was inevitable that life itself was denuded of any intrinsic meaning; that existence was viewed only as a struggle against the

¹¹ The unprecedented environmental crises that we face today is clearly due to our failure to take cognisance of this symbiotic relationship between humankind and its environment.

blind forces of nature that inexorably marched on; and that in such a hostile universe, therefore, all that ultimately mattered and deserved worship was power and brute force.

Secondly, with the unravelling of the organismic worldview, matter or materiality was henceforth considered the sole basis for all of existence. On this view, any event in nature and every state of affair was produced solely “by the mutual interplay of material particles ... (through) direct contact alone” (Westfall 1983:15-16). It implied that for any phenomenon to occur, natural or otherwise, it had to be mediated via some material substance to another event spatio-temporally contiguous to it. The crusade of modern science was reduced to a hunt for these causal mechanisms and the fundamental physical laws that drove them (Price 1955; Ackoff 1993; Dilworth 2007). But the real bite of this mechanistic science, according to Griffin (1996), was that it imposed on nature a form of complete determinism that ruled out any notion of self-determination. Matter simply had no hidden qualities or potencies vested within itself; it was ruthlessly driven by forces from the outside.

Thirdly, as the Cartesian and Newtonian schools began to meld and blend (see Schofield 1970), a third tenet of the new philosophy emerged as a corollary to its ontological precepts: the doctrine of reductionism or methodological individualism.¹² Reductionism or atomism holds that any entity is merely a linear aggregation of its individual components, and to fully comprehend it, or any of its individual parts, one has to undertake the process of *analysis*,¹³ i.e. deconstruct the object of study into its smallest or most irreducible constituent elements or particles (Ackoff 1974; Sorell 1993). Using this analytical method, everything (including every experience) should be reduced to its most indivisible elements¹⁴ in order to grasp its underlying structure and to determine the fundamental forces operating at that level (see Bohm 1990).¹⁵ The functioning of the “whole” can then be inferred through the aggregation of our understanding of the individual parts (Anees 1984; Johanessen et al. 1999). This

¹² See also Hodgson (2007).

¹³ As opposed to synthesis.

¹⁴ For example, in physics, it was the atom; in chemistry, the elements in the periodic table, and in biology, the most irreducible component was the cell (Ackoff 1993).

¹⁵ Consider, for example, the billions of dollars spent on the Large Hadron Collider (LHC) at CERN in an effort to discover/confirm the existence/behaviour of sub-atomic particles.

reductionist-analytic mode of enquiry became so dominant in all branches of scientific learning that it was equated with science itself (see Johnston 1976; Horst 2007).

Now as this body of ideas came together and took root, it formed the basis for a completely new conception of knowledge, in which it was believed that “there are no mysterious incalculable forces that come into play, but rather that one can, in principle, master all things by calculation” (Weber 1946:155). The confidence in this new methodology was hardly limited to the laboratories of the physical sciences. As Tofler (1985: xiii-xiv) recalls:

They pictured a world in which every event was determined by initial conditions that were, at least in principle, determinable with precision. It was a world in which chance played no part, in which all the pieces came together like cogs in a cosmic machine... And this image of a simple, uniform, mechanical universe not only shaped the development of science, it also spilled over into many other fields. Indeed, so powerful is its continuing influence that much of social science, and especially economics, remains under its spell.

So deep and widespread was the conviction attached to this onto-epistemic framework that no area of enquiry was considered beyond its ken. It is to this issue that I now turn.

4. Impact on Social Sciences and Economics in Particular

The relatively novel attitude to scientific study, as described in the preceding section, promised to revolutionise human understanding of not only the world, but the universe in its entirety (Ackoff 1993). The potential for Newtonian mechanics to predict the movement of celestial bodies with mathematical precision and accuracy suddenly appeared to penetrate the shrouds of mystery that previously cloaked the determination of these occurrences. Moreover, the application of Newton’s principles to a wider range of phenomena (see Newton 1687/1934: xviii), if successful, would signify that humanity had finally discovered the keys to unlock the mysteries of nature and even manipulate the universal laws that drove it. The material benefits that it would yield to humankind would be unprecedented.

Physics became the crowning glory of all scientific learning. Classical Physics, as developed and refined all the way from Descartes to Newton, had fully matured into a science

par excellence. With its capacity for predictive power and universal communicability through the language of mathematics (i.e. differential calculus), it epitomised the model of an exact science (Capra 1982; see also Barrow 1991, 2007). Consequently, it began to enjoy a prestige that was unrivalled by any of the other fields of knowledge. Accordingly, a hierarchy of sciences was declared, with Newtonian astronomy at its apex, to reflect “the different stages of development of the various sciences” and the trajectory they needed to follow to reach higher levels of scientificity (Henderson 1994:485; see also Ward 1898). The Newtonian laws of motion were embodied within science itself so that they were used to describe the very nature of cause and effect relationships.

The predictive power unleashed by the new physical sciences attracted the attention of many leading intellectuals of the time. The idea soon gained currency that all of life, including living organisms, could be explained in mechanistic terms, and a culture of “Newtonianism”¹⁶ rapidly spread to other areas of learning (Randall 1926; Dobbs & Jacob 1995). From Hobbes to Locke and then to Hume (in political theory), from Comte to Hegel and Marx (in sociology), from Hartley to Wundt, Watson, and Skinner (in psychology), and from Harvey to La Mettrie (in medicine), all subscribed to and adopted Newtonian principles in their diverse fields of enquiry (Merchant 1980; Capra 1982; Turner 1987; Sorell 1993). The adoption of the Newtonian metaphor, with its associated body of terms such as “forces”, “regularity”, “uniformity”, “stability”, “equilibrium”, and “balance”, in their writings are all reflections of the pervasive influence of mechanical thinking (Toulmin 1998). As McClelland (1996:314) suggests, “in the Enlightenment, everybody wanted to be the Newton of the social sciences”.

But it is economics, of all the social sciences, that most ardently and comprehensively embraced the model of rational mechanics (i.e. physics) as the idealised science to be emulated (Hamilton 1953; Georgescu-Roegen 1971; Hosseini 1990; Boldeman 2007; Ma 2007; Drakopoulos 2016; see also Nelson 2001). All the way from the classical economists through to the founders of the Marginalist movement and those that subsequently furthered their agenda, one finds that economic theory was impregnated and fully laden with Newtonian ideas. At the ontological level, just as Newton’s cosmos was fine-tuned by

¹⁶ See Louth (2011) for the almost prophetic reverence accorded to Newton by his peers for his scientific contributions.

universal constants, with celestial and terrestrial bodies reacting to the lone force of gravity, so too was the economic sphere, calibrated by its own constants of rationality and market structure, driven by the singular force of self-interest (Hamilton 1999, see also Skinner 1979; Blaug 1980). In striking similarity, Smith, Malthus, and Mill, and those that came after them during the 19th Century, all used the same ontological categories of physics to describe corresponding concepts and phenomena in economics (Cohen 1994; see also Tieben 2012). Embedded within their writings was thus a clear commitment to a mechanical conception of a social universe in parallel to the physical one (Gordon 1991; Keita 1992, see also Knight 1956; Overman 1988).

The mechanistic-materialistic metaphor and imagery of classical physics was extended and pressed even further into economics when notions of market “forces”, “tendencies”, the “self-adjusting mechanism” of supply and demand, “stable equilibrium”, etc., became entrenched within the economic nomenclature. Lest it be misunderstood, this was not done merely for heuristic purposes à la Friedman (1953). In the major works of those who laid the foundations of neoclassical economic theory, such as Jevons (1878/2008), Walras (1874/1969), Edgeworth (1881/2014), and Pareto 1906/1971), one easily recognises the resolve of these scholars to develop the discipline along the lines of the physical sciences. This was due to their unflinching belief in the inherent similarity between the two domains. As Walras (1874/1969:71) wrote, “this pure theory of economics is a science which resembles the physico-mathematical sciences in every respect”. Pursuant to this epistemic conviction, economic phenomena were increasingly described within the narrow framework of rectilinear causal relations,¹⁷ and psycho-social processes and relationships were likewise reduced to quantifiable nexuses of utility and monetary measures alone.

This almost dogmatic-like belief in the equivalence of the two realms (i.e. the economic and the physical) went so far that “some economists – Jevons, Walras, Fisher, and Pareto, among them – alleged that their equations were identical (or very nearly identical) with those of rational mechanics” (Cohen 1994:62). As Mirowski (1989:4) reiterates, “the further one digs, the greater the realisation that the neoclassicals did not imitate physics in a desultory or superficial manner; no, they copied their models mostly term for term and symbol for

¹⁷ As opposed to circular causal relations (see Section 7 below).

symbol". Even beyond the micro-economic domain, by asserting that the (macro) economy is ineluctably driven by certain fundamental forces towards a given or deterministic end,¹⁸ Marxian and Keynesian economics are also alleged to reflect a similar allegiance to a mechanical framework (Brown 1972; Fay 1975; King 1994; see also Latsis 1972).¹⁹

By the end of the Marginalist Revolution, economic theory was so utterly "bowdlerised [by] nineteenth-century physics" (Mirowski 1984:377) that a human being, as a complex and multi-dimensional person, was reduced to a simple, one-dimensional automaton. In the process of this transmogrification, individuals were stripped of almost every feature that defined their humanness; by virtue of the remaining vestiges of them being living beings, they could barely be distinguished from the rest of the animal kingdom. Lamenting this state of affairs, Veblen (1898) eloquently described this newly-invented creature, *homo economicus*, in the self-same jargon of its originators. He thus wrote:

In all the received formulations of economic theory... the human material with which the inquiry is concerned is conceived in hedonistic terms; that is to say, in terms of a passive and substantially inert and immutably given human nature. The hedonistic conception of man is that of a lightning calculator of pleasures and pains, who oscillates like a homogeneous globule of desire of happiness under the impulse of stimuli that shift him about the area, but leave him intact. He has neither antecedent nor consequent. He is an isolated definitive human datum, in stable equilibrium except for the buffets of the impinging forces that displace him in one direction or another. Self-poised in elemental space, he spins symmetrically about his own spiritual axis until the parallelogram of forces bears down upon him, whereupon he follows the line of the resultant. When the force of the impact is spent, he comes to rest, a self-contained globule of desire as before (Veblen 1898:389–90).

5. Economic Science Reaches Full Consummation

The ambition to cast economics within the framework of a physicalist-cum-naturalist science received a further boost during the first few decades of the 20th Century. This period was marked by a crusade that was painstakingly pursued by the logical positivists to unify all

¹⁸ I.e. by obeying natural and universal laws through the operation of causal mechanisms within a reified structure.

¹⁹ That Marx and Keynes were committed to purely physicalist causal explanations is, however, disputed by Mirowski (1992) and Drakopoulos & Torrance (1994), respectively.

knowledge, including the social sciences, under one homogenous system of laws, and exclusively in the language of physics (Carnap 1934, 1981; Hanfling 1981). Unsurprisingly, mainstream economists wholeheartedly embraced the logical positivists' campaign, for it bolstered their own agenda of the scientification of economics (Mahomedy 2016a). Leading economists were co-opted into the positivists' programme (see Buchanan 1959; McCloskey 1985; Caldwell 1994) so that as its domain of influence grew, economics was increasingly steered towards becoming more empirically-oriented like the other natural sciences.

These developments were to have significant implications for economics, several of which are discussed in detail elsewhere (see Mahomedy 2016a, 2016b). For the purposes of this paper, what is noteworthy is that the circumscription of the *explanantia* of economic phenomena to observable and/or quantifiable attributes only meant that they had to be completely explained vis-à-vis “complexes of physical laws” alone (Drakopoulos and Torrance 1994:183; see also Hempel & Oppenheim 1948; Latsis 1972; Hodgson 2007)). This reduction of human behaviour to materialist causes strengthened a version of causality that had already been initiated by Mill in the early 19th Century (see Blaug 1980), and consequently, served to entrench the deterministic paradigm for economics. A further and significant implication of this determinism (see Mill 1843/2008) was the notion that economic “laws” so derived were universally applicable and generalisable across all societies and cultures of the world.²⁰

With the onset of the Keynesian Revolution of the 1930s and the advent of macro-economics subsequently as a sub-field of economic study, one might have hoped for a new paradigm to emerge which took into account the greater complexities and nuances associated with economic phenomena. But by this time, the discipline was so deeply entrenched within physicalism that it continued to prevail as its dominant onto-epistemic framework. Methodological individualism thus still remained the sole basis for economic analysis. But the need to formulate macro-economic and social policy, particularly after World War II, became acute (see Kendall 1950). In response, ME simply extended the additivity and linearity theses of mechanistic philosophy to social phenomena (see Mill 1843/2008),²¹ and

²⁰ This principle was indeed the execution of the Enlightenment's “general attack upon the differentness of men” and the imposition of its “pervasive philosophy ... [of] uniformitarianism” (see Lovejoy 1948: 79-81).

²¹ Mill (1843/2008: bk.3, Ch.6) referred to this as the principle of the “Composition of Causes”.

assumed that the rational economic choices of individual agents could be linearly aggregated to arrive at societal preferences.²² But this notion too, was hardly novel: it was rooted in the earlier 18th-century Benthamite assertion that

the community is a fictitious body, composed of the individual persons who are considered as constituting as it were its members. The interest of the community then is, what? — the *sum* of the interests of the several members who compose it (Bentham 1780/1879:7).²³

On this view of economic and social reality, macro-entities, notwithstanding their degrees of complexity, were viewed simply as a “click-together” of their apparently separable constituent components. It provided the basis for the dictum that “the behaviour of economic systems, economies, markets, industries, firms, unions, and other collective entities are to be explained by appeal only to the behaviours of their parts” (Rosenberg 1995:358). For analytical purposes, therefore, when transiting from the micro to the meso to the macro scales, the self-same properties were deemed to be equally valid and operable across the spectrum. There was no scope within this framework for emergence or new symmetries to arise. Once again, the whole was strictly equal to the sum of its parts. This methodological individualism has ever since remained a most sacred analytical principle in mainstream economic thought (Gordon, 1991; Dupre, 2001; Kittel, 2006; see also Udéhn 2001; Hodgson 2007). It is clearly manifested by the widespread demand for macro-economic theories to be grounded within the micro-foundations of neoclassicism, despite the intractable problems encountered in doing so (see Lucas & Sargent 1981; Blanchard 1987; King 1994; Mahomedy 2016b).²⁴

When all of these various ideas merged together to establish for economics its “scientific research programme” à la Lakatos (1978), it imposed on the discipline what Latsis (1972) refers to as “situational determinism”: a scenario in which decision making is constrained by assumed circumstances and regulated only by the principle of rationality (see also Popper

²² See also Mäki (2001) and Hausman (2001) for a further discussion of this issue.

²³ See also Nozick (1974).

²⁴ This outcome, however, is not surprising, for in this process of linear summation, there was no scope for emergent properties, recursivity, or accommodation for organisational dynamics. As a result, any kind of interaction, integration and processual change among agents and between themselves and social structures and institutions (see below), remained distinctly absent.

1945). Not surprisingly, it readily lent itself to an examination of economic behaviour using a closed-systems approach in which deterministic models with all of their attendant contraptions of linear causality, marginalism, optimisation, static equilibriums, etc., were to dominate. Within such a scheme, no explanatory role whatsoever could be attributed to the psycho-social persuasions of economic agents, to the underlying structure of phenomena or institutions, their inner relations or internal dynamics, to circular causality, endogeneity, or process-oriented outcomes. All of these elements were walled off from economic considerations and considered trivial for analytical purposes (see Popper 1945). To achieve methodological tractability, the system was completely sealed so that all exogenous influences were to have strictly no recursive relations (i.e. feedback loops) with those from within. In this way, the link between ontology and epistemology became so closely tied-in that if either was abandoned the other would be left hanging in the air.

Despite the acceptance of this paradigm by the majority of economists for most of the 20th Century (see Hodgson 2007), to what extent was it able to capture reality and serve the needs of the discipline? For example, is human economic behaviour, individually or collectively, as deterministically predictable as other physical systems are purported to be, and ineluctably driven only by the impulse of self-interest? Is there no place for free will, intent, creativity, teleology or moral choice? Is it realistically conceivable that an individual's context, i.e. one's habits, norms, cultural and political values, etc., has only a peripheral influence, if at all, on one's choices and decisions? If so, how does one account for the complex mix of psycho-social elements that motivate action, and hence the observation of enormous variation in human behaviour even within a given social order? Is it even possible then, to describe or explain the totality of human experience vis-à-vis economy using a narrowly defined set of measurable parameters such as utility and monetary units alone?

Few economists today, apart from those still beholden to neoclassicism, would deny the relevance of these issues for their discipline. In fact, even fewer social scientists generally, would marginalise them as easily as some of their counterparts from economics have done. Why then, did the economics profession find it expedient to discredit these non-physicalist explanatory variables from their models, and so single-mindedly pursue their programme of slavishly imitating the physical sciences?

Capra (1982) and Mirowski (1989) are convinced that it was the allure of an “exact” science like that of physics which the economists wished to emulate for their discipline; that physics was *the* role model of science and hence economics had to be moulded along its lines to lay claim to its scientific status. Lawson (1997, 2003) and Blaug (1997) similarly argue that it was the obsession with mathematics that led ME in the direction that it followed. Rosenberg (1995) and Toulmin (1998) maintain that it arose from a metaphysical commitment to nature, including the human social order, being in a state of equilibrium, changelessness, and stability.²⁵ More recently, Nobel laureates Stiglitz (2002) and Krugman (2010), among others (Solo 1975; Dasgupta 1985; Heilbroner 1988), have insinuated that the broad contours of ME were subliminally shaped by ideological and political considerations, and masked as such under the pretext of aspiring for scientificity.²⁶ Whatever the motivations, the implications for the discipline, as described above, have been most profound, and are fully discussed elsewhere (see Mahomedy 2016a, 2016b).

Having expounded upon these fundamental onto-epistemic principles of modern science and its surrogate, ME, I will now draw in broad brush-strokes the core elements of the Islamic worldview and what it implies for Muslim scholars who wish to erect a scientific enterprise on its terms and postulates. I will again particularise this discussion to economics, and then conclude by elucidating to what extent, if any, IE could be subsumed within ME.

6. Worldview of Islam

Islam has at its core, the overarching and deeply embedded reality of the Oneness and Unity of God (*Tawhid*, in Arabic), The Most High. This precept of Oneness, however, is not confined (in its understanding and application) to God’s Divine Essence, the absoluteness of His attributes, or His right to be exclusively worshipped, as commonly (mis)understood. On the contrary, though God, in His Divine Being, remains distinct from the rest of existence, His attributes are reflected onto the created domain of what is termed “everything” (see Barrow 2007), so that His monotheistic law is ingrained in all of creation. In the coming to

²⁵ As Toulmin (1998:347) implies, economists fell prostrate before “the idol of stability”.

²⁶ These ideological and political motives continue to lie concealed beneath the assumptions of models presented as if they were mathematical truths.

existence of everything by God's Command (alone),²⁷ there is likewise, nothing in the heavens or the Earth except that it obeys and submits to His Will.²⁸

Against the background of the above, the Qur'an²⁹ unequivocally asserts in several verses how the cosmos and everything within it, down to the minutest particle, in "recognising" *Tawhid*, incessantly declares God's Glory and celebrates His Praise.³⁰ This conscious recognition of the Oneness of God and its manifestation in the created order, both within and without, in fact, constitutes the *raison d'être* for all of existence. In the fulfilment of this purpose, God, therefore, not only creates what is, but He equally sustains all life forms in a manner that is decreed by Him alone.³¹ That matter and reality could enjoy such a higher purpose and teleology stands in direct contrast to the modern scientific notion of matter as dead and inert; of life as nothing more than a struggle for survival amidst scarcity; and of an aimless universe regulated only by physical forces that would eventually coalesce and lead to its destruction into nothingness.

Of all of God's (observable) creation, human beings, as His Vicegerent on Earth,³² are uniquely endowed with the faculties of intellect, foresight, and creative knowledge.³³ Consequently, and unlike any other, they are able to exercise their free will in the choices they make, and then consciously strive towards the fulfilment of their goals.³⁴ But in so doing, this worldly life should never be pursued as an end-in-itself, but as the means towards attaining the everlasting felicity of the Hereafter.³⁵ The temporal and the eternal are, however, not viewed as contesting domains in which either has to be renounced for success in the other. In this, Islam is perhaps the most secular of all religions, for the outcomes in the Hereafter depends critically on the extent to which people recognise and actualise within their consciousness and *worldly* endeavours, the Oneness of God i.e. *Tawhid*.³⁶ They are

²⁷ Al-Qur'an (Ch.36: V.82).

²⁸ Al-Qur'an (Ch.3: V.83).

²⁹ The final Divine Book of Revelation sent down to God's Last Prophet, Muhammad (Peace be upon him).

³⁰ Al-Qur'an (Ch.16: V.48-50, Ch.17: V.44, Ch.22: V.18, Ch.24: V.41).

³¹ Al-Qur'an (Ch. 15: V.21)

³² Al-Qur'an (Ch.2: V.30, Ch.33: V.72).

³³ Al-Qur'an (Ch.2: V.34, Ch.76: V.2-3).

³⁴ Al-Qur'an (Ch.18: V.29).

³⁵ Al-Qur'an (Ch.87: V.16-17).

³⁶ Al-Qur'an (Ch.51: V.56).

guided to this fulfilment through the agency of Revelation and Prophethood³⁷ that God had periodically authorised to, and for, the different nations of the world.³⁸

From this privileged position of knowledge and choice vis-à-vis the rest of the created order, humans, both individually and collectively, are empowered to become the masters of their own destinies. In electing to enjoy temporal control over much of God's creation,³⁹ they have to bear a weighty responsibility for how they exercise this vicegerency granted to them. Notwithstanding the burden of this accountability in the Hereafter, the Qur'an points out repeatedly that even in this world, the human condition within the broader environment is in large part a consequence to the choices and deeds that people execute.⁴⁰ On this view, the kind of strict determinism asserted by the physicalist theories of modern science, and embraced by modern economic theory, is therefore altogether rejected by Islam, for it implies, in the ultimate, a denial of choice, self-determination, and accountability.

To facilitate humanity's earthly sojourn towards its permanent abode in the Hereafter, God has produced and made amenable for its beneficial use all that it finds freely available in the environment.⁴¹ Not only did He then confer upon humankind the exclusive "empire over nature" (see Leibniz 1699 as cited in Hall 2002),⁴² but He also vested humans with the knowledge and skills to mould and re-fashion these natural resources into forms suitable for their purposes.⁴³ These bounties of God, though plentiful and in abundance,⁴⁴ are to be used judiciously.⁴⁵ The "world out there" thus has additional meaning and conveys yet a second important purpose and objective: to serve human fulfilment in the good things of life.⁴⁶ Humankind's existence from beginning to end is, consequently, integral to the rest of creation

³⁷ All the prophets from Adam to Noah, Abraham to Ishmael and Isaac and through Moses, David, Jesus and finally Muhammad, including some other prophets, (May the Peace of God be upon them all) are recognised as such in the Islamic Faith, and similarly so, with regard to the Revealed books such as the Torah, The Psalms, the Bible and finally, the Qur'an.

³⁸ Al-Qur'an (Ch.10: V.47).

³⁹ Al-Qur'an (Ch.33: V.72).

⁴⁰ Al-Qur'an (Ch.6: V.44; Ch.30: V.31; Ch.42: V.30)

⁴¹ Al-Qur'an (Ch.2: V.29).

⁴² Al-Qur'an (Ch.14: V.32-33).

⁴³ Al-Qur'an (Ch.16: V.80-83).

⁴⁴ Al-Qur'an (Ch.14: V.34, Ch.16: V.18).

⁴⁵ Al-Qur'an (Ch.17: V.27, Ch.25: V.67).

⁴⁶ Al-Qur'an (Ch.7: V.32).

in terms of both means and ends.⁴⁷ Because of this strong value-orientation, the ethical implications are extensive and therefore need to be deeply embedded within materiality itself.

But apart from the centrality of knowledge in the God-man-nature nexus described above, there is an even more profound way in which the ontology of Islam differs from that of modern science, and directly links with its epistemology. By this is meant that the Grand Design of the entire universe reveals itself as a deeply interconnected and unified reality, what may be termed as *Tawhidi* phenomenology. At all levels of existence, within and between the human and non-human domains, there appears a vast network of intra- and inter-systemic connections that link these world-systems together (Wilson 1999; Capra 2003, 2014; Choudhury 2004). These occur through complementary relationships⁴⁸ and intricate linkages that reflect a systemic unity across the continuums of both time and space, in all of the created order. Given this, the constituent elements of reality cannot exist as discrete and independent units as claimed by the atomistic theories of modern physicalism (see Dilworth 2007), nor as organisms, individuals, or polities gripped in a fierce struggle for survival à la Darwinism and Marxism (see Campbell 1987; Resnick & Wolff 1987). On the contrary, they cohere together to form an integrated, symbiotic, and organic whole. For otherwise, how would it be possible for all of the sub-systems within the larger framework to function with such consilience, harmony, and sustainability, and not degenerate and breakdown into utter chaos?

From the above, we also understand why the monotheistic law of unity blends so seamlessly with its epistemology. *Tawhid* over-arches and pervades the entire spectra of the socio-scientific domains, such that it manifests itself at all levels of micro, meso, and macro perception. As God declares in the Qur'an

We will show them Our Signs in the universe, and within their selves, until it becomes evident to them that it is the truth. Is it not sufficient for you that your Lord witnesses all things? (Al-Qur'an: Ch.4, V.53).

⁴⁷ As God has decreed, this worldly existence is but for an appointed term (Al-Qur'an: Ch.35, V.13), after which it will perish completely (Al-Qur'an: Ch.55, V.26) and be recreated in a different form (Al-Qur'an: Ch.14, V.48), which would then usher in the realm of the everlasting Hereafter.

⁴⁸ Al-Qur'an (Ch.51: V.49).

and again

Verily in the heavens and the earth ... And in the creation of yourselves and the animals that are scattered forth, are Signs indeed... And in the alternation of night and day, and in the sustenance that God sends down from the sky, and revives therewith the earth after its death, and in the change of the winds are [sure] Signs for a people who have intellect. (Al-Qur'an: Ch.45, V.3-5).

Within such a scheme, for all of this to hold together, God, though ontologically distinct from, and absolutely independent of, creation, continuously interacts functionally, omnipotently and creatively within the complexities of universal life (al-Attas 1986; al-Ghazali 1997; Choudhury 2011).⁴⁹ Its import for epistemology is of great significance: it means that complementary to the Scripture of Revelation, the *Scripture of Creation* equally affords to humankind the opportunity to recognise and behold the Oneness of God and His Sublime Attributes (see also Paine 1880).⁵⁰

7. Implications for Islamic Science (and Economics)

An ontology premised on the conception of a theocentric and organically unified reality, as described above, means that its epistemology might look vastly different to an anthropocentric one, which, when merged with the atomistic and mechanical framework of modern science, finds little accommodation for a transcendental Higher Being. Consequently, any endeavour to erect a scientific enterprise has to take into account these contrasting points of departure, i.e. it has to ensure that its conceptual framework is complementary and apposite to its onto-epistemic worldview. The implications are therefore significant for the kind of IE that might then evolve from such a paradigm.

Fundamentally, because Islam rejects the notion of an inherent conflict between the temporal and the eternal (i.e. the *this*-worldly and the *other*-worldly) that has emerged from the rationalist philosophy of modern science (see Mahomedy 2015), Islamic science requires an integrative approach that is able to transcend this sharp dichotomy. It has to develop its basic concepts and categories (see Berlin 1978) in way that completely sidesteps all of the

⁴⁹ See Al-Qur'an (Ch.22: V.65, Ch.35: V.27, V.41).

⁵⁰ See Al-Qur'an (Ch.3: V.190-191).

spurious bifurcations that have always bedevilled rationalist thought. It has to cautiously manage this process to ensure that it does not become entrapped by the whole gamut of dualisms that have swamped the onto-epistemo-phenomenological domains of contemporary human experience (see Mahomedy 2016c). It is only then that its themata will cohere with its related axioms so that all subsequent thinking and reflection can evolve and develop in a consistent and cohesive manner. There will otherwise always remain an insurmountable disjuncture between the objectives of any discipline within Islamic science and the processes involved in trying to achieve them.

Given the need for such a unitary approach, it is imperative for Islamic scholarship to employ a process-oriented methodology that spans across all the realms of socio-scientific analysis. Such a methodology that sequences from the Primal Ontology of *Tawhid* a corresponding epistemology (i.e. unity of knowledge) that then projects itself likewise onto the phenomenological (i.e. experiential) world of unified reality. Whilst the actual dynamics of this approach are discussed in greater detail elsewhere (see Mahomedy 2016a, 2016b), how these processes unfold and feed into one another may be described briefly using the following figure:

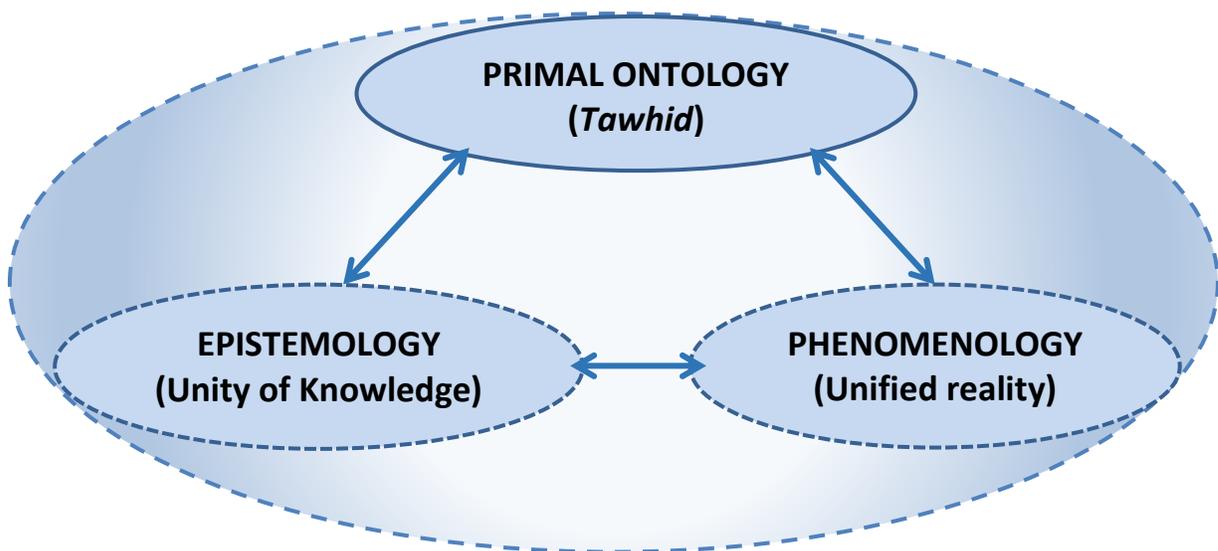


Figure 1: The Unitary Methodology of *Tawhid*

Firstly, it is critical to note that the outcomes of the unitary methodology depicted above are neither static nor idealistic; rather, they are viewed as a multi-stage, circular process in which there is a gradual progression towards the attainment of the desired objectives. This occurs through an evolutionary process of continuous and recursive steps of learning and doing that begins with, and returns to, the Primal Ontology. Consequently, this inter-causality takes place over ever-widening knowledge, space, and time dimensions; in Figure 1, the domains of epistemology and phenomenology, and the methodological framework itself, are indicated with broken lines to denote the potentiality for this continuous expansion to occur through the realisation of complementary relations.⁵¹ Note, however, that the Primal Ontology of *Tawhid*, the Knowledge of which is encapsulated in the Qur'an as the "Store-House of All Knowledge",⁵² remains absolute and fixed, and hence not subject to change;⁵³ it is thus symbolised as a fixed line in Figure 1 above.

Secondly, at each phase during the process (of any issue under study), an assessment is required of the extent to which *Tawhid*, i.e. unification (between the variables of interest), has been achieved. This entails, via circular causal relations, an evaluation of these states of learning and doing with reference to the Primal Ontology. This subsequently sets in motion a second round of learning (epistemic), doing/actualising (phenomena), and re-evaluating once more, and the cycle thus continues on recursively *ad infinitum*. It may be described as follows: Process 1 of evolutionary learning: {Primal Ontology (PO) → Epistemology (E) → Phenomenology (P)} → Process 2: {PO → E → P} → Process 3: {...} → repeat, etc. This general systems methodology is actuated by invoking the relevant Qur'anic verses, the Prophetic tradition (*Sunnah*, in Arabic), and scholarly discourse (*Shura*, in Arabic) on the issue at hand, all of which are appropriately navigated through the use of reason and observation.

The third notable feature of the framework is that it ought to be capable of explaining both the particular and the universal, and account for the dynamics that arise when transiting from

⁵¹ Contrarily, in the case of "de-knowledge", contraction and diminution of these spaces occur due to atomism, individuation, and competition (see Choudhury 2000, 2008b).

⁵² The Qur'an (Ch.85: V.22) thus describes itself as being "(Inscribed) in a Tablet Preserved" (*Al-Lauh-al Mahfooz*, in Arabic).

⁵³ This, of necessity, has to follow, for, as we recall, God's Being and His Knowledge are Absolute, and hence Exogenous to the process.

the “one-to-many”, and in reverse likewise, from the “many-to-one” (see Polanyi 1968; Georgescu-Roegen 1971; Anderson 1972). In this way, learning also becomes interactive, integrative, and participatory within a unified model that allows for multi- and inter-disciplinarity and connectedness, both horizontally and vertically. Nonetheless, as Choudhury (2006) reminds us, this does not mean that different problems cannot be studied and dealt with by institutions and systems specifically designed to address them. Oftentimes, it may even be desirable for this to happen, but in so doing, each sub-system must consider the feedback that flows into and out of all of its related systems. It is through this continuous process of evolutionary learning, in which the a priori and a posteriori modes of intellection integrate, that humans may comprehend with ever-increasing degrees of certainty and clarity the network of relationships that interconnect issues and problems.⁵⁴

That human life, nay, all of creation exists within such an organismic whole, and which therefore requires a holistic approach to comprehend its reality, brings into sharp focus the very notion and validity of drawing sharp disciplinary boundaries between different areas of learning. Activities, both human and non-human, in the real world do not occur as isolated or discrete moments of events, each separated spatio-temporarily from the other. Any authentic understanding of them therefore cannot be arbitrarily divided into watertight compartments marked “economics”, “sociology”, “psychology”, “anthropology”, etc. They have to be seen as part of the larger whole. As the Nobel laureate economist Gunnar Myrdal concluded:

I came to see that in reality there are no economic, sociological, psychological problems, but just problems and they are all mixed and composite. In research the only permissible demarcation is between relevant and irrelevant conditions. The problems are regularly also political and have moreover to be seen in historical perspectives (Myrdal 1979:106).

Economics, perhaps more than any other social science, reflects this multi-disciplinary character, and classical Islamic scholarship was most keenly aware of this

⁵⁴ For additional details of the actual dynamics of this process of unity of knowledge, see the other papers in this series (Mahomed 2016a, 2016b). For full textbook treatments, see also Choudhury (2000, 2004, 2006, 2011, 2013, 2014).

interconnectedness. Consequently, in all of the earlier writings,⁵⁵ economic issues were always examined as a subset within the unified social and moral philosophy of Islam (Chapra 1996). Any contemporary revival of Islamic science or economics would thus also have to carefully re-consider the utility, if any, of maintaining current academic disciplines. In all likelihood, these artificial boundaries may blur and disappear altogether, eventually coalescing to form super-disciplines that better capture and explain the totality of experience of real-world phenomena.

If, as pointed out earlier, all of creation has a transcendental link and its purpose is intrinsically related to humankind and its destiny, then morality, values, and ethics play a central role within the framework of the Islamic knowledge enterprise. It was this very value system which sparked and sustained the phenomenal rise of science during the early periods of Muslim history (Kettani 1984). Islamic economics, therefore, has to explicitly and unapologetically serve and promote the values of its worldview (see Manzoor 1991; Sardar 1988). The Islamic economists need not feel isolated in doing so, nor assume that it will compromise the integrity of their intellectual efforts; leading mainstream economists have now long recognised that the fact-value distinction upheld by some of their counterparts simply cannot be defended even on logical grounds. Consequently, for most of the last century, they have inveighed against the value-neutrality thesis asserted by modern economic theory (see Souter 1933; Hutchison 1938, 1964; Schumpeter 1949; Myrdal 1958, 1972; Robinson 1962; Hodgson 1983, 1988; Heilbroner 1988, 1996; Lawson 1997, 2003; Mongin 2006; Hands 2012).

But more importantly, as Choudhury (2011:156) argues in the case of IE, its moral law and ethics have to be “organically functional and endogenously embedded” within the general system of causal relations from which they are derived and within which they logically operate. Without this relational reference, these ethical imperatives will remain isolated from its fundamental premise of *Tawhidi* Oneness, and, as a result, will need to be exogenously imposed with all of the associated difficulties this entails. The inability of IE, in its current form, to translate its ethical framework into a viable practical model through

⁵⁵ Islahi (2005) has undertaken an encyclopaedic review of not only the role and impact of medieval Muslim scholars in Islamic economic thought, but also their influence in the evolution of mainstream economics itself.

Islamic finance exemplifies this assertion (see Mahomedy 2016b:31-33). Within the *Tawhidi* epistemological framework, on the other hand, the moral law as derived from Islam's textual sources will guide human behaviour through the discursive processes of learning, doing, and evaluating, as discussed previously.⁵⁶

The last distinguishing feature of Islamic science to emerge from its ontological and epistemological roots is the explicit recognition of the qualitative, the unmeasurable, the unknowable, and the hidden. Several Qur'anic verses affirm these notions and phenomena, and the role they play in the outcome of worldly events.⁵⁷ The need to incorporate them into the very constitution of Islamic economic thought is inevitable if one wishes to uncover and appreciate the richness, complexity, and dynamism of factors that continuously interact and integrate in the real world. It responds to the call for greater inclusivity of different modes of methodological enquiry (Anees 1984; Tebes 2005), recognises the multidimensional world of nature (Ford 1984), factors in the indelible influence of habit, culture, and history in explaining especially economic behaviour (Hosseini 1990; Zaman 2013), and explicitly acknowledges that our knowledge of the world will always remain imperfect and incomplete.⁵⁸

The admission of these qualitative and/or non-observable variables should not provoke concern that Islamic economics will degenerate into the occult, anarchy, or dogmatism. Nor does it imply that it will necessarily lose all sense of objectivity. The value system that underpins the Islamic faith will prevent this outcome and thus helps to assuage any concerns in this regard. The Islamic sciences may still be as "objective" and "rational" as the secular sciences, though it would draw its legitimacy and authenticity from a different philosophical base (Nasr 1976). As Sardar (1985:38) clarifies, "Islamic science is subjectively objective; that is, it seeks subjective goals within an objective framework". Furthermore, contemporary pioneers and leaders in this field such as Choudhury⁵⁹ have adequately demonstrated through rigorous methodological and logical formalism how the *Tawhidi* knowledge-centred

⁵⁶ So crucial is the role of ethical behaviour in even the this-worldly felicity of human beings, that their external environment and the conditions that prevail therein are in large part a reaction and response to the choices that they make in this regard (see Al-Qur'an: Ch.30, V.31).

⁵⁷ See, for example, Al-Qur'an (Ch.18: V.7; Ch.2: V3; Ch.74: V31)

⁵⁸ See Al-Qur'an (Ch.2: V.212; Ch.2: V232; Ch.17: V85).

⁵⁹ See the list of references for some of his works.

worldview, applied to diverse socio-scientific systems, can yield results that are intellectually acceptable and rationally satisfying.

Lastly, that Islamic economics could have its onto-epistemic framework premised on a distinct worldview is not unique, nor does it militate against the aims of economic enquiry. Modern economics, in all its shades and varieties, whether of its classical-neoclassical, Keynesian or Monetarist, Marxist or Institutionalist types, are all value-laden and ideologically or politically driven (see Mahomedy 2016a). They are predicated upon implicit (and sometimes explicit) sets of presuppositions, rarely acknowledged or even recognised as such by their proponents. These presuppositions are not arbitrarily selected nor chosen on the basis of any neutrally-objective criteria. Though often cloaked in the garb of positivist science, the various schools of economics actually serve a distinct agenda, a point emphasised quite convincingly by Schumpeter (1949), Myrdal (1958), Robinson (1962), Dasgupta (1985) and Heilbroner (1988, 1996).⁶⁰

As this paper demonstrates, even the modern physical and natural sciences, beneath their veneer of a purely empirical enterprise, adopt a set of metaphysical assumptions.⁶¹ These are unavoidable for science, for they provide a platform, as it were, upon which intellectual enquiry proceeds and advances, and consequently they blend in with its methodology to establish for it its conceptual paradigm (Burt 1932; Weber 1949; Wittgenstein 1969; Safi 1996; Smith 2003, 2006; Dilworth 2007; Mahomedy 2016d). Clearly then, no scientific quest may ever rightfully claim to be devoid of any subjective elements or presuppositions.

8. Turning Full-Circle and Concluding Remarks

This paper begins by alerting the reader to the growing crisis in the economics discipline, and the attempts by Muslim economists to overcome some of its limitations by crafting their own field of enquiry. They set out to accomplish this task by injecting within the neoclassical framework some of the ethical values of Islam, which they believe(d) was the only missing

⁶⁰ Even Friedman (1953:3-4) was forced to acknowledge in this respect: “Laymen and experts alike are inevitably tempted to shape positive conclusions to fit strongly held normative preconceptions and to reject positive conclusions if their normative implications - or what are said to be their normative implications - are unpalatable”.

⁶¹ These epistemological and ontological presuppositions are rarely acknowledged, less so subjected to critical scrutiny by the scientific community (see Smith 2003).

dimension in ME. When their discipline began to take shape during the 1970s and 1980s and even prior to those formative years, there was hardly any constructive engagement about the ontological and epistemological imperatives that a project of this magnitude required.

The above neglect occurred because the Islamic economists, by and large, discounted the need to interrogate the underpinnings of modern science, on the assumption that they were value-neutral and amenable to their project. They ignored early warnings that they risked failure by overlooking this important first step in the process of Islamising their discipline. Though they now concede that their agenda has not accomplished its goals, they are still not entirely convinced of the need to go as far as having to formulate an onto-epistemic framework distinct from that of ME. That the Islamic economists considered (and in some cases, continue to insist that) this issue (is) irrelevant for their project is indeed surprising. For well over a century, their counterparts, in the form of various heterodox traditions (see Lawson 2006), have disparaged ME for its myopic view on human nature, and the methodology developed to study economic choices and outcomes predicated on its assumptions.

To bring these issues to the fore vis-à-vis the Islamic worldview, I first trace the origins of the key principles of modern philosophy and explain how they have shaped modern science and its disciplinary off-shoots, particularly economics. I then show how each of its physicalist doctrines, in the form of materialism, mechanism, atomism, and determinism have had an indelible impact on economic science. As a result, a closed-system ontology, regulated only by the principles of marginalism, optimisation, and static equilibria, was served as the staple diet for all economic thinking and analysis. The system was held together by the covering law of rationality, which, in itself, had to be buttressed by the supporting hypotheses of full information, perfect markets, strict exogeneity, and non-recursivity.

As the labyrinth of all of these onto-epistemic assumptions piled upon one another, the subject matter of economics and the methodology adopted for its study were circumscribed to satisfy a narrow set of observable criteria. As measurement and the mathematisation of economics increased, the profession discarded other non-quantitative variables from its analytical toolkit. In the process, economic science became far detached from real-world phenomena. Its adherence to methodological individualism further hindered its capacity to

formulate effective social and economic policy. The discipline lost its relevance and is currently unable to unhitch itself from its complex mix of unrealistic assumptions without fundamentally altering its paradigm. Despite the pressing need to re-orient itself, there is strong resistance from the profession to undertake any radical change to the status quo. This refusal to acknowledge the structural problems within the discipline is rapidly developing into a *problematique*⁶² for society more generally.

I then juxtapose these key features of modern science and economics against the *Tawhidi* worldview of Islam. I illustrate how Islam's vision about the nature of the world and its underlying purpose, the responsibility of human beings within this nexus, and the ultimate unfolding of this reality in the Hereafter brings it in direct contrast to the nihilist predictions of modern philosophy. The omnipotence of God in all affairs, the manifestation of His Attributes in the created order, and the key role of knowledge in bringing this reality to human consciousness weaves together the ontology and epistemology of Islam. The implications this has for the unity of knowledge that Muslim scientists, particularly the Islamic economists, aspire to achieve are profound.

The need for Islamic scholarship to adopt an holistic framework for any conception of Islamic science and economics is beyond question. I explain the broad contours of the circular causal relationships that might emerge between the primal ontology of *Tawhid*, the episteme of unity of knowledge, and its projection onto the phenomenological world. Its ramifications for inter- and multi-disciplinarity are pointed out. It was from within this multi-dimensional perspective that the issue of morality and ethics is once again introduced, and the need for it to be embedded endogenously within the system of relations justified. I finally explain why Islamic economic thought needed to explicitly accommodate qualitative and other non-physicalist variables within the purview of its analytical framework. These are integral to the ontology of Islam and therefore deserve full recognition within Islamic epistemology. Doing this appropriately need not compromise the intellectual integrity of Islamic economics; on the contrary, it would actually strengthen the links between its objectives and its methodology.

⁶² See Warfield & Perino (1999) for a fuller discussion of the relevance of this term in this context.

The above comparison between the Islamic worldview and its onto-epistemic framework with that of modern science serves to demonstrate why any attempt to transplant a disciplinary area from one to the other, without adequate consideration of the underlying issues involved, is fraught with difficulties. This is because the Modernist and Islamic paradigms of science are too distinct and divergent from each other to be reconciled harmoniously. At both the ontological and epistemological levels, their axioms are fundamentally incompatible, largely because of sharp differences in their worldviews. Not surprisingly, therefore, the very form and substance of their knowledge enterprises are unique. Consequently, their programmes and outcomes are naturally expected to differ.

The experience of IE is a case in point. For until now, most of the literature on IE, particularly by those that attempted to construct the discipline on the foundations of modern science, has produced an admixture of contradictory notions, theories, policies, and practices (see Philipp 1990; Kuran 2004; Choudhury 2008a; Mahomed 2013). These divergences in the characterisation of the discipline were bound to occur due to the application of differentiated thought processes that arise out of the rationalist epistemology of modern science (see Mahomed 2016a; 2016d). As a result, the groundwork of thought on the subject had become vitiated and the vision for a unified premise for IE remains heretofore largely unfulfilled. And this is the fundamental thrust of the argument that writers on IE have remained oblivious to; an authentic science of (Islamic) economics can only be established upon an irreducible premise that is both self-referencing and universal, so that it can explain the world as a unified macro-system including all of its micro-system parts (Choudhury 2008b).

If the Islamic scientific schema (in which economics would be but an integral component) is, as argued above, incompatible with modernist science, does it necessarily imply that all forms of rationality are inimical to Islam? Certainly not. The Qur'an, in fact, enjoins upon humankind in no less than 750 verses (about one-eighth of the total) to employ its perceptual and intellectual faculties to study, ponder, and reflect on nature (Abdus Salam 1989; Atighetchi 2007; see also Nasr 1968; Iqbal 2007). Consequently, rational modes of enquiry such as deduction and induction have always formed an important part of scientific enquiry and application in Islamic scholarship. The Muslim world had already many centuries prior

to the Scientific Revolution in Europe, embraced the methods of ratiocination and experimentation in scientific enquiry, which they subsequently transmitted to the Latin West (Draper 1875; Haskins 1924, 1927; Gilson 1955; Durant 1980; Bakar 1991; Lewis 2009, see also Mahomed 2015). As long as these methods were integrated within the fundamental premise of *Tawhid*, Muslim scientists were able to richly cultivate and develop the various natural and social sciences harmoniously.

References

- [1] Abdus Salam, M 1989. Scientific Thinking Between Secularisation and the Transcendent: An Islamic Viewpoint. *MAAS Journal of Islamic Science* 5,1: 133-150.
- [2] Ackoff, RL 1974. *Redesigning the Future: A Systems Approach to Societal Problems*. New York: John Wiley & Sons.
- [3] Ackoff, RL 1993. *From Mechanistic to Social Systemic Thinking*. Pegasus Communications, Cambridge, MA.
- [4] Ahmed, H 2014. Analytical Tools of Islamic Economics: Choice and the Equi-Marginal Principle. In Hassan, MK & Lewis, MK (eds): *Handbook on Islam and Economic Life*. Northampton: Edward Elgar Publishing.
- [5] Alatas, SF 2006. Islam and the Science of Economics. In Abu-Rabi, IM (ed): *The Blackwell Companion to Contemporary Islamic Thought*. Oxford: Blackwell Publishing.
- [6] al-Attas, MN 1986. *A Commentary on the Hujjat al-Siddiq of Nur al-Din al-Raniri*, Kuala Lumpur: The Ministry of Culture, Youth and Sports.
- [7] al-Ghazali, AHM 1997. *The Incoherence of the Philosophers*. Marmura ME (trans). Utah: Brigham Young University Press.
- [8] Al-Qur'an (n.d). *The Koran*.
- [9] Anderson, PW 1972. More Is Different. *Science* 177,4047: 393-96.
- [10] Anees, MA 1984. Islamic Science: An Antidote to Reductionism. *Inquiry* 1,2: 49.
- [11] Armstrong, K 2001. *The Battle for God*. New York: Alfred A. Knopf.
- [12] Asaria IM 1985. Constructing the Edifice of Homo Islamicus: The Birth Pangs of a Discipline. *Inquiry* 2,4: 28-33.
- [13] Asutay, M 2007. A Political Economy Approach to Islamic Economics: Systemic Understanding for an Alternative Economic System. *Kyoto Bulletin of Islamic Area Studies* 1,2: 3-18.

- [14] Asutay, M 2008. Islamic Banking and Finance: Social Failure. *New Horizon* 169: 1-3.
- [15] Atighetchi, D 2007. *Islamic Bioethics: Problems and Perspectives*. New York: Springer.
- [16] Aydin, N 2012a. Comment on Nienhaus, V: Discussant paper on “Method and Substances of Islamic Economics: Moving Where?” *Workshop on the Future of Islamic Economics*, Jeddah: Islamic Economics Institute, King Abdulaziz University, 12-13 November.
- [17] Aydin, N 2012b. Islamic Economics and Finance: New Paradigm or Old Capitalism? *10th Harvard Forum of Islamic Finance*. Boston, USA: Harvard University.
- [18] Aydin, N 2013. Redefining Islamic Economics as a New Economic Paradigm. *IRTI Journal of Islamic Economic Studies* 21,1: 1-34.
- [19] Bacon, F 1620. The New Organon or True Directions Concerning the Interpretation of Nature. In Spedding, J, Ellis, RL and Heath, DD (trans 1863) *The Works (Vol. VIII)*. Boston: Taggard and Thompson. Available at www.constitution.org/bacon/nov_org.htm.
- [20] Bakar, O 1991. *Tawhid and Science: Essays on the History and Philosophy of Islamic Science*. Kuala Lumpur: Secretariat for Islamic Philosophy and Science.
- [21] Barrow, JD 1991. *Theories of Everything: The Quest for Ultimate Explanation*. Oxford: Oxford University Press.
- [22] Barrow, JD 2007. *New Theories of Everything: The Quest for Ultimate Explanation*. Oxford: Oxford University Press.
- [23] Bateson G 1973. *Steps to an Ecology of Mind*. St Albans: Paladin.
- [24] Baumol, WJ 2000. What Marshall Didn't Know: On the Twentieth Century's Contributions to Economics. *The Quarterly Journal of Economics* 115,1: 1-44.
- [25] Beker, V 2016. From the Economic Crisis to the Crisis of Economics. In Moro B and Beker V (eds): *Modern Financial Crises*. Cham, Switzerland: Springer International Publishing.
- [26] Bentham, J 1780/1879. *An Introduction to The Principles of Morals and Legislation*. Oxford: Clarendon Press.
- [27] Berlin, I 1978. *Concepts and Categories: Philosophical Essays*. Hardy, H (ed). London: The Hogarth Press.
- [28] Blanchard, OJ 1987. Neoclassical Synthesis. In Eatwell, J, Milgate, M & Newman, P (eds): *The New Palgrave: A Dictionary of Economics*. London: Macmillan: 634-637.

- [29] Blaug, M 1980. *The Methodology of Economics*. Cambridge: Cambridge University Press.
- [30] Blaug, M 1997. Ugly Currents in Modern Economics, *Options Politiques* 18,17: 3-8. Reprinted in Mäki, U (ed) 2002. *Fact and Fiction in Economics: Models, Realism and Social Construction*. Cambridge and New York: Cambridge University Press.
- [31] Bohm, D 1990. A New Theory of the Relationship of Mind and Matter. *Philosophical Psychology* 3,2: 271- 286.
- [32] Boland, LA 2003. *Foundations of Economic Method: A Popperian Perspective*. London and New York: Routledge.
- [33] Boldeman, L 2007. *The Cult of the Market: Economic Fundamentalism and its Discontents*. Canberra, Australia: ANU E Press.
- [34] Brown, MB 1972. Marx's Economics as a Newtonian Model. In Shanin, T. (ed): *The Rules of the Game*. London: Tavistock.
- [35] Buchanan, JM 1959. Positive Economics, Welfare Economics, and Political Economy. *Journal of Law and Economics* 2: 124-138.
- [36] Burt, EA 1932. *The Metaphysical Foundations of Modern Science*. New York: Doubleday Anchor Books.
- [37] Butterfield, H 1997. *The Origins of Modern Science*. New York: Simon and Schuster.
- [38] Caldwell, BJ 1990. Does Methodology Matter? How Should It Be Practiced? *Finnish Economic Papers* 3,1: 64-71.
- [39] Caldwell, BJ 1994. *Beyond Positivism: Economic Methodology in the Twentieth Century*. New York: Routledge.
- [40] Campbell, DT 1987. Evolutionary Epistemology. In Radnitzky, G & Bartley, WW III (eds): *Evolutionary Epistemology, Rationality, and the Sociology of Knowledge*. Illinois: Open Court Publishing.
- [41] Capra, F 1982. *The Turning Point: Science, Society and the Rising Culture*. New York: Simon & Schuster.
- [42] Capra, F 1996. *The Web of Life: A New Scientific Understanding of Living Systems*. New York: Anchor Books Doubleday.
- [43] Capra, F 2003. *The Hidden Connections: A Science for Sustainable Living*. London: Flamingo.
- [44] Capra, F 2014. *The Systems View of Life: A Unifying Vision*. Cambridge: Cambridge University Press.
- [45] Carlyle, T 1849. Occasional Discourse on the Negro Question. *Fraser's Magazine*, 40 (Dec): 670-679.

- [46] Carnap, R 1934. *The Unity of Science*. London: Kegan Paul, Trench, Trubner, and Co.
- [47] Carnap, R 1981. Protocol statements and the formal mode of speech. In Hanfling, O (ed): *Logical Positivism*. Oxford: Basil Blackwell.
- [48] Cartwright, N 2001. Ceteris Paribus Laws and Socio-Economic Machines. In Mäki, U (ed): *The Economic World View: Studies in the Ontology of Economics*. Cambridge: Cambridge University Press.
- [49] Chapra, MU 1996. *What Is Islamic Economics?* IDB Prize Winners' Lecture Series No. 9 Jeddah, Saudi Arabia: Islamic Development Bank.
- [50] Chapra, MU 2000a. *The Future of Economics: An Islamic Perspective*. Leicestershire: The Islamic Foundation.
- [51] Chapra, MU 2000b. Is it Necessary to Have Islamic Economics? *The Journal of Socio-Economics* 29,1: 21-37.
- [52] Chapra, MU 2007. Comments on "Islamic Economics and Finance: Where Do They Stand?" by Masudul Alam Choudhury. *Proceedings of the 6th International Conference on Islamic Economics and Finance*. Jeddah:IRTI.
- [53] Chick, V & Dow S 2005. The Meaning of Open Systems. *Journal of Economic Methodology* 12,3: 363-381.
- [54] Choudhury, MA 1990. Islamic Economics as a Social Science. *International Journal of Social Economics* 17,6: 35-59.
- [55] Choudhury, MA 1993. *A Theory of Ethico-Economics*. Bradford, UK: Barmarick Publications.
- [56] Choudhury, MA 1994. A Critique of Modernist Synthesis in Islamic Thought: Special Reference to Political Economy. *American Journal of Social Sciences* 11,4: 475-503.
- [57] Choudhury, MA 1995. *The Epistemological Foundations of Islamic Economic, Social and Scientific Order*. 6 Vols. Ankara, Turkey: Statistical, Economic and Social Research and Training Centre for Islamic Countries.
- [58] Choudhury, MA 1997. The Epistemologies of Ghazali, Kant and the Alternative: Formalism in Unification of Knowledge Applied to the Concepts of Markets and Sustainability. In O'Brien, JC (ed): *Essays in Honour of Clement Allan Tisdell, Part III*. Special issue of the *International Journal of Social Economics* 24,7/8/9. Bradford, England: MCB University Press.
- [59] Choudhury MA 1999a. Islamic Economics and Islamic Political Economy. *Managerial Finance* 25,5: 1-3.

- [60] Choudhury MA 1999b. The Structure of Islamic economics: A Comparative Perspective on Markets, Ethics and Economics. *Consumption, Markets and Culture* 3:1, 61-97.
- [61] Choudhury, MA 2000. *The Islamic Worldview*. London: Kegan Paul International.
- [62] Choudhury, MA 2001a. Perspectives on the Islamization of Knowledge and their Implications for Organization of the Occupational Composition: The Case of Canadian Muslims in the Labour Market. *Journal of Muslim Minority Affairs* 21,1: 93-107.
- [63] Choudhury, MA 2001b. Financial Globalization and Islamic Financing Institutions: The Topic Revisited. *Islamic Economic Studies* 9,1: 19-38.
- [64] Choudhury, MA 2004. *The Islamic World-System: A Study in Polity-Market Interaction*. London: Routledge-Curzon.
- [65] Choudhury, MA 2006. *Science and Epistemology in the Qur'an*. 5 Vols (different volume titles). Lewiston, New York: Edwin Mellen Press.
- [66] Choudhury, MA 2007. *The Universal Paradigm and the Islamic World-System*. Singapore: World Scientific Publication.
- [67] Choudhury, MA 2008a. Islamic Economics and Finance – A Fiasco. *Middle East Business and Economic Review* 20,1: 38-51.
- [68] Choudhury, MA 2008b. Islam versus Liberalism: Contrasting Epistemological Inquiries. *International Journal of Social Economics* 35,4: 239-268.
- [69] Choudhury, MA 2011. *Islamic Economics and Finance: An Epistemological Inquiry*. Bingley, UK: Emerald.
- [70] Choudhury, MA 2013. *Socio-Cybernetic Study of God and the World-System*. Philadelphia, US: IGI-Global.
- [71] Choudhury, MA 2014. *Tawhidi Epistemology and its Applications: Economics, Finance, Science, and Society*. Newcastle upon Tyne, UK: Cambridge Scholars Publishing.
- [72] Choudhury, MA & Nadwi, MA 1992. A Critical Examination of Islamization of Knowledge in Contemporary Times. *Humanomics* 8,3/4: 60-107.
- [73] Coase, RH 1992. The Institutional Structure of Production. *The American Economic Review* 82,4: 713-19.
- [74] Cohen, H 2005. The Onset of the Scientific Revolution: Three Near-Simultaneous Transformations. In Anstey, PR & Schuster, JA (eds): *The Science of Nature in the Seventeenth Century. Patterns of Change in Early Modern Natural Philosophy*. Dordrecht: Springer.

- [75] Cohen, IB 1994. Newton and the Social Sciences, With Special Reference to Economics, or, The Case of the Missing Paradigm. In Mirowski, P (ed): *Natural Images in Economic Thought*. Cambridge: Cambridge University Press.
- [76] Collins, J 1965. *A History of Modern European Philosophy*. Milwaukee, WI: Bruce Publishing.
- [77] Cottingham, J 1993. Descartes: Metaphysics and the Philosophy of Mind. In Parkinson, GHR (ed): *Routledge History of Philosophy, Vol. IV: The Renaissance and Seventeenth-century Rationalism*. London: Routledge.
- [78] Coyle, D 2014. Debunkery. *The Enlightened Economist* (blog). Available at <http://www.enlightenmenteconomics.com/blog/index.php/2012/06/debunkery/>.
- [79] Dasgupta, AK 1985. *Epochs of Economic Theory*. Oxford: Basil Blackwell.
- [80] Dasgupta, P 2002. Modern Economics and Its Critics. In Mäki, U (ed): *Fact and Fiction in Economics: Models, Realism and Social Construction*. Cambridge: Cambridge University Press.
- [81] Davidsen, B-I 2008. Methodology and the Practice of Economists: A Philosophical Approach. *The Journal of Philosophical Economics* 2,1: 55-75.
- [82] Descartes, R 1985. *The Philosophical Writings Of Descartes*, 3 Vols. Cottingham, J, Stoothoff, R and Murdoch, D (trans). Cambridge: Cambridge University Press.
- [83] Dilworth, C 2007. *The Metaphysics of Science: An Account of Modern Science in Terms of Principles, Laws and Theories*. Boston Studies in the Philosophy of Science, Vol. 173, Dordrecht, Netherlands: Springer.
- [84] Dobbs, BJT & Jacob, MC 1995. *Newton and the Culture of Newtonianism*. Atlantic Highlands, NJ: Humanities Press.
- [85] Dow, SC 2002 *Economic Methodology: An Inquiry*. Oxford: Oxford University Press.
- [86] Drakopoulos, SA & Torrance, TS 1994. Causality and Determinism in Economics. *Scottish Journal of Political Economy* 41,2: 176-193.
- [87] Drakopoulos, SA 2014. *Mainstream Aversion to Economic Methodology and the Scientific Ideal of Physics*. Munich, Germany: University Library of Munich.
- [88] Drakopoulos, SA 2016. Economic Crisis, Economic Methodology and the Scientific Ideal of Physics. *MPRA Paper* No. 74306.
- [89] Draper, JW 1875. *A History of the Intellectual Development of Europe*, 2 Vols. London: George Bell and Son.
- [90] Dugger, WM 1979. Methodological Differences Between Institutional and Neoclassical Economics. *Journal of Economic Issues* 13,4: 899-909.

- [91] Dupre, J 2001. Economics without Mechanism. In Maki, U (ed): *The Economic World View: Studies in the Ontology of Economics*. Cambridge: Cambridge University Press.
- [92] Durant, W 1980. The Age of Faith (*The Story of Civilization*, Vol. 4). New York: Simon & Schuster.
- [93] Easlea, B 1980. *Witch-hunting, Magic and the New Philosophy. An Introduction to the Debates of the Scientific Revolution 1450-1750*. Brighton: Harvester Press.
- [94] Edgeworth, FY 1881. *Mathematical Psychics: An Essay on the Application of Mathematics to the Moral Sciences*. London: Kegan Paul.
- [95] *Encyclopaedia Britannica 2010*. Chicago: University of Chicago Press.
- [96] Fay, B 1975. *Social Theory and Political Practice*. London: George Allen and Unwin Ltd.
- [97] Ford, G 1984. Rebirth of Islamic Science. In Sardar, Z (ed): *The Touch of Midas*, London: Manchester University Press.
- [98] Frey, BS 2001. Why Economists Disregard Economic Methodology. *Journal of Economic Methodology* 8,1: 41-47.
- [99] Friedman, M 1953. *Essays in Positive Economics*. Chicago: The University of Chicago Press.
- [100] Fuenmayor, R 1991. The Roots of Reductionism: A Counter-ontoepistemology for a Systems Approach. *Systems Practice* 4,5: 419-47.
- [101] Gaukroger, S 1993. Descartes: Methodology. In Parkinson, GHR (ed): *Routledge History of Philosophy, Vol. IV: The Renaissance and Seventeenth-century Rationalism*. London: Routledge.
- [102] Georgescu-Roegen, N 1971. *The Entropy Law and the Economic Process*. Cambridge, MA: Harvard University Press.
- [103] Giddens, A 1990. *The Consequences of Modernity*. Stanford, CA: Stanford University Press.
- [104] Gilson, E 1955. *History of Christian Philosophy in the Middle Ages*. New York: Random House.
- [105] Gordon, S 1991. *The History and Philosophy of Social Science*. London: Routledge.
- [106] Greenspan A 2008. House of Representatives Committee on Oversight and Government Reform, *The Financial Crisis and the Role of Federal Regulators*, 110th Cong. Available at: <https://archive.org/details/gov.house.ogr.20081023hrs15REF2154>.

- [107] Griffin, DR 1996. Why Critical Reflection on the Paranormal is So Important - and So Difficult. In Stoeber, M & Meynell, H (eds): *Critical Reflections on the Paranormal*, Albany: State University of New York Press.
- [108] Guenon, R 1953. *The Reign of Quantity and the Signs of the Times*. London: Luzac and Company.
- [109] Hall, AR 2002. *Philosophers at War: The Quarrel Between Newton and Leibniz*. Cambridge: Cambridge University Press.
- [110] Hamilton, D 1953. *Newtonian Classicism and Darwinian Institutionalism. A Study of Change in Economic Theory*. Albuquerque: University of New Mexico Press.
- [111] Hamilton, D 1999. *Evolutionary Economics: A Study of Change in Economic Thought*. New Jersey: Transaction Publishers.
- [112] Hands, DW 1990. Thirteen Theses on Progress in Economic Methodology. *Finnish Economic Papers* 3,1: 72-76.
- [113] Hands, DW 2012. The Positive-Normative Dichotomy and Economics. In Mäki U (ed): *Philosophy of Economics*. Amsterdam: Elsevier.
- [114] Haneef, MA 2005. *A Critical Survey of Islamization of Knowledge*. Kuala Lumpur: International Islamic University of Malaysia.
- [115] Haneef, MA 2007. *Islamization of Economics: Where Have We Gone Wrong?* Unpublished paper. Malaysia: International Institute of Islamic Thought.
- [116] Haneef, MA 2009. Research in Islamic Economics: The missing Fard 'Ayn Component. Paper presented at *3rd Islamic Economics Congress*, 12-14 January, Kuala Lumpur.
- [117] Haneef, MA 2012. Preliminary Thoughts on Diagnosing Some Methodological Issues in Developing Islamic Economics. In *Workshop on the Future of Islamic Economics*, Islamic Economics Institute, King Abdulaziz University, 12-13 November, Jeddah.
- [118] Haneef, MA & Furqani, H 2010. Contemporary Islamic Economics: The Missing Dimension of Genuine Islamization. *Thoughts on Economics* 19,4: 29-48.
- [119] Hanfling, O (ed) 1981. *Logical Positivism*. Oxford: Basil Blackwell.
- [120] Haque, Z 1992. Nature and Methodology of Islamic Economics: An Appraisal. *Pakistan Development Review*. 31,4: 1065-72.
- [121] Hargreaves Heap, SP 2000. Methodology Now! *Journal of Economic Methodology* 7,1: 95-108.
- [122] Haskins, CH 1924. *Studies in the History of Medieval Science*. New York: Harvard University Press.

- [123] Haskins, CH 1927. *The Renaissance of the Twelfth Century*. Cambridge, M.A.: Harvard University Press.
- [124] Hausman, DM 2001. "Tendencies, Laws, and the Composition of Economic Causes", in Maki, U (ed): *The Economic World View: Studies in the Ontology of Economics*. Cambridge: Cambridge University Press.
- [125] Heilbroner, RL 1988. *Behind the Veil of Economics: Essays in the Worldly Philosophy*. New York: WW Norton.
- [126] Heilbroner, RL 1995. Putting Economics in Its Place. *Social Research* 62,4: 883-897.
- [127] Heilbroner, RL 1996. The Embarrassment of Economics. *Challenge* 39,6: 46-49.
- [128] Hempel, C & Oppenheim, P 1948. Studies in the Logic of Explanation. *Philosophy of Science* 15,2: 135-175.
- [129] Henderson, JP 1994. The Place of Economics in the Hierarchy of the Sciences. Section F, From Whewell to Edgeworth. In Mirowski P (ed): *Natural Images in Economic Thought*. Cambridge: Cambridge University Press.
- [130] Hetherington, NS 1997. Early Greek Cosmology: A Historiographical Review. *Culture and Cosmos: A Journal of the History of Astrology and Cultural Astronomy* 1,1: 10-32.
- [131] Hodgson, B 1983. Economic Science and Ethical Neutrality: The Problem of Teleology. *Journal of Business Ethics* 2,4: 237-254.
- [132] Hodgson, B 1988. Economic Science and Ethical Neutrality II: The Intransigence of Evaluative Concepts. *Journal of Business Ethics* 7,5: 321-335.
- [133] Hodgson, GM 2007. Meanings of Methodological Individualism. *Journal of Economic Methodology* 14,2: 211-226.
- [134] Hoover, KD 1995. Why Does Methodology Matter for Economics? *The Economic Journal* 105,430: 715-734.
- [135] Horst, S 2007. *Beyond Reduction: Philosophy of Mind and Post-Reductionist Philosophy of Science*. Oxford: Oxford University Press.
- [136] Hosseini, H 1990. The Archaic, the Obsolete and the Mythical in Neoclassical Economics: Problems with the Rationality and Optimizing Assumptions of the Jevons-Marshallian System. *American Journal of Economics and Sociology* 49,1: 81-92.
- [137] Hussain, MY (ed) 2006. *Islamization of Human Sciences*. Kuala Lumpur: IIUM
- [138] Hutchison, TW 1938. *The Significance and Basic Postulates of Economic Theory*. London: Macmillan.

- [139] Hutchison, TW 1964. *Positive Economics and Policy Objectives*. London: Allen & Unwin.
- [140] Hutchison, TW 1996. On the Relations Between Philosophy and Economics. *Journal of Economic Methodology* 3,2: 187-213.
- [141] Hutchison, TW 1997. On the Relations Between Philosophy and Economics, *Journal of Economic Methodology* 4,1: 127-151.
- [142] IEI (Islamic Economics Institute) 2012. *Workshop on the Future of Islamic Economics: A Call for Discussion*. Jeddah: King Abdul Aziz University, Saudi Arabia.
- [143] Iqbal M 2007. *Science and Islam*. Westport, CT: Greenwood Press.
- [144] Iqbal, M 2012. Development of Theory of Islamic Economics: Problems and Proposals. Discussion Paper prepared for *Workshop on the Future of Islamic Economics*. Jeddah: Islamic Economics Institute.
- [145] IRTI (Islamic Research and Training Institute) 2004. *Current State of Knowledge in Islamic Economics and Development of the Discipline*. Roundtable Discussion. Jeddah, Saudi Arabia.
- [146] Islahi, AA 2005. *Contributions of Muslim Scholars to Economic Thought and Analysis (11-905 AH/632-1500 AD)*. Jeddah, Saudi Arabia: Scientific Publishing Centre, King Abdul Aziz University.
- [147] Jevons WS 1878/2008. *The Theory of Political Economy*. London: Macmillan.
- [148] Johanessen, J-A, Olaisen, J & Olsen, B 1999. Systemic Thinking as the Philosophical Foundation for Knowledge Management and Organizational Learning. *Kybernetes* 28,1: 24-46.
- [149] Johnston, R 1976. Contextual Knowledge: A Model for the Overthrow of the Internal/External Dichotomy in Science. *Australia and New Zealand Journal of Sociology* 12,3: 193-203.
- [150] Kahf, M 2004. Islamic Economics: What Went Wrong? Paper presented at the *Islamic Development Bank Roundtable on Islamic Economics: Current State of Knowledge and Development of the Discipline*, Jeddah, May 26-27, pp. 26-27.
- [151] Kahf, M 2012. Comments on Methodology Papers. Presented at the *Workshop on The Future of Islamic Economics: A Call for Discussion*. Islamic Economics Institute, Jeddah: 215-221.
- [152] Kallis, G, Martinez-Alier, J & Norgaard, RB 2009. Paper Assets, Real Debts: An Ecological-Economic Exploration of the Global Economic Crisis. *Critical Perspectives on International Business* 5,1/2: 14-25.

- [153] Keita, LD 1992. *Science, Rationality, and Neoclassical Economics*. Cranbury, NJ: Associated University Presses.
- [154] Kendall, MG 1950. The Statistical Approach. *Economica, New Series* 17,66: 127-145.
- [155] Kettani, A 1984. Science and Technology in Islam: The Underlying Value System. In Sardar, Z (ed): *The Touch of Midas*. London: Manchester University Press.
- [156] Khan, M 2013. *What is Wrong with Islamic Economics? Analysing the Present State and Future Agenda*. Cheltenham, UK: Edward Elgar.
- [157] King, IT 1994. *Explorations Beyond the Machine: A Philosophy of Social Science for the Post-Newtonian Age*. New York: Nova Science Pub.
- [158] Kittel, B 2006. A Crazy Methodology? On the Limits of Macro-Quantitative Social Science Research. *International Sociology* 21,5: 647–677.
- [159] Knight, F 1956. Statics and Dynamics. In Letwin, WL & Morin, AJ (eds): *On the History and Method of Economics*. Chicago: University of Chicago Press.
- [160] Kreps, D 1997. Economics: The Current Position. *Daedalus* 126,1: 59-85.
- [161] Kristol, I 1981. Rationalism in Economics. In Bell, D & Kristol, I (eds): *The Crisis in Economic Theory*. New York: Basic Books.
- [162] Krugman, P 2010. Wall Street Whitewash. In *New York Times*, 16th of Dec., 2010 [online] Available at http://www.nytimes.com/2010/12/17/opinion/17krugman.html?_r=1.
- [163] Kuran, T 2004. *Islam and Mammon: The Economic Predicaments of Islamism*. Princeton and Oxford: Princeton University Press.
- [164] Kurz, HD 2010. On the Dismal State of a Dismal Science? *Investigación Económica*, 69,274: 17-41. Available at: <http://www.redalyc.org/articulo.oa?id=60115471001>.
- [165] Lakatos, I 1978. *The Methodology of Scientific Research Programmes: Philosophical Papers, Vol. 1*. Cambridge: Cambridge University Press.
- [166] Latour, B 1998. From the World of Science to the World of Research? *Science* 280,5361: 208-209.
- [167] Latsis, SJ 1972. Situational Determinism in Economics. *The British Journal for the Philosophy of Science* 23,3: 207-245.
- [168] Lawson, T 1994a. Why are so Many Economists So Opposed to Methodology? *Journal of Economic Methodology* 1,1: 105-134.
- [169] Lawson, T 1994b. A Realist Theory for Economics. In Backhouse, RE (ed): *New Directions in Economic Methodology*. London: Routledge.

- [170] Lawson, T 1997. *Economics and Reality*. London and New York: Routledge.
- [171] Lawson, T 2003. *Reorienting Economics*. London and New York: Routledge.
- [172] Lawson, T 2004 Reorienting Economics: On Heterodox Economics, Themata and the Use of Mathematics in Economics. *Journal of Economic Methodology* 11,3: 329-40.
- [173] Lawson, T 2006. The Nature of Heterodox Economics. *Cambridge Journal of Economics* 30,4: 483-505.
- [174] Lawson, T 2015. *Essays On: The Nature and State of Modern Economics*. London: Routledge.
- [175] Lennon, TM 2000. Cartesianism. In Ferngren, GB (ed): *The History of Science and Religion in the Western Tradition: An Encyclopedia*. New York and London: Garland Publishing Inc.
- [176] Leontief, W 1971. Theoretical Assumptions and Non-observed Facts. *American Economic Review* 61,1: 1-7.
- [177] Lewis, DL 2009. *God's Crucible: Islam and the Making of Europe, 570-1215*. New York: WW Norton.
- [178] Limam, I 2004. Discussions on Presentations. In Hussein, KA (ed): *Islamic Economics: Current State of Knowledge and Development of the Discipline* Jeddah: Islamic Development Bank.
- [179] Louth, J 2011. From Newton to Newtonianism: Reductionism and the Development of the Social Science. *Emergence: Complexity & Organization* 13,4: 63-83.
- [180] Lovejoy, AO 1948. *Essays in the History of Ideas*. Baltimore: Johns Hopkins University Press.
- [181] Lucas, RE & Sargent, TJ 1981. After Keynesian Macroeconomics. In Lucas, RE & Sargent, TJ (eds): *Rational Expectations and Econometric Practice*. Minneapolis: The University of Minnesota Press.
- [182] Lucas R 2009. In Defence of the Dismal Science. *The Economist*, 6th of Aug., 2009 [online]. Accessed at: <http://www.economist.com/node/14165405>.
- [183] Ma, SY 2007. Political Science at the Edge of Chaos? The Paradigmatic Implications of Historical Institutionalism. *International Political Science Review* 28,1: 51-78.
- [184] Mahomedy, AC 2013. Islamic Economics: Still in Search of an Identity. *International Journal of Social Economics* 40,6: 556-578.
- [185] Mahomedy, AC 2015. Occidental Rationalism: Its Early Impact on the Foundations of Modern Science. *ERSA Working Paper 543*. Economic Research Southern Africa.

- [186] Mahomed, AC 2016a. *When Economics Neglected Epistemics: How Islamic Economics was Implicated*. Unpublished Paper: University of KwaZulu-Natal, South Africa.
- [187] Mahomed, AC 2016b. The Disintegrating Force of Rationalism on Economics: What it Means for Islamic Economics? *ERSA Working Paper 611*. Economic Research Southern Africa.
- [188] Mahomed, AC 2016c. Sources of Dualism in Modern Rationalist Thought: Implications for Islamic Economics. *ERSA Working Paper 632*. Economic Research Southern Africa.
- [189] Mahomed, AC 2016d. Epistemology and Science: How the Relationship Fractured. *SAEF Working Paper No. 2016/01/06*. University of KwaZulu-Natal, South Africa.
- [190] Mäki, U (ed) 2001. *The Economic World View: Studies in the Ontology of Economics*. Cambridge: Cambridge University Press.
- [191] Mäki, U (ed) 2002. *Fact and Fiction in Economics: Models, Realism and Social Construction*. Cambridge: Cambridge University Press.
- [192] Manzoor, SP 1991. Studying Islam Academic. In Sardar, Z (ed): *How We Know: Ilm and the Revival of Knowledge*. London: Grey Seal Books.
- [193] Mattick, P 2011. *Business as Usual: The Economic Crisis and The Failure of Capitalism*. London: Reaktion Books.
- [194] McClelland, JS 1996. *A History of Western Political Thought*. London: Routledge.
- [195] McCloskey, D 1985. *The Rhetoric of Economics*. Madison: University of Wisconsin Press.
- [196] Merchant, C 1980. *The Death of Nature: Women, Ecology and the Scientific Revolution*. New York: HarperCollins.
- [197] Mill, JS 1843/2008. *A System of Logic, Ratiocinative and Inductive: Being a Connected View of the Principles of Evidence and the Methods of Scientific Investigation*. New York: Cosimo Classics.
- [198] Mirakhor, A 2006. *A Note on Islamic Economics*. IDB Prize Lecture. Jeddah: Saudi Arabia.
- [199] Mirowski, P 1984. Physics and the 'Marginalist Revolution'. *Cambridge Journal of Economics* 8,4: 361-379.
- [200] Mirowski, P 1989. *More Heat than Light: Economics as Social Physics, Physics as Nature's Economics*. Cambridge: Cambridge University Press.
- [201] Mirowski, P 1992. *Against Mechanism: Protecting Economics from Science*. Lanham: Rowman & Littlefield Publishers.

- [202] Mongin, P 2006. Value Judgments and Value Neutrality. *Economica* 73,290: 257-286.
- [203] Myrdal, G 1958. *Value in Social Theory*. Streeten, P (ed). London: Routledge.
- [204] Myrdal, G 1972. *Against the Stream: Critical Essays in Economics*. New York: Pantheon Books.
- [205] Myrdal, G 1979. Institutional economics. In his *Essays and Lectures after 1975*. Kyoto, Japan: Keibunsha.
- [206] Nasr, SH 1968. *Science and Civilization in Islam*. Cambridge, MA: Harvard University Press.
- [207] Nasr, SH 1976. *Islamic Science: An Illustrated Study*. London: World of Islam Festival Trust.
- [208] Nasr, SVR 1986. Whither Islamic Economics? *Islamic Quarterly* 30,4: 211-20.
- [209] Nasr, SVR 1989. Towards a Philosophy of Islamic Economics. *Hamdard Islamicus* 12,4: 45-60.
- [210] Nasr, SVR 1991. Islamisation of Knowledge: A Critical Overview. *Islamic Studies* 30,3: 387-400.
- [211] Nelson, RH 2001. *Economics as Religion: From Samuelson to Chicago and Beyond*. Pennsylvania: Pennsylvania State University Press.
- [212] Newton, I 1687/1934. *Newton's Principia: The Mathematical Principles of Natural Philosophy and His System of the World*. Motte, A (trans). New York: Daniel Adee Publishers.
- [213] Norgaard, RB 1987. Economics as Mechanics and the Demise of Biological Diversity. *Ecological Modelling*, 38,1: 107-121.
- [214] Nozick, R 1974. *Anarchy, State, and Utopia*. New York: Basic Books.
- [215] Olson, R 1991. *Science Deified and Science Defied: The Historic Significance of Science in Western Culture, Vol. 2*. Berkeley: University of California Press.
- [216] Overman, ES (ed) 1988. Introduction: Social Science and Donald T Campbell. In *Methodology and Epistemology for Social Science*. Chicago: University of Chicago Press.
- [217] Paine, T 1880. *The Age of Reason*. London: Freethought Publishing Company.
- [218] Pareto, V 1906/1971. *Manual of Political Economy*. Schwier, A (trans). New York: Augustus M. Kelley.

- [219] Parrique, T 2013. *Economics Education for Sustainable Development: Institutional Barriers to Pluralism at the University of Versailles Saint-Quentin (France)*. Master's thesis. Sustainable Development. Uppsala University: Sweden.
- [220] Parkinson, GHR (ed) 1993. *Routledge History of Philosophy, Vol. IV: The Renaissance and Seventeenth-century Rationalism*. London: Routledge.
- [221] Perry, M 2012. *Western Civilization: A Brief History*. Boston: Cengage Learning.
- [222] Phelps-Brown, EH 1972. The Underdevelopment of Economics. *The Economic Journal* 82,325: 1-10.
- [223] Philipp, T 1990. The Idea of Islamic Economics. *Die Welt Des Islam's*, 30,1/4: 117-139.
- [224] Polanyi, M 1968. Life's Irreducible Structure. *Science* 160,3834: 1308–1312.
- [225] Popper, KR 1945. *The Open Society and Its Enemies*. London: Routledge & Sons.
- [226] Posner, RA, 2009. *A failure of Capitalism: The Crisis of '08 and the Descent into Depression*. Cambridge, MA: Harvard University Press.
- [227] Price, GR 1955. Science and the Supernatural. *Science* 122,3165: 359-367.
- [228] Prigogine, I & Stengers, I 1985. *Order Out of Chaos: Man's New Dialogue with Nature*. London: Flamingo.
- [229] Randall, JH 1926. *The Making of the Modern Mind*. Boston: Houghton Mifflin.
- [230] Ravetz, JR 1986. Usable Knowledge, Usable Ignorance. In Clark WC & Munn T (eds): *Sustainable Development of the Biosphere*. Cambridge: Cambridge University Press.
- [231] Resnick, SA & Wolff, RD 1987. *Knowledge and Class: A Marxian Critique of Political Economy*. Chicago: The University of Chicago Press.
- [232] Robinson, J 1962. *Economic Philosophy*. London: CA Watts.
- [233] Rosenberg, A 1995. The Metaphysics of Microeconomics. *The Monist* 78,3: 352-367.
- [234] Rothbard, M 1995. *An Austrian Perspective on the History of Economic Thought, Vol. 1*. Cheltenham: Edward Elgar Publishing.
- [235] Russell, B 1945. *The History of Western Philosophy and its Connection with Political and Social Circumstances from the Earliest Times to the Present Day*. New York: Simon and Schuster.
- [236] Russell, B 1917/1959. *Mysticism and Logic, and Other Essays*. London: George Allen & Unwin Ltd.
- [237] Safi, L 1996. *The Foundation of Knowledge: A Comparative Study in Islamic and Western Methods of Inquiry*. Kuala Lumpur: International Islamic University Malaysia and International Institute of Islamic Thought.

- [238] Sardar, Z 1984. Islamisation of Knowledge or the Westernisation of Islam? *Inquiry* 1,7: 40-45.
- [239] Sardar, Z 1985. *Arguments for Islamic Science*. Aligarh: Centre for Studies on Science.
- [240] Sardar, Z 1988. *Islamic Futures: The Shape of Ideas to Come*. Kuala Lumpur: Pelanduk Publications.
- [241] Sardar, Z 1989. Islamization of Knowledge: A State of the Art Report. In Sardar, Z (ed): *An Early Crescent: The Future of Knowledge and the Environment in Islam*. London: Mansell Publishing Limited.
- [242] Schofield, RE 1970. *Mechanism and Materialism. British Natural Philosophy in an Age of Reason*. Princeton, NJ: Princeton University Press.
- [243] Schumpeter, JA 1949. Science and Ideology. *American Economic Review* 39,2: 345-59.
- [244] Shackle, G 1978. *Epistemics and Economics: A Critique of Economic Doctrines*. Cambridge: Cambridge University Press.
- [245] Sheldrake, S 2012. *The Science Delusion: Freeing the Spirit of Enquiry*. London: Hodder & Stoughton.
- [246] Siddiqi, MN 2001. *Economics: An Islamic Approach*. Islamabad: The Institute of Policy Studies and Leicestershire: The Islamic Foundation.
- [247] Skinner, A 1979. Adam Smith: An Aspect of Modern Economics? *Scottish Journal of Political Economy* 26,2: 109-125.
- [248] Smith, JW 2003. The Plague of Scientistic Belief. In Zarandi, M (ed): *Science and the Myth of Progress*. Bloomington: World Wisdom.
- [249] Smith, JW 2006. Science and Myth: The Hidden Connection. In Nasr, SH and O'Brien, K (eds): *The Essential Sophia*. Bloomington: World Wisdom.
- [250] Solo, RA 1975. Neoclassical Economics in Perspective. *Journal of Economic Issues* 9,4: 627-644.
- [251] Solow, RM 1997. How Did Economics Get That Way and What Way Did It Get? *Daedalus* 126,1: 39-58.
- [252] Sorell T 1993. Seventeenth-century Materialism: Gassendi and Hobbes. In Parkinson, GHR (ed): *Routledge History of Philosophy, Vol. IV: The Renaissance and Seventeenth-century Rationalism*. London: Routledge.
- [253] Souter, RW 1933. The Nature and Significance of Economic Science in Recent Discussion. *The Quarterly Journal of Economics* 47,3: 377-413.
- [254] Stiglitz, JE 2002. Information and the Change in the Paradigm of Economics. *The American Economic Review* 92,3: 460-501.

- [255] Tag el-Din, SI 2012. Comments on “Crisis in Islamic Economics: Diagnosis and Prescriptions” by Asad Zaman. *JKAU: Islamic Economics* 25,1: 173-175.
- [256] Tarnas, R 1993. *The Passion of the Western Mind: Understanding the Ideas that have shaped our Worldview*. New York: Ballantine.
- [257] Tebes, JK 2005. Community Science, Philosophy of Science, and the Practice of Research. *American Journal of Community Psychology* 35, 3/4: 213-230.
- [258] Tieben, B 2012. *The Concept of Equilibrium in Different Economic Traditions: An Historical Investigation*. Cheltenham: Edward Elgar Publishing.
- [259] Tofler, A 1984. Foreword: Science and Change. In Prigogine, I & Stengers I (eds): *Order Out of Chaos: Man's New Dialogue with Nature*. New York: Bantam Books.
- [260] Toulmin, SE 1990. *Cosmopolis, The Hidden Agenda of Modernity*. Chicago: The University of Chicago Press.
- [261] Toulmin, S 1998. The Idol of Stability. *The Tanner Lectures on Human Values* 20: 325-354.
- [262] Turner, JH 1987. Analytical Theorising. In Giddens, A & Turner, JH (eds): *Social Theory Today*. Stanford: Stanford University Press.
- [263] Udéhn, L 2001. *Methodological Individualism: Background, History and Meaning*. London and New York: Routledge.
- [264] Veblen, T 1898. Why is Economics not an Evolutionary Science? *The Quarterly Journal of Economics* 12,4: 373-397.
- [265] Wallerstein, I (ed) 1996. *Open the Social Sciences: Report of the Gulbenkian Commission on the Restructuring of the Social Sciences*. Stanford: Stanford University Press.
- [266] Walras, L 1874/1969. *Elements of Pure Economics or The Theory of Social Wealth*. Jaffé, W (trans). London and New York: Routledge.
- [267] Walsh, L 2013. *Scientists as Prophets: A Rhetorical Genealogy*. New York: Oxford University Press.
- [268] Ward, B 1972. *What's Wrong with Economics?* New York: Basic Books.
- [269] Ward, LF 1898. *Outlines of Sociology*. London: The Macmillan Co.
- [270] Warfield, JN & Perino, GH Jr. 1999. The Problematique: Evolution of an Idea. *Systems Research and Behavioral Science* 16,3: 221-226.
- [271] Weber, M 1930. *The Protestant Ethic and the Spirit of Capitalism*. New York: Allen & Unwin.

- [272] Weber, M 1946. *From Max Weber: Essays in Sociology*. Gerth HH & Mills, CW (eds & trans). New York: Oxford University Press.
- [273] Weber, M 1949. 'Objectivity' In Social Science and Social Policy. In Shils, EA & Finch, HA (eds): *Max Weber On the Methodology of the Social Sciences*. Glencoe: The Free Press.
- [274] Westfall, RS 1983. *Never at Rest: A Biography of Isaac Newton*. Cambridge: Cambridge University Press.
- [275] Wilson, EO 1999. *Consilience: The Unity of Knowledge*. New York: Vintage Books.
- [276] Wittgenstein, LW 1969. *On Certainty*. Paul, D & Anscombe, GEM (trans) and Anscombe, GEM & Von Wright, GH (ed). New York: Basil Blackwell/Harper & Row.
- [277] Worswick, GDN 1972. Is Progress in Economic Science Possible? *Economic Journal* 82,325: 73-86.
- [278] Wren-Lewis, S 2014. When Economics Students Rebel. *Mainly Macro* (blog), April 24. Available at <https://mainlymacro.blogspot.co.za/2014/04/when-economics-students-rebel.html>.
- [279] Zaman, A 2005. Towards a New Paradigm for Economics. *Journal of King Abdul Aziz University: Islamic Economics* 18,2: 49-59.
- [280] Zaman, A 2009. Origins of Western Social Science. *Journal of Islamic Economics, Banking and Finance* 5,2: 9-22.
- [281] Zaman, A 2011. Crisis in Islamic economics: Diagnosis and Prescriptions. Paper presented at the *8th International Conference on Islamic Economics and Finance*. Doha, Qatar: 19-21 December.
- [282] Zaman, A 2013. Logical Positivism and Islamic Economics. *International Journal of Economics, Management and Accounting* 21,2: 1-28.
- [283] Zaman, A 2015a. Re-Defining Islamic Economics. In Egri, T & Kizilkaya, N (eds): *Islamic Economics: Basic Concepts, New Thinking and Future Directions*. Newcastle Upon Tyne, UK: Cambridge Scholars Publishing.
- [284] Zaman, A 2015b. Deification of Science and Its Disastrous Consequences. To be published in the *International Journal of Pluralism in Economics Education*. Available at: http://www.academia.edu/3286146/Deification_of_Science_and_Its_Disastrous_Consequences.
- [285] Zarqa, MA 2004. Methodological and Systemic Implications of the Theory and Practice of Islamic finance. Paper presented at the *Islamic Development Bank Roundtable on Islamic Economics: Current State of Knowledge and Development of the Discipline*, Jeddah, May 26-27.