Towards an Externalist History of Islamic Science

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This essay will attempt to propose a methodology for the study of the history of Islamic science. The method outlined below offers a way of reinterpreting the history of Islamic science and covers those angles that have been obscured by the method of narrative writing. The project itself remains an immense one and cannot be simply dismissed, as there is always room for reinterpretation. Foucault writes: "History shows that everything that has been thought of will be thought of again by a thought that does not yet exist."[1] There is no value in the glorification of the past if that glorification hides the conflict within the tradition—a conflict that may remain unresolved.

The central focus of this study will be that of the externalist method rather than the internalist method. To the internalist, the methodology of science follows a rational course: to the externalist, many irrational factors, at times beyond the rational, may influence the direction of science.[2] However, one must state, with caution, that both methods are indispensable, for the development of science can only be understood with a clear insight into how they intersect in the evolution of science as a body of knowledge. Besides presenting an evolution of scientific ideas, they give an insight into scientific research itself and, secondly, into the sociological context in which science developed. This is only possible, Kuhn states, if there is a bridge between internal history (which concerns itself with the evolution of the field, its chief actors, and in what way their discoveries and methods have helped to develop the field [this view is insular as it argues that

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[1]M. Foucault, *The Order of Things: An Archeology of the Human Sciences* (Les Mots et les Choses) (New York: Vintage Books, 1970).

[2]Paul Feyerabend's position, one described as an anarchist view, is very illustrative of this position. What the externalist method aims to examine is not the internal logic of science or that of the scientific community, but how scientific belief and choices are influenced by situations of power, religion, and politics.

science is autonomous and exists on its own accord]),[3] and external history (which is an attempt to study cultural or sociological influences on the development of science, the nonintellectual activities of society on the development of science, and the role of institutions, economics, or general public attitude to the field).[4]

Robert Merton, in his study of scientific revolution, examines guilds and the way science borrowed many of its ideas from craftsmen. He also examines Max Weber's study of the puritan ethic and its role on scientific activity. Kuhn writes:

> Still the dominant form, often called the "internal approach," is concerned with the substance of science as knowledge. Its newer rival, often called the "external approach," is concerned with the activities of scientists as a social group within a larger culture. Putting the two together is perhaps the greatest challenge now faced by the profession, and there are increasing signs of a response. Nevertheless, any survey of the field's present state must unfortunately still treat the two as virtually separate enterprises.[5]

The converse is true for Imre Lakatos, who opines that internal history has more significance than external history. This is based on his assertions that internal history is primary and defines external history and its problems, and that the former has its own scientific logic, while the aim of the historian is to describe the rational development of scientific knowledge.

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[3]A key part in the debate between the Church and the Natural Philosophers in the seventeenth century was on the issue of the autonomy of science. The Natural Philosophers argued that science had its own reasoning and logic; it had a distinct approach and an ultimate and more stringent methodology for the derivation of natural truth. In this sense autonomous science was distinct from religious sciences. Those defending the Church argued that the autonomy of science cannot be claimed as it is informed by external sources which influence perception; and one cannot deny necessarily alternative perspectives to knowledge, which autonomous science seems to do. See B.C. Southgate, "Forgotten and Lost: Some Reactions to Autonomous Science in the 17th Century," *Journal of the History of Ideas* 50, no. 2 (April-June 1989).

[4]The debate between Pasteur and Pouchet on the validity of spontaneous generation may have led Pasteur to defend his position against it not only on the basis of his experimental evidence, but also on the political and religious climate that prevailed. At the time Pasteur may well be echoing the sentiments of the Church in its opposition to spontaneous generation, this in view of the fact that Pasteur was the patron of the State at a time when both the State and Church had a strong allegiance to one another. See J. Farley and G. L. Geisan, "Science, Politics and Spontaneous Generation in 19th Century France: The Pastuer-Pouchet Debate," in *Darwin to Einstein: Historical Studies in Science and Belief,* ed. Colen Chant and J. Fauvel (London: Longman Group Ltd., 1980).

[5]T. Kuhn, *The Essential Tension* (Chicago and London: University of Chicago Press, 1977), 110.

> Most theories of the growth of knowledge are theories of the growth of disembodied knowledge. Whether an experiment is crucial or not, whether a hypothesis is highly probable in the light of the available evidence or not, whether a problem shift is progressive or not, is not dependent in the slightest on the scientist's beliefs, personalities or authority. These subjective factors are of no interest for any internal history.[6]

Lakatos in this sense is a traditional positivist; scientific activity is insular, and extraneous factors do not taint the logic of discovery. In other words, external history is incidental and has no consequences for rational scientific discovery.

The philosophy of science is very closely linked to the history of science, and is even included, in part, within the history of science itself. Every philosophical tradition has a history, and for every history there is a philosophy. In particular, the cross-cultural interchange in the Islamic world had an important influence on the development of the philosophy of science in Islam as it was perceived and practiced by the Muslim scientist. Thus the term "Islamic science"[7] is not a term simply referring to the development of science within the culture (i.e., the values and institutions) of Islam, but is essentially a description of how Islamic philosophy, as a window of perception, has come to influence the development of science in Islam with its own reputation and tradition.

The practice of Western historians of science to relegate the Islamic world to the role of a mere transmitter of the Greek (Western) tradition is an attempt to deny Islam an important role in the history of science, one that perhaps generated and contributed to modern science in a unique way. The phrase "transmitter of knowledge" conveys a passive role, one of translation and preservation, as if by this very statement the element of creativity and innovation within the Islamic community had no existence of its own in the rich evolution of science. While this is not an attempt to mourn the death of Islamic science

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[6]I. Lakatos, *The Methodology of Scientific Research Programmes* (Cambridge, UK: Cambridge University Press, 1978), vol. 3, p. 106.

[7]Why argue for the concept "Islamic science"? This interesting question arises from the concern that science is science, and there is nothing exclusive or distinctive that justifies the rise of Islamic science. In this sense, science would be defined as an endeavor that would have occurred within a particular group of people in a particular historical setting. In other words, according to this argument, science is value free and culturally neutral. Science also can be viewed as value-neutral or value-laden. Like all forms of knowledge, science takes place within a particular cultural milieu; the setting of power and the sociology of the community both affect how knowledge is reproduced. In this sense we can now speak of science in terms of Western science and Islamic science. Here, however, we do not talk of its results, since the results are a consequence of a paradigm within a value-laden scientific society. The cosmology of the believer is just as important as the results, since it tells him what to believe and how to deduce. "Islamic science" has its own sociology of knowledge and developed within certain political, ideological, and class realities in a given historical setting.

or of Islamic civilization, its contribution to the plurality of civilizations should not be dismissed and its honor forgotten. It is in this vein that Joseph Needham wrote his work on Chinese science and civilization.[8] Needham looks at the Chinese contribution to science and how its civilization's cultural values contributed to scientific thinking and a growth in knowledge. He also attempted to construct a history of science vis-à-vis non-European people.

Western historians of science make the fundamental error of viewing the development of science within the confines of their own closed culture. If a non-European culture is included at all, it appears only as a chapter or two and its development is viewed as incidental, for the Western tradition from Aristotle to Einstein dominates the text. Science began with Aristotle; all other forms are mere derivation and differentiation of this central episteme. In other words, all roots of science are found in the West, just like all roads lead to Rome, as if the history of non-Europeans were nonexistent and peripheral. This view reveals the cultural bias of a civilization that through its years of practicing slavery and colonialism has come to view the histories of those "lesser" people as insignificant and therefore of no merit to the archaeology of knowledge.

A history that is not written is forgotten; a civilization that is forgotten is permanently lost. History is an important reminder of the past. However, its significance is not to be found in relating the past; rather, its true value lies in what it is capable of doing to the future. In this sense, popular history reinforces the love for culture and its values, and in this way perpetuates the civilization's tradition. The writing of history enhances the power of the dominant culture by diminishing the value of the history of those people who have been subjugated or who have come under the sway of the dominant culture.

Through the writing of history, a civilization's development is measured, rationalized, and explained. Moreover, through history one determines the future. A people without history are a people said to have no culture and no civilization, meaning that there is a clear danger to all traditions that are dominated, either now or in the future, by another civilization. The writing of history is nothing but the quest for cultural preservation, whether it be in the form of a narrative or a critique, so long as the window from which it is assessed and explained is under the control of its own cultural players. A history written by others for others is, perhaps, an attempt at historical imperialism if and only if such pens are fed by those who live within the paradigm of imperialism. In Eurocentrism, there is certainly a motive to universalize Western values above the rest, and thus the "fundamental error of Eurocentrism is that tacit postulate that since modern science and technology, which did indeed flower in Europe of the Renaissance, are universal, then everything that is European is universal."[9]

[8]J. Dhombres, "On the Track of Ideas and Explanations down the Centuries: The History of Science Today," *Impact of Science on Society*, no. 160, 200.

[9]Ibid., 200.

History is written for many reasons, and as the reasons vary so do the methodologies. The narrative is also referred to as historiography and is aimed at subjectively glorifying the past for either ideological or political ends. In this sense, narrative history, as far as its selection of the facts, has no qualms when it comes to tangentially bending the picture to suit the narrator's image. The selective use of historical material is aimed at drawing principles and explaining present failures by drawing upon past success and glory as a guiding point for finding a remedy to the present social ethos.

One can possibly divide the writing of history into two kinds: academic (aimed at objectivity) and literary (historiography) storytelling (value oriented and subjective). Philip Bagby writes:

> In his role of literary artist, the historian does not confine himself merely to describing the facts in clear and harmonious language. On the contrary, he borrows many of the tricks of the novelist and the dramatist. To divert his readers, he stresses the unusual or the amusing incident. He quotes the apter sayings of historical passages and not their duller everyday remarks. He pads his work with local colour, but only where it is agreeable or exciting. Often he uses vague and highly-coloured language, seeking to stir his readers' emotions rather than merely satisfy their curiosity. In all this he panders to that prevailing taste for the exotic, that love of other places and other times which we have already seen is one of the characteristic aspects of modern urban life. And in so doing, he inevitably gives a distorted picture of the past, one comprised primarily of the brighter colours, omitting the dull workaday grays and browns. In Descartes' words: "Even the most faithful histories, if they do not alter or enhance the value of things to make them more readable, at least nearly always omit from them the baser and less notable circumstances."[10]

In the pre-Islamic era, history was in the form of oral traditions and poetry which, grouped under the term *ayyām*, glorified important events in the days of the tribe, such as the fighting of major battles and victories or heroic tribal feats. In those days, the battle was the event which was of paramount importance: the blood of the tribe was spilled, and the event only needed to be remembered for what it was. This early presentation of history among the pagan Arabs had no chronology, for the "bad" was not important. Only the glory which gave prestige and a sense of identity to the tribe's members was important, for in this glorification the enemy would know that it had been weakened and defeated on

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[10]P. Bagby, *Culture and History* (CT: Greenwood Press, 1976 [reprint]), 44.

this day. History here was a memory instead of a sequence of events. There was no sense of time evolving, for time and dates were immaterial.

With the advent of Islam, chronology became the central focus. Events were fixed, time evolved, and dates mattered just as much as the events themselves. The use of the *hijrī* calendar marked the beginning of a new civilization, one which was moving from nomadism to state, from paganism to religion, from lawlessness to law. Even revelation was a chronological event, for the *asbāb al nuzūl* (lit. the reasons for the descent) were now connected to the hermeneutics of the text. Time and text were related. Chronology and text were important in that each sequence of revelation was related to the other in the evolving drama of a new civilization; prophethood was a chronology of events. This relation was also seen in the case of *al nāsikh wa al mansūkh* (lit. that which abrogates and that which has been abrogated), for these were chronologically related in that each was a consequence of the *sīrah*. What was abrogated could only be determined by studying where it appeared in the sequence of events, or else contradiction would persist and the text would become meaningless. The law itself, taking into account the *asbāb al nuzūl* and *al nāsikh wa al mansūkh*, was assisted in its derivation by the strong tradition of chronology. For the first time in the history of the Arabs, time occupied the central position, and events were meaningful only if they were set in relation to time.

The emergence of the calendar and the writing or recording of history through the method of tradition allowed a richer assessment of prophethood and revelation in Islam. History allows civilization to be recorded, and civilization persists through history. Tradition and revelation are related in that one explains the other, and both of them compose the manner in which Islamic civilization was recorded. In both, history is a praxis, a divine power manifested in material history driven by souls in spiritual solitude.

Due to the *sīrah*'s importance at the time of al Zuhrī, as well as the *maghāzī* (accounts of the Prophet's battles) and other events of Islam's early days, only a meticulous verification process based on the principles of *uṣūl al ḥadīth* was used in the collection of historical data. In this sense, the hadith scholars established a kind of objectivity unmatched by any other. At the time of Ibn Isḥāq, the writing of history took on a more literary style with the inclusion of the *qiṣaṣ* (stories of the Banū Isrā'īl) and the influence of Persian literary stylistics and poetry.[11] This literary style was acclaimed, sponsored, and encouraged by

[11]Ibn Isḥāq may have been influenced by Ibn Munabbih, a known narrator of the Israeliyyāt and Quṣaṣ. The tangential overtones of Ibn Isḥāq were severely criticized by the more strict *muḥaddithīn*, so much so, that his work was refined by Ibn Hishām to bring it into conformity with those of the *uṣūlīyūn*. Al Mas' ūdī, when writing his accounts of the biblical tradition, makes very little use of the Israeliyyāt material of Ibn Munabbih or the *Kitāb al Mubtada'*, often referring to some of the claims made by Ibn Munabbih and Ibn Isḥāq with some skepticism, the creation of *jinn* in particular.

the rulers of the day. It is at this time that the writing of the *sīrah* begins to be done in the style of historiography.

> In characterizing their discipline, Muslim historians had already emphasized the comprehensiveness and diversity of its subject matter, and its uses for the various classes of people. Theologians, mystics, philosophers, and litterateurs studied history, and each class tried to learn from its ibra in their respective fields. Common people enjoyed its pleasant and dramatic stories, and its memorable events. Rulers and princes cultivated and encouraged it because it was a field through which they could learn the policies of their predecessors and gain in the art of ruling.[12]

In both al Mas'ūdī (d. 957) and Ibn Khaldūn (d. 1406), the writing of history is informed by the tradition of the philosophers. Though separated by time, they were united by one tradition. History is not only data, but has to be processed, and civilization, represented in legible form, is a process. The travels of al Mas'ūdī allowed him to construct a terrain's bio-data and geography, which then made it possible for him to write his natural history of the world – science in the form of natural history. Civilization is a cross-cultural exchange, for the culture of Islam is understood only in relation to others. His two remaining books, *Murūj al Dhahab wa Ma'ādīn al Jawhar* and *al Tanbīh wa al Ishrāf*,[13] deal with the unity of religion and the epics of rulers, states, and wars. History, then, is a process, the conflict and cross-fertilization of civilizations, the understanding of one civilization and one religion in relation to others. His history is one of similitude and difference. Natural history, by which is meant geography and climate, is important insofar as it informs the rise and fall of nations. In al Mas'ūdī's view, geography and climate would determine a people's economy, the possibility of conquests, and, to a certain extent, influence religious beliefs.[14] Therefore, he saw natural history and culture as interrelated and inseparable from each other.

In Ibn Khaldūn's writings, the shape of history takes a new turn, for it is described in terms of its political and economic milieu. In his *Muqaddimah*, the roles of institutions and their interrelationships help to describe the nature of *'umrān* (the state and polity). The development of the arts and sciences is an indication of the development of civilization, and they are examined insofar as they lead to an understanding of the achievements attained thus far. But, more significantly, they represent a taxonomy common to all civilizations. In other

[12]M. Mahdi, *Ibn Khaldun: Philosophy of History* (Chicago: University of Chicago Press, 1971), 116-7.

[13]A. Shboul, *Al-Mas'udi and His World* (London: Ithaca Press, 1979).

[14]Ibid., 79.

words, Ibn Khaldūn develops a model, a description of key characteristics that distinguish civilization from barbarism.

Through a sociological study of society, Ibn Khaldūn sees history as evolving from a certain ethos, from *badaw* (nomadism) to *haḍārah* (civilization), by the mechanism of *'aṣabīyah* (tribal solidarity). On the other hand, Marxist theory claims that the mechanism is dialectical materialism and that the process is historical materialism. The evolution from slavery to communism, through the intervening states of feudalism and capitalism, is attained through the dialectics of class struggle.[15] Therefore history is not only a narrative: it becomes a science having its own purpose, beginning, and end, all of which the historian must define. Every civilization thus follows a path determined by its social, political, and economic institutions. In Ibn Khaldūn's work, the macrocosm is investigated and defined by way of the microcosm. "Therefore, collective human action takes place according to a pattern discernible to human reason, and the phenomenon of culture can be made the object of a rational science."[16]

The study of culture is central to Ibn Khaldūn's writing of history. Culture offers a value orientation, generates institutions, serves as a source for an episteme and a discourse, a discourse that informs power and encapsulates the framework in which the disciplines of knowledge are generated. The actors in history either portray the collective consciousness or act against it. All history is perhaps this tension between those who wish to preserve the old order and those who wish to establish a new one.

The demarcation between the externalist and the internalist methods cannot be defined. Human discourse and the development of disciplines is influenced by ideology, and ideology, in turn, determines the setting of politics and economics. No discipline is independent, for it is always somehow connected to the arena of a society which, in turn, is constrained by the dominant discourse that determines the distribution and setting of power. Power and ideology frame the paradigm in which all other discourses, be they major or minor, are allowed to participate.

Merton views the working of society as a social institution, a community of scientists with their own belief system and peer groups. The different social institutions will have a bearing on the kind of knowledge produced. A second view, also of interest, is how the community outside the scientific community determines which knowledge is acceptable and which is not.[17] Pinch refers to

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[15]The work of Muhsin Mahdi is an important study that sheds light on Ibn Khaldūn's philosophical leanings when examining the subject of history. While Ibn Khaldūn is critical of the philosophical tradition, we are also informed by it sufficiently to apply it as a tool of analysis for his own subject.

[16]Mahdi, op. cit., 183.

[17]T. Pinch, "The Role of Scientific Communities in the Development of Science," *Impact*, no. 159, 1990: 220.

this as the "strong agenda" and that of the scientific community the "weak agenda." It is therefore possible for two different societies to produce different knowledge based on their notions of acceptability. Society acts to legitimize and to define in its own terms what is sacred and profane within the field of knowledge. Thus,

> According to the strong agenda, different societies and different sets of social arrangements within science may produce very different sorts of knowledge. This is not merely a question of a different mapping – the very knowledge produced may be different.[18]

One can examine the role of the state in this matter. An obvious example is that of Nazi Germany, which attempted to purge its institutions of all Jewish scientists or of any science having its roots in Jewish figures or civilization. The Germans specifically attacked "French Rationalism" and "English Empiricism" and encouraged the struggle for an independent German science.[19]

In the Soviet Union, Lenin rejected the positivist tradition of Ernst Mach on the grounds that it was in total opposition to the Marxist tradition and dialectical materialism. These attacks on the positivist tradition were laid out in his *Materialism and Empiriocriticism: Notes on a Reactionary Philosophy.*[20] The role of the Communist party and its effects on the career choices of Soviet scientists is an interesting study in itself. The field of study chosen depended to a great extent upon its political acceptability to the party, for a totalitarian creed judges all human actions by a single set of criteria. Thus, any action which does not fit into the approved criteria is regarded as heretical.[21] This had a negative effect on the development of certain sciences in the Soviet Union. To cite just one example: the extreme nature of Stalinist ideological puritanism resulted in the persecution of Nikolai Vavilov in the 1940s and the ending of Mendelian genetics by Lysenko.[22] Vavilov was sentenced by a Soviet inquisition for promoting bourgeois pseudoscience and was judged to have committed treason against the Soviet state and ideology.[23]

We cannot exclude the history of Islam from this turmoil, for orthodoxy and its link with the state defined the mode of thought. Opposition to orthodox

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[18]Ibid., 121.

[19]P. Frank, *Modern Science and Its Philosophy* (New York: Collier Books, 1961), 193.

[20]Ibid., 188.

[21]P. Frank, ed., *The Validation of Scientific Theories* (New York: Collier Books, 1961).

[22]Nikolai Vavilov, a brilliant Soviet geneticist, was the president of the All-Union Academy of Agricultural Sciences and Director of the Institute of Genetics of the Academy of Sciences of the USSR in the early 1940s. Lysenko replaced Vavilov as part of the state's attempt to purify its academies of those whom it viewed as hostile to the state and who were accused of practicing bourgeois science. See B. M. Mednikov, "The Life and Works of Nikolai Vavilov," *Impact of Science on Society*, no. 154: 124-32.

[23]G. Jones, "British Scientists, Lysenko and the Cold War," *Economy and Society* 8, no. 1 (February 1979).

thought was condemned, and official sanctity was gained by the method of *takfīr* (excommunication), even in instances where the accused only differed on matters of interpretation as opposed to the fundamentals of the Islamic religion. It was always easy to isolate an opponent when it suited a politically justifiable end. It is horrifying to note that the two important schools of *kalām* (philosophy), the Mu'tazilah and Ash'arīyah, expressed their opposition to each other not only through polemics but, more harshly, through persecution.

This can be seen in the establishment of the *miḥnah* (inquisition), a political trial designed to examine an individual's theological beliefs. If he/she was found to be in disagreement, he/she faced excommunication and possible execution. The imprisonment and persecution of Imām Mālik and Imām Abū Ḥanīfah is an indication of past ideological extremism on the part of Muslims. Indeed, such extremism continues today in one form or another, for Islamism (not Islam) can be just as coercive as other systems of thought. Is not ideology, then, coercion in its crudest and most sophisticated forms? Every proponent of a particular line of thought only expresses it in an attempt to increase power. The will to power from one speaker to another is an underlying rationale, with coercion being the guiding principle. Tolerance becomes mere diplomacy, an act of expediency, while behind the scenes totalitarianism is the name of the game.

When we refer to the definition of orthodoxy, then orthodoxy cannot be viewed except in relation to power. In other words, it is power that defines orthodoxy and, in turn, orthodoxy legitimizes power – the two are interrelated. Orthodoxy can only flourish if the situational politics are conducive for its development. It is in terms of this that we can view the development of the four *madhāhib* and understand why others did not gain such prominence and widespread following. It is not coincidental that the role of conquest and the spread of the schools of thought are related. Shi'ism was able to entrench its dominion over Sunni Iran, via the Safavid dynasty, in the seventeenth century. The spread of Wahhabism could not have succeeded without the alliance made between Shaykh 'Abd al Waḥḥāb and the Āl Sa'ūd. It is not coincidental that the establishment of the Niẓāmīyah college by Nizām al Mulk helped entrench the ascendancy of al Ghazālī's *kalām* and that of his mentor al Juwaynī.[24]

Arkoun defines orthodoxy as follows:

> Orthodoxy is defined as the system of beliefs and mythological representation through which, and with which, a given social group perceives and produces its own history . . . In this context, orthodoxy can also be defined as the system of values which functions primarily to guarantee the protection and the security of the group.[25]

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[24]Hodgsin Q. S. Marshal, *The Venture of Islam* (Chicago: University of Chicago Press, 1974).

[25]M. Arkoun, "The Notion of Revelation," in *Gegenovart als Geschichte* (Leiden and New York: E. J. Brill, 1988), 63.

Arkoun seems to imply that orthodoxy is something static, always linked to something established in the past, fixed and continued by the perpetuation of the same mode of thought. In this instance, Ṭalāl Asad's definition seems to be more appropriate:

> Wherever Muslims have the power to regulate, uphold, require, or adjust correct practices, and to condemn, exclude, undermine, or replace incorrect ones, there is the domain of orthodoxy.[26]

In terms of Asad's definition, modernism can also emerge as an orthodoxy if it is sufficiently entrenched or replaces an earlier orthodoxy. For every orthodoxy there is a counterorthodoxy willing to replace it in the name of truth, purification, and preservation, and always with the goal of establishing its textual interpretation as the ultimate arbitrator in the affairs of humanity. As there is a web of interpretations, so is there a network of orthodoxies and counterorthodoxies willing to take over where the others have left off.

Our thesis is to examine how science may have been affected by such tendencies and whether orthodoxy, as it existed at that time, allowed sufficient room for its development as well as for the individual scientist to gain acceptance and independence. The institution of *muwaqqit*, or the establishment of prayer times through astronomical means and other rituals, necessitated accuracy in terms of astronomical measurements. The development of the sundial and the astrolabe were based on the knowledge of the Indians, Greeks, and Persians. Muslim astronomers refined the methods and set up lunar tables with a considerable degree of precision. Before the emergence of astronomy as an important science in Islam, the mosque's *qiblah* (prayer niche) was often misjudged due to inaccurate methods of determination. Through the use of astronomy and mathematics, however, an accurate determination of the Ka'bah could be made relative to any position on earth. As religious needs were clearly served by these scientific methods, traditional Islamic institutions encouraged and tolerated the astronomers' expertise.[27] Can we view this as a rare occasion in the history of science in Islam, or are we bound to have misgivings about the interrelationship of orthodoxy and the practitioners of science?

The construction of a history of science is necessary, as the scientific tradition of Islam was unable to maintain itself and eventually perished. The important question which must be answered is: what were the processes that contributed to such a decline? The answer may lie in the spiritual realm, but this view alone

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[26]T. Asad, "The Idea of An Anthropology of Islam," Occasional Papers Series, Center for Contemporary Arab Studies (Washington, D.C.: Georgetown University Center for Contemporary Arab Studies, 1986), 15.

[27]D. A. King, "Science in the Service of Religion: The Case of Islam," *Impact*, no. 159, vol. 40, (1990): 245-62.

would obscure those events. Concern should be placed on the level of spiritual interaction, where the conscious choices of individuals have come to bear on the tradition of others. While external history is useful in explaining the evolution of science as a discipline and also in constructing the sociological context in which science was allowed to flourish, the internalist method would deny this orientation, as its sole aim is to explain the logic, and not the context, of discovery. Sardar writes:

> There is a conspicuous absence of analysis in the existing histories of Islamic science. On the whole they tend to be catalogues of the achievements of individual scientists, translations of individual works, biographies of noted figures, learned comments on this or that manuscript and sweeping accounts of the rise and fall of Islamic scientific culture. There is an acute need of analytical works on the methodologies of great Muslim scientists, their philosophy of science, and most of all, their rationale and ability for integrating their world-view. In other words, we need models and theories for the historical practice of Islamic science that either can be adopted per se or used as guidelines for contemporary practice of Islamic science. Without those models, contemporary Muslim scientists have nothing tangible to relate to.[28]

What Sardar argues for here is the construction of the epistemological foundations of Muslim scientists. In other words, which interpretative values were constructed from the tradition of Islam to inform the development of Islamic science? Was such a tradition positivist, rational, or empiricist? What was the nature of reasoning, deduction, or theoretical construction? Sardar is no different from the rest of the internalists who are primarily concerned with the logic of discovery, and he therefore fails to consider the implications of how the social context may have had a bearing on the development of the scientific discourse. If there is a lack of critical analysis, then it is not only in the construction of the logic of discovery but in how the scientific epistemology was born relative to the context of discovery. A totality of Islamic scientific history cannot be envisioned except when external history is allowed to intersect with internal history. Sardar, like Sarton, views science as the culmination of something, but not as culmination in terms of other forces which have come to determine it and develop its counterarticulation, as can be seen in the early history of Western science.

Sarton's view of the history of science was not only an analysis of its development, but an attempt to measure its periodic evolution in the quest for

[28]Z. Sardar, "Can Science Come Back to Islam?" *New Scientist* (October 1980): 213-6.

supremacy and truth. The history of science offered a rational and clear view of that past vision together with its strengths and weaknesses.

> Science must be tempered by humanity, and the best way of doing this is to explain its organic development, and also to show all that was really great, beautiful and noble in these civilizations of old, all that our conceited scientists and inventors have too often forgotten and disdained. We must teach reverence for the past—and not simply for its own sake or because it is still full of treasures—but for the sake of the present which it will aid us to appreciate, and for the sake of the future in which it will help us to walk with dignity.[29]

Sardar's analytical construct of the logic of discovery is insufficient to explain the genesis of Islamic science. Its decline can only be understood in terms of the sociology of science. This realization is important, as it assists in constructing a vision of scientific ideology with the prism of the past, insofar as that prism is allowed to diffract both the beams of external and internal history.

In the works of Sayyid Hossein Nasr[30] and Franz Rosenthal,[31] one finds Islamic science in the form of a narrative. In Rosenthal, Muslim scientists and philosophers are allowed to speak about their activity by quotations he inserts from various authors after a brief introductory note on the subject of interest. Nasr's writing is inadequate for the very reasons I have outlined in my previous argument and is from a different perspective of that of Sardar. Nasr is content with describing the cosmologies from which Muslim scientists operated. He does this in a very interesting fashion in his later works, in which the natural order of plants and animals was set according to the cosmology of nature, which informed the role played by animals and plants in the hierarchy of being; from this premise, the taxonomy and studies were conducted.[32] With a discussion on cosmologies, the narrative includes biographies of individual scientists and their areas of scientific achievements laid out according to subject matter. Nasr's work is nothing but an attempt to bolster his own view that Islamic science and philosophy, as they appear in Shi'ism, were the realization of the Gnostic tradition.

Finally, we have the level of pure knowledge and understanding. It

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[29]Quoted in L. Pyenson, "What is the Good of History of Science?" *History of Science*, no. 27 (1989): 353-89.

[30]S. H. Nasr, *Science and Civilization in Islam* (Cambridge, MA: Harvard University Press, 1968).

[31]F. Rosenthal, *The Classical Heritage in Islam*, trans. Emile and Jenny Marmostein (London: Routledge and Kegan Paul, 1965).

[32]S. H. Nasr, *Islamic Life and Thought* (Albany, NY: State University of New York Press, 1981). See chapter 11.

> is that of the contemplative, the gnostic (*'ārif*), the level that has been recognized throughout Islamic history as the highest and most comprehensive. The gnostic is Muslim in that his whole being is surrendered to God; he has no separate individual existence of his own. He is like the birds and flowers in his yielding to the Creator; like them, like all the other elements of the cosmos, he reflects the Divine Intellect to his own degree. He reflects it actively, however, they passively; his participation is a conscious one. Thus "knowledge" and "science" are defined as basically different from mere curiosity and even from analytical speculation. The gnostic is from this point of view "one with Nature"; he understands it "from the inside," he has become in fact the channel of grace for the universe.[33]

Islamic gnosis for Nasr is a continuation of the Pythagorean tradition of spiritual symbolism. Gnosis in Islam establishes the intuitive and rational faculties as an integral part of the unity of creation; science is a mere dedication of effort towards that goal.[34] Ultimately, what Nasr wishes to seek is an effective response to the Western history of science which, as he claims, dismisses the significance of Islam. Nasr tries to illustrate the importance of Islam in the development of Western science through his narrative. In other words, he sees Western science as a logical extension of the Islamic tradition, thereby linking the two civilizations.[35]

It is clear, then, that both narrative history and the logic of discovery are inadequate when one is attempting to identify those key factors that have influenced the tradition of Islamic science. In addition, neither version is able adequately to explain the development of a distinct scientific epistemology, if such a development did indeed take place. If Islamic science was a combination of previous traditions, then it was not something unique, but merely a continuation of the "ancien regime" by people of another tradition. If it was unique, when and how does Islamic science branch off from the "ancien regime"? This in itself would give an indication of its distinctiveness and how traditions of power, value, and even cosmologies have come to shape the development of an alternative episteme and scientific tradition. The important issue to address is how it culminated and why it was not sustained. Only external history can answer these questions.

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[33]H. S. Nasr, *Science and Civilization in Islam*, 23.

[34]Ibid., 36-7.

[35]Ibid., 38.