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TECHNOSCIENTIFIC IDENTITIES: MUSLIMS AND THE CULTURE OF CURIOSITY

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF PHILOSOPHY

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To the memory of my father, Nasrollah
Technoscientific identities in the Islamic world are changing. The recent resurgence of Islam has raised a new understanding of the West. In contrast to the view that the transmission of Islamic medieval sciences to the West has resulted in a continuity of Islamic values in Western science, an understanding of the West as an epoch has emerged, allowing Muslims to rethink the presumed value and culture free basis of technoscience. The ephocal view of the West sees it as based on a set of inter-related phenomenon, including a secularized Christianity and notions of rationality, progress and a universalist subjectivity. A radical critique of Western secular and universal technoscientific identity is shown to be emerging, drawing on both the critical rethinking of the foundations of technoscience and on the experiences and practices of actors bound by different contexts out of which different ideas spring forth and are enacted. Radical critique deconstructs existing technoscientific formations through
invocations of the Islamic metaphysical foundation of knowledge as well as its eschatological structure of change. It is also a reconstructive force insofar as it opens the way of constructing new forms of technoscientific identities out of existing experiences and institutions. A transnational landscape delineates the terrain, where scientists and engineers play important social and political roles. Institution building and other scientific activities become subject to different global and local modalities of interaction. Through the mobility of individuals and institutions in the transnational landscape, ideas and discourses travel from one locality to another via frames of abstraction. An ethnographically informed understanding of these sites reveals contested tropes of technoscientific identities. Instead of relying on pure forms, radical critique engages in developing a critical and performative view of this condition and acts as a resource to form the basis for a new culture of curiosity.
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Chapter One:

Introduction: Radical Critique and the Remaking of Technoscientific Identity

This dissertation illustrates the relevance of the Islamic challenge for the future of technoscience in the Islamic world. I focus attention on the pragmatic maneuvers that have been, and will continue to be, effected by appeals to grounding the technoscience differently than they have been in the West. I do not argue here for another epistemological basis for science, but I do argue, as an anthropologist, that it is important to understand the struggles occurring over the control of universities and technoscientific training in the Islamic world and their longer term effects. Just as it was dismissive to call the Islamic revolution in Iran a medieval archaism, or to dismiss the capacity of the Iranian clergy to actually run a government, so too, I argue that something serious is going on through the struggles over technoscience in the Islamic world.

This dissertation, then, concerns the relationship of Islam to secularism, and specifically this relationship in a global context. I explore and test the limits of this global context in particulars. I try to open up the Islamic deconstruction of secularism ethnographically, through a look at various sites of technoscientific production. To this end, each of the
moments chosen in this dissertation is an ethnographic test ground for contested tropes of technoscientific identities.

That there is a metaphysical and cultural underpinning to both Western science and to Western secularism -- that secularism is not quite so value-free as it claims -- is after all not a new idea, either in the West or in the Islamic world. That, however, Islamic critiques of secularism, which have framed the nationalist and political struggles against cultural, political and economic colonialism in the Islamic world over the course of the 20th century, have challenged the existing technoscientific enterprises in the Islamic world, is something quite different.

I focus on four countries - Iran, Malaysia, Pakistan, and the U.S. This focus was created, initially, through interviews with individuals or groups of scientists, and eventually led to understanding their larger milieu, national and transnational. Each case chosen in this dissertation provides an ethnographic test ground for evaluating the pragmatic effects of contested tropes and institutional maneuvers over technoscientific identities. Many of my interview subjects argue that there should be a religious and cultural basis for technoscience. They argue, further, that the Western "value-free" secularism that is said to underpin universal technoscience is neither value free, nor without metaphysical underpinnings. Do their arguments make a difference? That is what the
dissertation will attempt to explore and it is for this reason that I use practicing scientists to explore these questions.

Of key importance is the fact that Islamic activists work inside and among institutions with transnational connections. Therefore, while in a sense I focus on four countries, it is crucial to the dissertation that readers understand that these actors are transnationally mobile, and can leverage resources in multiple settings. In addition, contrary to the arguments that assume national boundaries are Western colonial impositions and that Islamic umma (community of believers) transcends this imposition, the argument here is different in that in the condition of the late 20th century, there is transnational mobility that affects the construction of many local institutions. In other words, it is not just that people are moving but that these movements have a structural effect on institutions.

For example, in Malaysia alone there are numerous institutions with a transnational presence. One institution that engages in Islamization of knowledge, and claims to focus on social sciences, is the International Institute of Islamic Thought (IIIT), headquartered in Herndon, Virginia, and Kuala Lumpur. Meanwhile, the International Institute of Islamic Thought and Civilization (ISTAC), based in Kuala Lumpur, has a branch in Turkey. The International Islamic University in Kuala Lumpur accepts students from all over the world. Moreover, Muslim activists work as well within colonially inherited institutions, such as University Malaya, where
Osman Bakar, who was trained by the Iranian born scholar of Islamic studies based at George Washington University, Seyyed Hossein Nasr, heads a department on science and technology.

These institutions are themselves important, but more important is the movement of individuals, that is, what goes on in between these institutions and individuals is the locus of far more important activity. For instance, while the concerns of the 1979 Nobel Prize laureate, the Pakistani physicist Abdus Salam, focused on such problems as the appropriation of resources -- finding books, journals, equipment or setting up schools and laboratories -- today's scientists are aware of greater concerns. My interviews with Iranian scientists and engineers currently at work in their country, for instance, reveal the concerns of this generation of Western trained scientists who have been working in relative isolation since the 1979 Islamic Revolution. Veterans in their own fields of research, they now face the problems of learning what is involved in training a new generation of young people who have grown up under an entirely different symbolic structure with a different set of values than themselves.

As Hefner argues (1997a; 1998) Islamic politics is not singular and Islam has always interacted with national discourses. Global and transnational effects of Islamic discourses should be understood in their articulation into localities and the ways in which these articulations interact with national and international politics.
Science Studies and Muslim Technoscience

Literature on science in cross-cultural perspective is scarce. Sharon Traweek's (1988) pioneering work examines the transnational community of high-energy particle physicists, focusing on Japan and the United States. In the Indian subcontinent, studies of colonial and post-colonial science have been around for a decade (Baber 1996; Guha 1989; Nandy 1988; Visvanathan 1985; Visvanathan 1988a; Visvanathan 1988b). But in the Islamic world, there are really only two strains of relevant work. The one is historical work on Islamic medieval sciences, such the work of Saliba (1994) and Sabra (1981; 1994). The other, most prominently that of Seyyed Hossein Nasr (1968; 1978; 1993) attempts to identify metaphysical, cosmographic, and gnostic themes that could be used to argue for a civilizational holism of science and technology within the Islamic world that might differentiate it from science and technology in the West. However, this strain, when not merely apologetic, is drawn to medieval sources rather than the contemporary technoscientific worlds.

What then, should a study of science and technology that is informed by both historical and philosophical concepts and situational, social and cultural contexts look like? In Muslim polemics, Western science has been characterized as an enterprise in crisis, and arguments are made for
alternative sciences based on different cultural traditions. The strong claim is that science cannot reproduce and advance with its current epistemological tools\(^1\). Such a claim could be based, for instance, in ecological concerns that science has been destructive to the environment, a claim made by some Muslims, and also by many in the West. In India, Ashis Nandy (1988) and his colleague have made a similar claim, not just on ecological grounds, that the modern Western sciences are disciplines of violence -- violence both in terms of dissecting and tearing apart of the material world for analytical purposes -- but also cultural violence that marginalizes alternative scientific traditions rooted in India (e.g., survival of Auyavedic medicine, local traditions of metallurgy, and various other craft sciences which were replaced by European ones). Or such a claim for alternative forms could also be based on the kinds of institutional problems mentioned by the Iranian scientists cited above: that the social and cultural training of the young generations of the 1990s under the influence of the Iranian Islamic Revolution and similar Islamist movements elsewhere have created a pedagogical crisis that needs to be addressed, not just wished away.

\(^{1}\) Heidegger calls the essence of science its methodological ability which allows its premise to be revealed. Therefore it is not its philosophical foundation that generates its essence but the ability to make that foundation to show itself. In this sense, science can be in crisis when the methods cannot yield further reproduction and expansion of science.
Or thirdly, and perhaps most basic, such a claim might be based on the observation that modern science is institutionally intimately related to the nation-state. For Ashis Nandy, the American state is colonized by the rationality of large-scale technologies, symbolized by President J. F. Kennedy's 1962 speech making placing a man on the moon a national goal. An alternative to such a science - pursued in India through its own nuclear power, defense, and national laboratory establishments -- would be to pursue a more indigenous, cost-effective, and culturally unique set of scientific goals.

Lysenkoism, a kind of Lamarkian genetics directed toward agriculture and known as a proletariat science of the 1930's Soviet Union, illustrates the dangers of such an argument taken to an extreme. Graham (Graham 1998) chronicles the rise and fall of Lysenkoism as an effort to force cultural values upon science. He claims that the reality principle eventually defeated Lysenkoism, as Western genetics possessed greater scientific rigor, was grounded in a richer body of empirical evidence, and resulted in more effective agriculture. Ghamari-Tabrizi, albeit in a negative example, uses Lysenkoism as a way to illustrate the immense power that control over knowledge can leverage, analogizing the elevation of Muslim clerics as arbiters of science as an Islamic Lysenkoism. He argues, for instance, that in the case of 'Alwani and al-Faruqi, two contemporary Islamists, misconception and miscalculation are due to
deviation from "revelation." He goes on to say that, "Revelation should not be considered as the predetermined outcome of scientific inquiry. Thus, Islamic Lysenkoism is a system within which the expert who has the power to legitimize his/her interpretation of revelation determines the validity of any knowledge-claims. Islamic Lysenkoism is appended with a divine self-righteousness that resembles vulgar positivism and other universalizing tendencies of modern ideologies." (Ghamari-Tabrizi 1996, p. 327)

Social and culturally informed studies of science should move beyond ideological assessments of constructivism of science to show the situational and contextual alternatives for technoscientific development. There is a need for a "constructivism" that allows an understanding of actors, milieus, and situations rather than a large, broad scope of social constructivism. I argue that this can be done by analyzing the linguistic utterances, or speech acts, that pass between actors, milieus and situations.

In this dissertation, for instance, I unpack some of the arguments that revolve around Pervez Hoodbhoy's 1991 book, Islam and Science: Religious Orthodoxy and the Battle for Rationality in which he disputes the Islamization of science. Although many contestors simply dismiss this book as the cry of a simple Western-trained positivist, in Malaysia, for example, I found many Muslim intellectuals who disagreed with this dismissal. As I will argue, Hoodbhoy's work can be seen as a speech act
among many other speech acts that address the shift in technoscientific identities.

I situate my work within the recent work on the philosophy and anthropology of language which studies local/global effects on linguistic and speech communities (Silverstein 1998). My reference to technoscientific identities here refers to a set of linguistic enactments that are about constructing institutional, epistemological, and cultural bases for science and technology. This relationship of language, culture and science and technology make up what I refer to as technoscientific identities. The culture of curiosity derives from the methodological process through which knowledge becomes objectified, such as scientific methods, educational process, and institutional constructions. It is for this reason that I refer to the remaking of technoscientific identities by way of the culture of curiosity.

In my dissertation I argue for the notion of "radical critique" as a key frame to understand the remaking of technoscientific identity. The return or resurgence of religion is considered here as a deconstructive force that provides a movement for a radical critique. This force is in the form of invocations of Islamic metaphysical foundations of knowledge as well as its eschatological structure of change. However, radical critique also occurs in a context where players enact different ideas that spring out of their milieu. It is thus also a reconstructive force insofar as it opens the
way of constructing new forms of technoscientific identities out of that which already exists. I will describe a global context for this activity, which is a metalinguistic space (Benjamin Lee 1997) where multi-level mediations, actors/institutions/machines, enframe the dynamics of change.

A Global Context for Technoscience and Muslims

Islamic studies has too long been stuck in debating the degree to which there are local Islams or a regulating ideal of universal Islam -- Great Traditions and Little Traditions, Geertz's Moroccan Islam vs. Indonesian Islam (1968). The cases examined here provide a basis for insisting upon multiple local-global dialectics in constant dynamic interaction. "Global" here, moreover, means something historically quite specific to the late 20th century. Global is the slogan of neoliberal political thought that in the aftermath of the collapse of the Soviet Union and the decline of a bi-polar Cold War world has become the hegemonic ideology of a particular kind of "free market" restructuring of the international economy. It is this political economy regime, as much as a more general religious and cultural hegemony of the secular-Christian West, that Islamic ideologies struggle against. This is the contemporary variant of the struggles against colonialism, neocolonialism, dependency and unequal trade relations of earlier decades.
Secondly, "global" here also refers to the ways in which modernity presumes a unidirectional and missionizing goal. Technological objects and scientific practices connect the local to the global in constricted ways, that is, certain aspects are abstracted and travel independently of local effect. Here global is made possible through the globalizing aspects of science and technology transmitted through large projects such as the usage of media used as the infrastructure for the Human Genome Project which have global aims.

As mentioned earlier, historically social movements associated with Islam have been transnational: e.g., the reform movements associated with Islamic modernists such as al-Afghani, or the sufi tariqas which have had strong educational, political and cultural effects, such as the Nakshabandiyya across Central Asia to Malaysia. Moreover the scholar-traveler is not a new phenomenon in the Islamic world. Traveling in search of knowledge (rihla) started already as a form of propagation of Islam, and remains important today along with 'ilm (knowledge) and dawa (the call to Islam) as key elements in activist ideologies supporting mobility and travel across the world.

Moreover, the modernist reformers, especially the early 20th century Egyptian scholar, Rashid al-Rida, were interested not merely in travel and exchange of scholars, but in the construction of new institutions for such exchange. It is in this context that modernists took up the call for
the separation of "church and state," using this slogan from the modernizing West to undermine the stagnant hold of the ulama on institutions of education. With the rise of secular states in the Middle East, and the increasing monopoly of the state over public education, the scene was set for a counter-reaction, against the complete subordination to Western models and projects.

I would like to propose that we think of Islamic arguments in the contemporary world as more a deconstructive force than a primordial ideology. I agree with Mona Abul-Fadl that, in this global context, "Islamization, then, constitutes that process of reforming and revitalizing the current underlying structures of thought and perception by means of their exposure to a radical critique in the light of an integrated set of cognitive, affective, and symbolic values derived from the Islamic tradition." (Abul-Fadl 1995, p. 4) In this sense, I use Islamization as a deconstructive force, what was marginal under a constriction of the universalizing modernity is indeed the radical other or critique of the system.

But I interpret this less as another claim for "an integrated set of cognitive, affective, and symbolic values," and rather would place the stress on "radical critique" stemming from Islamic thinkers positioning as "other" to a hegemonic system. Whereas in traditionalist polemic against Christianity or within Islam of one sectarian group against another,
Muslims could position themselves as carriers of hegemonic truth, today
the force of Islamic arguments is rather a critique of hegemonic claims
stemming from power and authority structures situated outside Islam.

This deconstructive positioning is facilitated -- not only vis-a-vis "the
West" or Christianity, but also vis-a-vis local and nation-state structures
within the Islamic world -- by the increased speed with which people and
ideas can be moved around. Print (Hefner 1997b) and tape recorder
(Naficy 1995) technologies used first by secular states for education, have
now been appropriated as ways to distribute Islamic scriptures, sermons
and ideas. And now video cassettes, satellite television, CD-ROM, and the
Internet have supplemented these technologies.

State monopoly over education -- and over the reproduction of
modern subjects -- have crumbled in the 1990s almost everywhere in the
Islamic world. The state monopoly is displaced by a hybrid of national and
transnational educational institutions whose guiding program may include,
exclude, or hybridize Islamic, nationalist, or Western tropes. Funding for
these new educational institutions relies on global financial, cultural, and
political networks. The reliance on the state as a source of development
and hope has shifted to a set of culturalist and eschatological
presuppositions for new economics and social outlooks, that function first
in a deconstructive way and perhaps -- it remains to be seen -- in a
constructive way that can provide new institutions for the modern world.
Islamization, then, must be considered in the singularities of globally constructed localities. All the cases I explore in this dissertation reveal the constant dynamic interaction of these multiple local-global dialogues.

**Muslims Subjectivities in the West and "America's Islam" in the East**

The increasing number of Muslims in the West is rapidly changing the cultural landscape. In the U.S. alone, Islam is one of the fastest growing religions. This increase, coupled with the resurgence of Islam in the Muslim world, is sources of both anxiety and curiosity for the West. Islam is no longer the exteriorized other, but is both ontologically and anthropologically face-to-face with the West.

Take the role of *dawa* (the call to Islam) and the role of cultural translation and the ways these two features play themselves out in the Muslim diasporas' attempt to create its own identity from inside the Christian West. The particular role of Islam, and more specifically, the question of the divine, needs to be taken up in consideration of these processes of identity formation (and not just the sociological devices more typically considered in studies of identity construction in the West.) *Dawa* (the call to Islam) presumes an I-thou relationship (as Martin Buber would say), or a constant awakening (as Emmanuel Levinas would say). The
knowledge of the other is not something that can be figured out. Rather, the other is to be encountered and understood in a dialogical mode. The ambiguity of the other as divinity's radical otherness on the one hand, and ethical relations with human others, on the other hand, is central here. "Constant awakening" for both Islamic dawa and Levinas involves continually drawing attention to the uniqueness of their being.

Translation has long been a dynamic feature within Islam: maintaining the centrality of Arabic as the language of the Qur'an, versus local vernaculars as routes to understand the Islamic message. Ismail al-Faruqi (1986) argued for an Islamic English, for an Islamization of English as a means of redemption of meanings lost in translation. Although his view was one of complete redemption -- which translation constantly undermines -- his initiative raises interest in the task of (re)inscribing Islam into Western culture.

But of equal importance to the West being face-to-face with Islam, is the growing return influence of "America's Islam" in the East. A construction in the East, the notion of "America's Islam" is not a singular notion but its singularity comes out in references to Muslims trained or educated in the U.S. or to the U.S. government's growing interest in Islam. The label "America's Islam" has negative, and almost always, ideological connotations. For instance, in Iran, this label is being used by segments of the clergy to attack members of the pro-Khatami movement without any
individual or institutional connection to the U.S. The recent Malaysian crisis with the ouster and arrest of Deputy Prime Minister Anwar Ibrahim in 1998 dramatically illustrates the point. President Mahathir also arrested a large number of Muslims from abroad who work in Malaysia. Most were alleged to be from the U.S. In the International Islamic University in Malaysia, a large percentage of the faculty are U.S. educated Muslims. The International Institute of Islamic Thought (IIIT), based in Herndon, Virginia, has strong ties with Anwar Ibrahim while he was in power. When Mahathir put Anwar Ibrahim in prison he attacked "America's Islam" and foreigners.

And the relation of Islam to science is also a part of this "America's Islam." Many players in the debates about Islamic science are in fact situated in transnational institutes and spaces. Leif Stenberg (1996) asserts that advocates of Islamic science might be projecting the way they are trying to make sense of their own marginal status in the West onto what Muslim countries are experiencing.

Constructions of Islamic positions are a function not so much of what is said, but where and how they travel and feed into wider discourses. Pnina Werbner (1994) talks about something similar when she notes how Muslims around the world support Saddam Hussain in his confrontation with the U.S. She attributes this positioning to the media dissemination of the confrontation and the reaction of Muslims to those media events.
Indeed in Kuala Lumpur, I had a conversation with a cab driver (a member of the Shi'a minority in Malaysia) who asked if I was a Muslim from the U.S. When I said yes, he wanted to test my position on Saddam. Knowing what the answer should be, I replied contrarily, that I did not like Saddam because he killed so many of his own countrymen. The cab driver became angry with me, and refused my reasoning.

One of the theoretical questions I am asking is how Islamic idioms, which have mobilizing force, are connected to political outcomes, and particularly how disjunction between intentionalities and outcomes in terms of social processes can be understood. For example, some authors, such as Nilüfer Göle (1993b), have drawn the distinction between traditional Islamic symbols as an imaginary community rooted in the sacred on the one hand, and on the other hand neo-communitarian formations that arise through the emergence of new elites. One of Göle's strongest examples is that women may be mobilized around the symbolism of the veil, but the ways in which they wield the veil can well end up in a sharp critique of Islamic traditions. Women from traditional families, for instance, use the veil to gain permission and access to university education, and then demand the right to career and independent decision-making. With these examples, and more generally in the analysis to follow, I want to draw attention to show how narratives that are in specific places relate to the larger global context.
On the proper name, Islamism

So far I have discussed that Muslim constructions of identities involve their subjectivity in the West as well as its projection onto the Islamic East. In doing so, I addressed what an incarnation of certain Islamic identities might mean in different localities. Now I would like to situate the historical significance of Islamism or Muslim assertions of identity into a global-local context.

Islamism's unitarian (*towhidi*) perspective is posed from within an already differentiated modern society. The object of Islamization is dialectical in that Islamism is always already being framed by its object: modern society. Many sufi scholars reject Islamism as an ideology that has nothing to do with true Islam; but other lay Muslim scholars such as Ali Shariati have made an ideology of Islam in order to bring about socio-political transformations.

Various terms have been used for the oppositional movements of the past two hundred years that draw upon Islam: Islamization, Islamism, fundamentalism, neo-fundamentalism. A distinction is often drawn between traditionalists and these modern movements. I see the notion of Islamisms in its general use in association with the *salafiyya* movement (a turn-of-the-century Islamic reform movement), a call for a return to
tradition, to the Qur'an, and to the Shari'a, but by passing the 
commentaries (hadith). Most Islamist movements use this call as a way to 
empower lay Muslims, and disempower the ulama. The term *ijtihad* is 
adapted as well, as a form of individual interpretation (rather than its 
traditional usage for consensus ulama opinion or interpretation by those 
with *'ijaza* "degrees" from the theological education system). Moreover, 
Islamism, in its struggles against secular states, wants to use the state 
apparatus to effect change. Echoing many Islamists, Roy writes "It is not 

enough for society to be composed of Muslims, it must be Islamic in its 
foundations and its structure: a distinction is therefore introduced between 
what is Muslim and what is Islamic." (1994, p. 36)

*Dawa* (the call) and *tabliq* (to propagate, to propagandize) are 
relational terms connecting Muslims to others in "unIslamic" spaces. In 
contemporary global terms, they relate to resistance to globalization and 
displacement of Muslims in the West. In Islamic countries, *dawa*, 
additionally refers to a social movement -- often where people take a 
month or year's leave from their ordinary lives to engage in missionary 
work -- where Muslims mobilize themselves for social change.

Having explored the global scope of the Islamic resurgence and its 
effect on structures of identity, whether individual or institutional, I would 
like to turn now to technoscientific identity. First, I will talk about the 
intellectual bases of what I called "radical critique." Secondly, I will
suggest a theoretical frame to understand the potential of this critique in a transnational setting.

The Emergence of Radical Critique and the Epochal Understanding of the West

To explain this radical critique, one needs to work through some of the rhetorical exchanges between Muslim intellectuals and their Western counterparts. One of the most cited of such exchanges is the one between the 19th century Islamist reformer Al-Afghani and the French scholar Ernest Renan, in which they engage in a debate to qualify or disqualify Islam for its capability of producing modern science. But this was the last turn-of-the-century debate: as I argued earlier the recent resurgence has new elements. While I will talk about these elements, my argument about radical critique is not about the fact that there is a one-to-one correspondence between modernity and technoscience, secularism and religion. It is, rather, a critique that opens a third space of exploration.

Central to my argument is that what marks the present resurgence of Islam is the emergence of a discursive understanding of the West as an epoch. By this I mean that there has been an emergence of a set of critical understandings that has enabled a view of the West as a set of inter-related phenomenon: first, the critique of secularism as it relates to its Christian
and Greek hybridization of values; second, the critique of the modern age as a secularized Christianity; third, understanding Western science as it goes back to the Enlightenment's presuppositions on progress, rationality, and epistemology; and forth, the importance of language and religion in cultural understanding, as opposed to universal subjectivity. By this I do not mean to suggest that there is a consensual understanding over the emergence of the West as such, but rather that these elements to some extent affect most Islamic discourses.

Can secularism accommodate for religion or religion for secularism? Islam appears to be the main discourse available to challenge the identity of secular ideology. This challenge, therefore, is to undo this construct and in the process insert Islamic worldviews in what will come. The question arises, then, as to whether this effort would imply an Islamic secularism? A symptom of this process is the concern of Muslims with the relation of rational and revelational. Manzoor (1981) argues that what presupposes Islamic challenges to Western secularism is a paradox. He asserts that while the political component of Islam is "non-immanentist," Muslims have been seduced to find temporal solutions. This does imply a kind of "secularism" and "positivism" yet it does not divorce itself from the revelational aspect of Islam. He concludes: "While affirming some of modernity's ethical values, Islamic civilization need not take the immanentist road to the restoration of its political order. Without falling
prey to the dichotomy of "theocracy" and "secularism," it can construct a pragmatic, historical order and turn it into a rational-revelational state." (ibid., p. 428)

The ambiguous relationship of revelation and rationalization is one of the strong markers of the critique of secularism by Islamists. In post-revolutionary Iran, debates over the importance of revelation have heated up. Abdulkarim Soroush, a philosopher of science by education, has recently spoken about the temporality of revelation: it is hermeneutic reading of what can be revealed to the umma which has a temporal horizon. In this sense it is neither redemption, nor incarnation of a revelation, for instance a Islamic Lysenkoism, but a kind of revelability. Revelability (since the word does not exist in English) means appearing without taking place in a body.

As a result of epochal understanding of the West, Muslim intellectuals are rethinking modernity and trying to find a cultural base for modernity. In this effort, debates are taking place over the relationship between rational and revelational, on the one hand, and ideas of development and eschatological structure of Islam, on the other. Two instances of these debates that relate to technoscientific identities are about secularism and authenticity.

*The Critique of Western Secularism*
The emergence of an understanding that science is not value-free and culture-free is different from the early reformers' understanding, such as Abduh and Afghani, where there was an understanding of continuity of Islamic values in Western science due to the transmission of Islamic medieval sciences to the West. Seyyed Hossein Nasr, at the first Muslim world conference on Islamization of knowledge which took place in Mecca in 1977, alluded to this understanding of the early reformer's as having created much confusion about adopting Western science as their own as if the values transmitted through this adoption will not affect them. He further pointed to the conference itself as a departure from the latter view. This implies that the Islamic world can no longer take the West as a value-free modernizing agent.

It is in the context of the epochal understanding of the West that one needs to interpret the Islamic critique of Western science. The way science and technology used to be appropriated, that is within, the hegemony of universal subjectivity, has shifted. Now there are new language games and contexts on which science and technology need to be built.

In the mid-nineties two books became most cited among Muslim intellectuals, namely Fukuyama's *The End of History and the Last Man* (1991) and Huntington's *The Clash of Civilizations and the Remaking of World Order* (1996). Whether or not they have been widely read is not the point, the point is rather the manner that these authors have argued that
resonates with Muslims that is of interest. For instance, Fukuyama argues that "historicity" has come to an "end," and that it is through a moral, universal ontology, that is created through consensus, that we need to live by. The world has become de-ideologized, he argues, and thus the variety of historical ideologies that were available, such as nationalism or socialism, have come to an end. He explicitly argues that the Islamic recourse to the uniqueness of its own identity is entangled in history and cannot live up to the new age of universal morality. Fukuyama's argument is an attitude toward the end-of-century where a better future can only be thought out in a universalized ontology that is speculative. The end of time is the beginning of truth.

This line of argument has instigated criticism from Muslim intellectuals. An Islamic critique of Fukuyama concerns the possibility of other historicizing. An "end" that is an autonomous and opposed to history is not plausible for Muslims because of the role that revelation and eschatological structure of an "end" play in Islam. First, the end of prophecy is the beginning of history and secondly, the transcendence from history, through a "return" to prophecy, or revelation, is to end the historicity and not opposed to it. Fukuyama's argument undermines other ways of historicizing such as that implied in the Islamic conception of an "end." In fact, the test of Fukuyama's argument for universal liberalism would be for him to show why the Islamic claim to a different structure of
promise is not essentially a liberal or emancipatory act. This is where his argument cannot hold.

It is no surprise that many Muslims have an anti-postmodernist tone. This is because a line of postmodernism has always opted for the impossibility of having a fixed identity and neglected the possibility of a meaningful present through having recourse to one's past. The discourse of authenticity illustrates a call for other ways of imagining a present.

*Authenticity and Technoscientific Identity in Western Tradition*

Another way in which the West is understood as an epoch and which provides a frame for radical critique are discourses of authenticity. Muslim intellectuals such as Shariati were informed by the pre-World War II debates in the West on technology, questioning the relation between language and technology, particularly through Heidegger. The main theme that authenticity addresses, as far as technoscience is concerned, is alienation. Can denaturalization be overcome by a return to origin?

The denaturalization of language and culture has also been addressed in the West by writers who have had interest in hermeneutics and the philosophy of language. Heidegger was interested in the ambiguity of techne where it is both revealing and an obstacle. Modern technology for him is a mode of truth that passes from covered to uncovered. As Stiegler (1994) points out in the first volume of *La Technique Et Le Temps: La
Faute d'Epimethee techne for Heidegger is a denaturalization of language through arraisonnement of nature and being through calculation.

Habermas, on the other hand, is interested in the relation of communicational activities to technical activities. Habermas reverses Marcuse's idea on the role of rationalization and technology. For Marcuse, the rationalization of society is a characteristic of capitalism where the intentions and ideologies of power are hidden in these rationalizations. Rationalization is a hidden system of domination. Marcuse's second thesis is that one should develop a different science that is in dialogue with nature (a discourse close to his teacher, Heidegger). Habermas calls this utopic and proposes a different scheme. Rationalization becomes the extension of rational activity in relation to an end, and scientific progress and technology is submitted to this process. He suggests that communicative actions are manipulated by politics, and have become technical. Therefore it boils down to emancipating the communicative process from its technicalization.

The issue that concerns me here, broadly, is how discourses of authenticity have related to the rethinking process I am exploring. Both Western and Islamic thinkers have been engaged in rethinking the relationship between language and technology through the frame of authenticity. Part of the epochal understanding of the West is an
assumption of a different horizon of thinking, culture and language. This, then, is carried into the problem of technoscientific identity.

This approach to authenticity as only denaturalization has limited the understanding of the relation of technology to language and identity. Both Heidegger and Habermas' work converge on the point of the technicalization of language as denaturalization. One difference between the two concerns the fact that Habermas sees technology as a tool, whereas Heidegger considers it as metaphysical determination. Habermas' and Heidegger's attempts to establish the relationship of language to technology have further implied that in order to understand technology we should have recourse to, in Habermas's case, emancipated communication, and in Heidegger's case, the metaphysical construct of technology. In either case, there is a sense of technology as what is "thought out," whose effect can be preconceived and prevented. There is a similarity between these debates over technology and the epochal understanding. The Islamic epochal understanding of the West has raised the question of what one should have recourse to in order to rethink technoscientific identity. How will Islamic metaphysical idioms lead to the creation of new technoscientific identity? What is the relationship of authenticity to the pragmatics of a new technoscientific identity?

*Authenticity and Technoscientific Identity*
Let me discuss to what extent the discourse of authenticity has been influential among Muslim thinkers. The discourse of Westoxification (i.e., gharbzadegi), for instance, which became one the main tropes of the Iranian revolution, is a search for authenticity. Authenticity or Asala in Islam is about the uniqueness of being, bound by time/space. The uniqueness as such is a philosophical and theological presupposition. The effect and limit of this discourse has not been explored ethnographically. In fact, what the resurgence of Islam suggests, is a test of the intellectual undertaking of Muslims such as Muhammad Iqbal, Sayyid Qutb, and Ali Shari'ati. In Robert Lee's survey of the Islamic thinkers Iqbal, Qutb, Shari'ati, and Arkoun, who have explicitly taken up the issue of authenticity, he explains "...[they] all seek to reestablish foundations upon which meaningful, effective, modern lives can be built and societies constructed. All build upon a religious tradition, but none finds mainstream Islamic theology, either Sunni or Shi'i, adequate to the task." (1997, p.176) As Lee suggests, these four authors did not find reason or rationality sufficient for overcoming the modern social and cultural problems. They even rejected that a mere overcoming of reason by theology would do the task. Authenticity, in these four authors concerns itself with being, knowledge of the modern world, and action. The Iranian Revolution may have been a voice of dissent from the periphery to suggest that tradition is not and did not wither away (Boroujerdi 1996; Shayegan
1979). In fact, Foucault was interested in this event because it might have suggested the possibility of a different norm as opposed to a universalizing modernity.

The discourse of authenticity is both mobilizing and reifying (Binder 1988; Jahanbegloo 1995; Shayegan 1990; Shayegan 1992). For instance, Shariati's notion of authenticity helped create an ideology of dissent. He saw the process of modernization or "becoming modern" as a loss of self and denaturalization. The recovery of self is through a mediated subjectivity (Vahdat 1997) which in Hegelian terms means that Muslims' struggle and belief is a recovery of denaturalized self. A post-revolutionary view of this redemptive ideology can be seen in the rhetoric of Abdulkarim Soroush who uses Karl Popper to argue that Islam, as a redemptive ideology of authenticity, which I described as Islamism, is to be understood as an ideology (in the marxian interpretation of the term.) In this sense the discourse of authenticity oscillates between essentialism and dynamism.

Islamists' discourses of authenticity resonate with Habermas' and Heidegger's concern with the relation of language and technology. In the chapters that follow, I will explore a range of situations to find a dynamic relation between language, culture and technology. This is a reading that takes place within the frame of global disjunctions. The intellectual critiques of technology just discussed should be put in the global context
that I have begun to describe. How does a text travel between global institutions? What conduits effect articulations of different readings? What is the scene of articulations? This is a reading of these philosophers and scholars for the purpose of defining a social action, at the level of speech act and performativity. This is what I call a subjunctive reading whose meaning oscillate between ethical and dogmatic incarnations.

The rhetorical language of Islamists has a singular tone, but its effects nonetheless should be measured in particular contexts. In a particular context, the singularity of rhetorical language competes with other specters. In Malaysia, for instance, the variety of development plans that are informed by Islamic discourses, or those formed through 'pure' universal discourses (such as the MIT project described below), have to be realized in already-existing systems. This makes achievement of a pure form impossible. This is what Derrida calls the logic of specter (1993). The specter, ghost, is like an idea or thought that has been detached from its roots and it is something between body and spirit but it is neither. The specter, as such, haunts the singularity of any discourse.

"Radical Critique" as Deconstruction

Radical critique is not in the idiom of Islam. Islam is different in metaphysical and eschatological structure from the West. But radical
critique is not about the content itself, it is about how the singularity of this difference interacts with competing discourses, in which Islam un-self-consciously challenges existing technoscientific identities. This dialogical process is essential for radical critique.

*Universal or Constriction*

A prelude to the emergence of a secular state is a period that is associated with the development of discourses such as "governmentality" as instrumental rationality. An example of these kinds of social transformation is evident in the emergence of the Republic of Turkey in 1923, which became an important model to be emulated in the Islamic world. Social change became a project. The program of total social transformation was conceived on a perception that Islam was no longer in touch with life and could not be adapted to the modern world. This "cultural revolution" led to the development of certain tools, adopted from European culture, such as the Latin alphabet, theater and music, and Western educational systems, to induce social change.

The adoption of the Latin alphabet can be looked at as a model for technological change. The alphabet change, which took place in 1928, led to changes in language, especially in a form marginalizing Arabic-Islamic script. The obvious consequence of this change in language was the fact that the new Turks, who were being educated in the secular state
educational system could not read Ottoman texts -- they were cut off from their tradition in a literal sense. While, many authors have written on the marginalization of tradition as a whole (Bozdogan and Kasaba 1997; Mardin 1997; Tapper 1991), what is less explored is the question of what the new techniques adopted from Europe introduce and what they marginalize.

This period of transition, from the last turn-of-the-century to the emergence of secular state, was rich with activities of cultural translation. This was an attempt to create a new culture of curiosity. Prior to the formation of modern secular state, with its discourses of "governmentality" and other "autonomous" processes, one can talk about emergence of a culture of curiosity as it pertains to science and technology. Among the elements of this discursive formation are two broad categories. The emergence of forms of critique through translations of Western theater and cinema involved techniques of reflexivity through engagement in the public sphere, a kind of self-mirroring to form a public culture. The second category involved the actual taking on of new techniques and tools through the adoption of language (especially the written form, *écriture*) and scientific techniques, theories and processes as modes of modernizing processes towards the creation of a 'new man,' including new scientific subjectivities.
Abdul Rahim Talibuf's *The Book of Ahmad* (1893; 1894) is an important work for creating the culture of curiosity. The son of a carpenter, Talibuf was an educated, self-made man from Azarbijan. He was very active in arguing for new social formations that would undermine the rules of the monarchs at the time. *The Book of Ahmad* is written in a conversational mode unlike the language of the learned *literati*. The parallel between this book and Rousseau's *Emile* is evident, suggesting a kind of a cultural translation. The first of two books sets the scene by arguing for the importance of developing the natural curiosity of children by letting them explore nature and experience it for themselves. Talibuf's argument was directed at traditional Islamic schooling, calling to allow a kind of education that was not under religious auspices, and for a while it was taught in *Darul-Fonun*, one of the first technical schools in Tehran.

These kinds of crafted cultural translations stopped by the time of the emergence of modern secular states. Until recently the development of the secular state and technoscientific identities borrowed from Europe have been approached under the rubric of "universal." I would like to propose that "constriction" may be a more appropriate rubric. Constriction does not imply replacement of local by universal, but the creation of certain norms and forms that marginalize others. The existence of cultural exchanges during the last turn-of-the-century suggests that cultural translations have been taking place in the encounter of the West with the
Islamic world. These cultural translations were gradually constricted by the hegemony of "value-free" or "culture-free" ideology that was emerged in the 1920s.²

*Undoing Constriction or "Radical Critique"*

The emergence of the resurgence of Islam has hinted at the failure of the accommodation to universal European discourse. This has raised the question of the relationship between secularism and religion. Recent work on the Islamic world focusing on social movements, for instance, those looking at Islamists in Iran and Turkey, tries to rethink the dichotomies of secular and religious (Göle 1990; Göle 1993a; Göle 1993b; Göle 1995; Kepel and Richard 1990; Richard 1991; Roy 1990).

Studies of social movements suggest that the "universal" subject is a social construct. For example, Nilüfer Göle (1995) asserts that Islamism, as a product of crises, is an idea that was tied to different versions of modernization and nationalism in Turkey. It was seen by secularists as a pathology to do away with: if the system functioned well Islamism would

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² I use constriction in this dissertation to refer to a universal that is not ontological, even if it makes that claim, such as the way the universal subjectivity is understood in secularism. Moreover, constriction is about closing down, or narrowing passages, such as the passages between science and humanity, as Michel Serres would say. Derrida uses stricture: "The strict, Derrida argues throughout Glas, is the result of constriction (striction) or, rather, counter-constriction by which the constriction of natural determination or empirical singularity is radically overcome. This liberating constriction proceeds through "closing up, squeezing, containing, suppressing, subjecting, compressing... In a movement that Derrida calls "strict" as well, what has been subdued, compressed, choked..."
not have surfaced. Göle points out that Turkey has not been a colonized country, therefore modernization and modernist elites are native. Modernization does not appear to have been imposed by foreign forces. Kemalism emerged in 1923 as the triumph of modernity that did away with tradition. Göle describes: “The distinction between the “civilized” way and “non-civilized” way will be done in details, franca life style will be borrowed and turca will be abandoned: Wearing a tie, shaving the mustache, man and women walking together, going to theater together...” (ibid., p. 225, translation mine). Islam has been excluded from the project of modernization: modernization was meant to reach contemporary civilization, which is the West. She argues that Islamism has emerged as a party against the state through both the mobilization of masses and by taking advantage of political parties, as is exemplified in the Refah Party. This is a project that creates a “schizophrenia” (Shayegan 1990) for the countries of “weak historicity,” to use Göle’s term.

The social construct of the "universal" subject is challenged by the social movement. Göle (1995) talks about the emergence of the Islamic subject in Turkish society. She classifies the Islamic subject as connected to intellectual circles, to an engineering state and politics, and to the women's movement. Intellectuals and militants of Islamists originate from the

to death is raised to, or erected as, the universality of the strict." (Gasche 1994, p. 195-196)
periphery of the society. They are from small villages, and they have often succeeded through the social mobility afforded by education or political careers. The Muslim subject is not created either by privatization or against the state, although the two have provided mobility. This strand of work invokes Touraine's (1995) effort to find a social-cultural base to the question of subjectivity. It is a project of cognitive remapping.

Social movement is not the only explanatory theory that takes the question of subjectivity as its object. Other compelling theories try to use linguistic and psychoanalytic frames to theorize about the question of subjectivity in the field of conflicting ideologies and cross-cutting interests. For example, Katherine Ewing's (1997) work on Pakistan tries to analyze how Sufism fit in people's lives, through webs of cross-cutting ideologies and experiences. She also understands, as I read her work, universal as constriction, where the undoing process of what was imposed as an opposition between modernity and tradition has led to a multiplicity of subjectivities.

*Undecidability in "Radical Critique"

The question of subjectivity in a secular state has re-emerged as a possibility of formation of new identities for Muslim countries. Through what Laclau calls the logic of hegemony (1996) the other is excluded.
"We have seen that the absent fullness of the structure (of the community in this case) has to be represented/misrepresented by one of its particular contents (a political force, a class, a group). This relation by which a particular element assumes the impossible task of a universal representation, is what I call a hegemonic situation."
( Ibid., p. 59)

The particular element creates a totality by excluding the other; the other is calculated within a totality, what Levinas\(^3\) calls "an objective totality" (1969). I take Laclau's "hegemonic situation" to mean the incarnation of any "program" as universal, whereas I argue that this constricted rather than universal.

Radical critique is about opening up the constriction which renders the emergence of new norms and forms subject to an "undecidability" -- an act of making decisions about possibilities. What I have called so far competition of different discourses and speech acts, in the creation of new forms and norms for Muslim technoscientific identities, leaves the process undecided, which means open for criticism and aporetic cross-over. This then raises the question of where the substance of the critique comes from. And this opens up the fields of experience and language.

\(^3\) In Levinas' work the multiplicity that is conceived as cognition in which the knowing subject is reflected and absorbed has the same effect of "objective totality" -- it pretends that the other can be figured out. The I and the non-I come together in social relations, what constitute exteriority for Levinas. The utterance of I happens in this social relation defying the totality of reflected I. He asserts that multiplicity implies the impossibility of a total reflection that brings I and non-I in whole. "Being must hold sway as revealing itself, that is, in its very being flowing toward an I that approaches it, but flowing toward it infinitely without running dry, burning without being consumed." (Levinas 1969, p. 221)
Experience here is understood in the field of language and the performativity of interaction between culture and specific fields of culture. Following Etienne Balibar (1995), I argue that the relation between culture and identity on the one hand, and institutions and subjects on the other, are not fixed. Identity and subjectivity, or the person and a particular position, are not synonymous. Rather, subjectivity is floating between persons and positions. Further, culture is not shared in a homogeneous way, it is distributed and experienced through institutions. Balibar suggests that "subjects moves from language to practice; the institution from practice to discourse." (ibid., p. 184)

In this dissertation I attempt to explore this performativity of interaction of individuals and institutions, how these 'floating' situations might provide the elements of a critical understanding from which technoscientific identities are being reconstructed. My argument is not about any one institution or person, but about the fact that these discourses and experiences travel and interact with one another in a metalinguistic landscape as a part of what I am calling radical critique. In the pages that follow, I reveal radical critique to be a simultaneously deconstructive and reconstructive force opening the way to construct new forms of technoscientific identities.

The global and transnational contexts for this activity are central to the current moment. Recalling the late 19th, early 20th century hub of
activity around cultural translations between the West and the Islamic world, I show that the current moment seems to have been reopened to allow such activities again. In addition, the epochal understanding of the West operates as a kind of illocutionary act, constantly reminding Muslims that the West is historically and epistemologically different from their own culture and tradition. In this dissertation, therefore, I am trying to reframe our understanding of modernity in that what has been considered the universal and culture-free base of modernity needs to be understood instead as metalinguistic constrictions of forms and norms that are not culture free. As I will attempt to reveal in the upcoming chapters, reconstruction is not about the politicking and creating new institutions in and of themselves, but is about creating conditions where sets of experiences happen such that new discourses can emerge. This culture of curiosity, then, refers sets of ways of disciplining and organizing practices and activities that make up the activity and discourses of technoscience. In the upcoming chapters I offer four cases which not only illustrate these changes but also allow me to theorize about the possibilities of reconstructing new technoscientific identities.

Methods and Approach
The question that I faced in this project was how to study Muslims scientists and engineers in the global setting. Because my project was triggered by the call for Islamic science, which itself had a transnational cultural aspiration and scope, I had to figure out what would be the locus of my ethnography. The question I was pursuing was not that of how the Islamization of knowledge and science is happening but rather how this call, the call for an alternative science, resonates with lifeworld of Muslim scientists and engineers, that is, how technoscientific identities are shifting. Rather than focus attention on those engaged in the call for alternative science, it was important to look to the practicing scientists themselves to see what kinds of changes were happening. I set out to examine, through their language, the ways practicing scientists exhibit symptoms of these changes, perform their work and understand their milieu, whether within national boundary or transnational settings. These accounts became the locus of my ethnography.

Because we are not talking about a coherent community of scientists, and because what is said travels and echoes in other places through the movement of people, publications, theories and practices by way of the internet, conferences, visits, and so forth, I use an experimental approach to bring together different kinds of events and experiences. Following George Marcus (1998), my approach is based on a multi-sited ethnography where different localities are put in dialogue with one another in a
global/local frame. I further perform the task of reflexivity through the juxtaposition of seemingly unrelated materials and various localities.

My main chapters are framed by lengthy interviews and observations, conducted at both American universities and in Islamic countries, as well as memoirs. Borrowing from Slavoj Zizek (1994), I have used a form of interview that can classified as a "self-interview" where the interviewee is directed to comment on public (social, political, or historical) events, offering the interviewee's reflection of the public gaze of the event, as if he or she was reflecting on "common knowledge."

This approach offers a personally and generationally situated perspective of the interviewee's own actions and thoughts. It relates their personal understandings and development to other things that have happened. In this way I have tried to show what the narratives of these scientists and engineers tell us about the complexity of this rethinking process.

Overview of the Chapters

In chapter two I set the stage for the contemporary situation of technoscience through an exploration of the discourse of the Iranian engineer and post-revolutionary Prime Minister, Mehdi Bazargan. In his work, Bazargan mobilized the theory of thermodynamics to discuss crucial aspects of Islamic thought, such as the relationship between faith and
knowledge and the role of morality in everyday life. While his life-world hints at some of the mid-century tension of the secular state and shares the transnational and hybrid ground of the technoscientific activity, it does not reveal the tensions of the current context.

In chapter three I explore a contemporary case of technoscientific identity formation in the Islamic world, specifically in Malaysia. Here I follow the formation of a technical institution that is both modeled after the Massachusetts Institute of Technology and being planned with its assistance. I situate this attempt in the context of the resurgence of Islam in Malaysia by juxtaposing practicing scientists' and Muslim intellectuals' responses to this effort. It demonstrates the scope and complexity of this process by ethnographically revealing the nature of competing discourses in the Malaysian scene, and thus can be read as an illustration of the theoretical threads that appear in more focused case studies in the remaining chapters.

In the fourth chapter, I consider the performativity of a prominent scientist's opposition to Islamization. Pervez Hoodbhoy is a Pakistani physicist who travels between MIT and Quaid Azam University in Pakistan and the author of a provocative book, *Islam and Science*. Informed by my extensive interviews with Hoodbhoy, I situate the positivistic stance he assumes in the book in relation to competing speech acts, themselves situated in transnational social and cultural settings, and which reveal changes in technoscientific identity in Pakistan.
The fifth chapter focuses on experiences of scientists in Western institutions and the personal and psychological aspects of practicing in a field of science. In this chapter I suggest that Muslim scientists perform with a double-vision, that of their own cultural background and that of the Western setting where they work. I explore how this double-vision, as Michael Polanyi would say, engenders not only a space of creativity but also a space through which critical changes in science can emerge. My primary material for this chapter includes a set of ethnographic interviews with Cumrun Vafa, a Harvard based Iranian physicist in a new field of string theory, and is supplemented with interviews and observations of Muslim students at MIT and the meetings of Iranian professional organizations in Houston.

In conclusion, I recapitulate the notion of radical critique by illustrating the global/local frame that cuts across different utterances of technoscientific identity and argue that Muslim technoscientific identity is changing. This study contributes to social and cultural studies of science by revealing acts of cultural critique through juxtaposing non-western and western views of science in a transnational space.
Chapter Two:

A Techno-Cosmopolitan in the Context of the Secular State: The Discourse of a Muslim Engineer/Politician

"Techno-cosmopolitanism shares with other modern projects an understanding that society must be constructed, planned, and organized through art and science. It seeks this end through the use of already existing cultural, social, and aesthetic institutions and spaces seen to embody a healthy sediment of historical practices which need organization." (Rabinow 1996, p. 59)

"During the course of the 1920 and 1930 [Europe] the object of intervention slowly shifted from city planning to the management of la matière sociale...This sea change in techniques, objects, and goals constituted a shift from a search for means of adaptation to a historico-natural milieu to the creation of an appropriate socio-technical one." (ibid., pp. 77-78)

Introduction

In this chapter, through examination of the work and life of an Iranian Muslim engineer and politician, Mehdi Bazargan, I develop an instance of technoscientific identity formation from the early to mid 20th century. It is difficult to place Bazargan's identity in the landscape of identities of his generation -- he is an odd personality. He is closer to the Muslim reformers of the 20th turn-of-the-century, as he often quotes the Egyptian reformist, Abdulah. Yet, he has been to Europe under a mandate
that was different from these earlier reformers: to learn European technoscience and become a modern.

Bazargan's involvement in development projects of the mid-20th century are of interest. He uses his technical ability and combines it with local cultural sensibilities for serving the public good. His style is what Rabinow calls "techno-cosmopolitan," to which I have added the prefix, "Muslim." This term captures his identity as a modern who uses local knowledge to overcome social ills.

It is important to understand this transitory personality because of his creative combination of science and culture that eventually, in the late 60s, become old fashion. He has a utilitarian approach in using technoscience, as Rabinow might suggest. The reason this approach becomes old fashion later is that technoscience becomes increasingly used as instrumental reason which means that forms of abstracted development plans and technological objects begin to become instruments of change in the name of progress, science, and life-style.

In this chapter, I analyze Bazagan's appropriation of a technoscientific model, the theory of thermodynamics, in an Islamic cultural context. Bazargan uses this model to argue against both "secularists" and "traditionalists" of his time and to bridge the gap perceived to exist between faith and knowledge. He uses the model to argue that the connection between faith and knowledge is porous. He
neither places them in opposition, as secularists ideology of the earlier part of the 20th century had done, nor put them totally under faith. Central to the thesis of this chapter is that technoscientific language, namely the theory of thermodynamics, creates this heterogeneity or disjointedness.\textsuperscript{4}

The Socio-Political Context of Bazargan

Before telling Bazargan's life story and mobilization of technoscientific theory, I will begin by briefly describing elements of the socio-political context in which Bazargan lived and worked, elements in which the dynamic between the West and Iran were prominent. There are two moments that are important to explore for situating both the milieu where Bazargan worked and the kinds of questions that were prevalent at the time. The first moment is the late 19th century and early 20th century. The second moment is the post-1920s era. Bazargan was born in the former and worked in the latter.

\textit{Late 19th Century to Early 20th}

The question of what role the West should play in Iranian education, especially technical education, has been a perpetual one. Technical

\textsuperscript{4} This was inspired by reading Derrida's work on \textit{Foi et Savoir}. Derrida is interested in showing how faith has been separated from knowledge and how this debunking is the
education in Iran started with a flow of migration of European and later American missionaries to Iran during the early 19th century (Mahjubi Ardakani 1976). But it is not until the late 19th century that social political changes brought the Islamic world closer to the West. In Iran, the Constitutional Revolution of 1905-11 brought the question of law, democracy, and freedom to the forefront and eventually brought the absolute monarchy of the Qajar dynasty to an end. With the revolution new debates were invoked under the nezami jadid⁶, or modern order initiatives advanced by the post-revolutionary intelligentsia. One of the early attempts to create an indigenous technical education was the establishment of Dar al-Fonun in the mid-19th century which primarily focused on military technology. This school was established around the same time as the similar schools in Turkey and Japan. Technical education was supposed to bring a base for science and technology. The early

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⁶ Menashri suggests that the debates over education were not simply divided along the line of religious and anti-religious: "One group, among whom the clerics were the most adamant, acknowledge the importance of education in general terms but regarded the new schooling system as dangerous to Muslim civilization and to their own status in the society. The liberal, westernizing intellectuals, by contrast, extolled it as the principal means of approaching western civilization. Aware of the power of Islam and the clerics, the constitutionalist tried to argue that modern education did not necessarily contradict religion. Only a few, such as Akhundzade, Spahsalar, and Talebov, advocated from time to time the separation of education from religion. The most sophisticated line in arguing for an accommodation was, again, Malkom's [who was an Armenian convert to Islam]. In Shaykh va Vazir, the Shukh [who represent a cleric] wonders: "How is it at all possible to adopt the principles of infidels?" and the Vazir replies: "I do not deny that they are infidels. My only claim is that the strength of Europe derives from their unique mechanisms. If we wish to gain the same power, we must adopt in full their mechanisms and instruments." (Menashri 1992, p. 37)
reformers were interested in creating technical education because they were interested in ways to create a 'new man.'

During the late 19th and early 20th century there were a range of debates concerning technoscientific identities. For instance, the debate over Darwinian evolution and its relevance to Islam was wide spread in the Islamic world. There were also debates over astronomy (Arjomand 1997) and whether Islam could accept Galileo's theories. In addition, there was at least one dissertation written at the Qom seminary to translate between Islam and modern astronomy. Furthermore, a variety of forms of cultural translation from the West were in evidence during this time. There seemed to be a great deal of translations at work (Sanjabi 1998), for instance, to bring some European forms of theater that had to do with the public sphere to Iran.

These debates, together with the sensibility toward cultural translation, I argue, fade away after the establishment of the secular state. This period must be seen, however, as a fertile period. Yet, there has been an historical assumption that this moment was a weak period in the last days of the Ottoman Empire which was important as the last Islamic state. Until recently, historical work has not focused on the style of cultural translations and their unveiling potentials. For example, while during the reign of Sultan Abdulhamid hybrid (Islamic and European) forms of education existed as well as military maps that were both in Ottoman and
European cartographical styles, there has not been any work to analyze the importance of this hybrid style. I show in this dissertation that these cultural translations are important because they show that people were trying to bring new forms into the system and to expand the horizon. Whether successfully adopted or not, these dynamics were important in the imaginary of the people. In later chapters I will argue that transnational Muslim scientists are in many ways doing this all the time, and that such cultural translations are important sources of rethinking.

Post-1920's, or Constriction

The second moment important to situating Bazargan's work and life is the 1920's and beyond, with the rise of Shah Reza Pahlavi, the emergence of the secular state and the end of the First World War. Reza Shah was a staunch anti-clerical and his rise to power marked a period of decline in madrasah (i.e., traditional Islamic school) (Fischer 1980). As opposed to the first moment described above, this period is marked by the emergence of education, especially technical education, as the main vehicle for creating citizens in the newly centralized power. It is marked as well by the emergence of nationalism as the main ideology of modernization. The bifurcation of modernity and tradition become what I am calling a constriction, supported by new secular institutions. During this period all the debates suggested above were constricted, they became irrelevant, and a
utilitarian approach to education and technology became hegemonic. This is were I place the work and life of Bazargan, in this milieu of utilitarian technoscience.

Work and Life

By Way of Biographical Sketches

Mehdi Bazargan (1907-1994) was the first prime minister of the provisional revolutionary government in Iran. Born in 1907 in Tehran, Iran, he was the son of a merchant from the city of Tabriz. His education included both traditional madrasah and modern European pedagogy (he had been in Ecole Polytechnique and Ecole Normale). Generationally, he was part of a wave of students whose education was bifurcated through Westernization. Although he had a traditional Islamic education, he had to accept the ideology of modernization, which said that technical education has to be acquired in Europe and that technoscience is instrumental and value free. Bazargan did not buy this ideology as a whole, and set out to argue against at least part of it through a journey of personal discovery.

His involvement in politics was somewhat different from the usual path of his cohorts. His political career started much later after he returned back to Iran from France as an engineer. Bazargan was increasingly involved in the Iranian political culture, especially after the
Shah's "White Revolution" when he agreed that without collective action no changes were possible, events such as spending time in prison with nationalist leaders were factors in his political formation. Chehabi (1990) tells a story of the politicization of Bazargan: he was not among the inner circle of the Mosadeqist, although, Mosadeq himself always admired Bazargan for his skills in problem solving and management.

Chehabi argues that the Iranian atmosphere became radicalized in the mid-seventies. He attributes this to many socio-economic changes such as the changes in structure of clerical life, the movement of masses to the cities, and the lack of democracy. The dislocated masses became active in their small religious groups where they became mobilized at the time of the revolution. The radicalization activated the idea of revolution and destruction of the old regime and got rid of earlier (post-Mosadeq) liberal democracy. He also argues that the life of the students abroad became more singularly focused on learning engineering skills, and as a result they were living in a closed environment.

During this time, engineering skill was viewed as only instrumental and the role of social engineering as politics was not understood by the ruling elites. Therefore, what Bazargan was up to was assumed to be utilitarian. While not involved in the political aspects of the nationalization of oil, he was involved in the technical aspects. When the British left their rule over the oil industry, they took their expertise with them. Creative
technical and management solutions were required, then, to transfer the technical power to Iran, which Bazargan helped to provide. He returned to Tehran with this experience. In 1952 he went back to his teaching position. It is at this time that he was approached by Zangeneh, who was the interior minister of Mosadeq's cabinet, to take charge of a drinking water project for the city of Tehran. Still prior to the coup d'état, an Englishman had the contract to provide water to 70,000 subscribers. While this project was being carried out, Bazargan aimed to provide more rapid results, so he used some of the existing wells within the city to fulfill this need. He mobilize local resources -- local university researchers, existing wells, small amounts of money -- to provide water faster to different sectors of the city and to attract people's trust by taking care of long and short term needs. Meanwhile, the coup d'état happened and Bazargan was forced to quit his position after completing the task of the water project (Bazargan 1996, pp. 297-305).

By 1961, Bazargan had combined his technical power and his experience in the post-Mosadeq era. He became a part of an important group of clerics and scholars who set out to revitalize Shi'a Islam in the modern world. After the death in 1961 of Ayatollah Borujerdi, the grand Ayatollah of the time, a group of Islamic thinkers got together to discuss some of the issues at hand (Mirsepassi-Ashtiani 1994). This was a diverse group of people in terms of their interests and background, and included
the French Orientalist, Henri Corbin. Many, such as Allameh Tabatabai, were interested in theorizing about Shia' Islam. Others, such as Bazargan and Taleqani, two figures who were interested in praxis, wanted to appropriate Western technology without importing its "ideology." Most individuals in this group became prominent figures in the Iranian contemporary political scene after the revolution.

One can attribute Bazargan's political style to his interest in "free-associating" groups whose ideas he brought back from Europe. As early as 1945, he became one of the founders of the Association of Engineers in Iran. One of the first protests organized by this association concerned itself with "giving work to experts," which meant giving decision making power to engineers whose numbers were increasing but who were left out of the political process.

In addition to his political and professional activities, Bazargan was an extremely prolific writer. His publications exceed 400 items, including articles and books. Though they were widely circulated and read, this output did not translate into a comparable influence among Muslim intellectuals and clerics. One might assert that he was marginal in the contemporary Iranian political climate, a climate marked by the radicalization of the 1970s. Bazargan's own comments indicate that he could not make sense of this radicalization, but he later realized that
students appealed to a collective consciousness, a form of subjectivity that was missing from his discourse.

Before 1969, Bazargan was mostly engaged in writing and giving talks on the importance of individuated moral and ethical action. This is the period where he wrote on *Thermodynamics in Human Condition* and gave a number of talks and wrote articles. In two articles, written as speeches for a political party audience, he is concerned with converting the individual performance of morality to a societal movement. Bazargan comments on these articles and their relation to his politicization: "The reason for refraining from participation in the political activities of that time was that I did not see that the main problems in the country can be solved through political parties and politics, and more importantly I gave priority to the moral and ethical preparation of the young people. Therefore, at the occasion of a speech in Iran Party, I gave a talk on "The Coefficient of Conversion Between Material and Spiritual Matters" and another talk elsewhere on "Swearing and Ritual Courtesy in Iran." In the first talk, I pointed out to the intellectuals and party builders that morality, aside from its religious value is important for its value on necessities of life" (Bazargan 1996, p. 267; all Bazargan translations mine).

*By Way of Memory and History*
Bazargan's political career is interesting from two points of view. First, he is a modernist Muslim intellectual who follows the path of his late 19th century predecessors in order to recast a modernist subjectivity with an ethos and morality based on Islam. Second, he is different from both his secular and Islamist predecessors in that he focuses on individual subjectivity and "acting" moral through "living religion." The ways in which he thinks back and forth between Iran and France and Islam and modernity is the theme of chapter. What does he remember and select? How do experiences at home make him search for answers abroad?

The sending of students abroad as a national project in Iran dates back to the late 19th century, but more strictly to just before the first world war. Iran had not been colonized and thus did not have a colonial program of education for its technical needs. The desire to send students abroad was more emphatically implemented by Shah Reza Pahlavi, although it had already begun prior to him. According to 1927 legislation, pushed by Shah Reza Pahlavi, one hundred students were to be sent abroad each year to be educated in the fields of medicine, engineering, education, and law. An additional number were sent to acquire expertise in mining and metallurgy. This was a new era that marked a positivistic attitude toward science, technology, and education.

Bazargan in his memoir, entitled Bazargan (Memoirs): Sixty Years Service and Opposition (1996), talks about how he was affected by religion
in Europe. Although he spent time in *École Central* which was run by Catholics, his view of religiosity in Europe went beyond his experience in that school. There is an importance that I give to time and space in Bazargan’s narrative. His experience of *École Central* is connected to what he felt in Iran before he left. If we take Bazargan’s narratives as a telling that needs translation, context, and unpacking, then what becomes important is not his correct evaluation of the situation in Europe, but what his telling reveals about a series of things that are happening between Iran and Europe and the ways he constructs his understandings against this myriad of things. For example, he is struck by the fact the Europeans are not anti-religious the way the political atmosphere of the time in Iran was (i.e., Shah Reza Pahlavi and his attempt to discount Islam). He says: “Let me say this, that Europeans, unlike what some of our moderns (motejaded) believe, don’t think of religiosity as signs of backwardness and illiteracy. Many of their scientists such as Copernicus...were believers” (Bazargan 1996, p. 219). In this observation, he is actually retelling something for the Iranian audience that is directed toward what is going on in Iran concerning the socio-political ills.

Memoir, unlike biography and autobiography is not totally a European form. Self-statements of travel memoirs of pilgrimage and *rhila* (Metcalf 1990) are widespread in the Islamic world. This genre is usually about affirmation of certain faith. Bazargan says that he wanted to go to
Europe to see the source of anti-religion. So it is on his return that he
decides that the source is actually "internal" rather than "external." In
Europe, he finds that there is no contradiction in being a modern and at the
same time a believer.

The beginning of Bazargan’s memoir is a remembering of the socio-
political atmosphere of the time before he went to Europe. Debates
concerning education at the turn of the century were marked by
vocabularies such as backwardness (aghab ofiateg-i), progress (pisraft),
East/West, and emulating the ulama without individual and critical effort
(taqsid). Philosophical and political discourses by Islamists and seculars
have not escaped the effect of this language. These markers show that the
dyad of modern-tradition was very much at stake and that it was conceived
as if they were opposed to one another. It was in this frame that students
took off for Europe, to become modern.

In this chapter I am talking about time that is "out of joint" --
forward to Paris, rewind to Iran, re-rewind to Paris. The stage is set in
Tehran, before Bazargan goes to France. The peep show (shahr-e farang)
was the looking-glass for observing the West, small boxes that were carried
around which displayed pictures of European cities. Bazargan talks about
the youth’s perception of the West through the metaphor of the peep show:
"farang for the young was a paradise. More important, it holds their
future job security..." (1996, p. 144). This metaphor of the peep show can
be juxtaposed with the metaphor of cinema: experience in the first is
distant, in the latter it is very close. They each provide different models of
the psyche and the way the individual experiences the West.

The atmosphere of pre and post World War I in Middle Eastern
countries such as Iran and Turkey was one of change toward a positivistic
political attitude in regard to progress by the means of science and
technology. This orientation had its effect, which was the degradation of
religion and a renewed hostility toward Islam as "backward." Bazargan
was affected by the general saying that progress in the West was due to
receding religious beliefs. Therefore, he set out to investigate this, in
person. In a story-telling fashion, he describes his interaction with his
father as follows: "I told my father, I'll go to Europe under one condition
and that is if I became an atheist, it will be like here [Iran], and if I find out
that what they say here is not correct, I will become even a stronger
believer" (ibid., 147). He goes on to say that his father, being a modernist,
agreed with him. So, his task was to find out the truth in the West about
the dominant secular ideology of the time in Iran.

What sets his trip on a different path from his secular cohorts was
that he did not buy into the hegemonic ideology that encouraged students to
leave behind their own culture. Instead, the question for him concerned
"how much should one be open to Western culture?" The question of
degree and appropriateness needed to be negotiated within the cultural
context of tradition. The next step was to consult with a clergy concerning what he calls the condition of prayer and cleanliness such as eating halal food. The clergy tells him that it is okay if this trip is about proselytizing (tablīq) Islam. What does tablīq mean here? The word is derived from the root bl-gh in Arabic, meaning to reach one’s destination, to achieve an objective. Yet another meaning can be deciphered through how conversion to Islam is understood. DeWeese (1994), in his study of conversion to Islam in Central Asia, demonstrates that there are different ways in which Islamization is conceived: da'wath (to summon); tawbath (repentance); fatahā (to open - to open territory to Islam); brakah (not change of heart but change of form or adapting). Tablīq and dawath can be understood as a call or an invitation to exhort people to embrace Islam. Both terms have a connotation of “mission.” In this context, tablīq connotes both cultural immunization from and cultural openness to the West. This path sets a different trajectory from that of his secular cohorts. Although Bazargan remained positive about the West, he did not take the European cultures to be value free and instrumental.

Bazargan described his perception as he traveled toward Europe. The journey had to be made by land and sea, and it would take days. “The closer we got to the West, situations got better. Trains got faster, more comfortable, cleaner...” (Bazargan 1996, p. 151). He went on to say that “arriving at Paris, which we had seen its picture in the peep show, we
would not believe that we had marched onto the heart of Europe.” (ibid., p. 152). One of his first impressions is that there were many interesting museums and churches. In churches, he observed, many prominent people sought spiritual guidance. Streets and places included both traditional and modern names.

After seven years, he returned to Iran and wrote his first article on “religion in Europe.” In it, Bazargan asserts that the success of Europe depends on the morality of its people that can be seen in their daily action. “I realized that the civilized and advanced Europe is not only the Europe of the hat, tie, cinema, men's and women's attire, cabarets and dancing. Europe has spirituality, ideals and religion.... In spite of some modernist imagination, religion in Europe has not been pushed to the darkest corner and the 20th century civilization; has not turned this to an age old worn out custom. In the periods that Iran wanted to wear the Western cloth of civilization, the first suggestion was that worshipping God is an obstacle to progress...” (Bazargan 1996, p. 218). Bazargan’s argument is not directed only at secular positivistic discourse but also at what he calls “superstition” and “backwardness” which he attributes to non-active religion.

In 1951, he wrote an article that has been widely read in the Islamic world, The Secret of Backwardness of Muslim Nations (Bazargan 1977b). In this article he argues that Muslims, in the triad of individual, society, and god have chosen the first and the last as the center of religious life, and
have not paid attention to the second, the society. Bazargan goes on to say that the separation of religion and politics, which Muslims have attributed to Westerners, has been achieved by Muslims themselves by leaving society outside the realm of religiosity. This is what he means by separation of religion and society. It is not the same as the separation of church and state. Moreover, he argues that national independence depends on individual independence. I will show that the self-reflexive and autonomous individual, in relation to society and to god, becomes the center of his attention.

*By Way of Problematizing Social Ills*

In this section I consider the work of Bazargan and analyze the way he constructs a discourse that is different from that of his generation and previous generations in that he focuses on subjectivity through connecting society, the individual, and god. I argue that he achieves this by using technoscientific language. I will show this through his memoir and discourses that are written within a period ranging from the World War II to just before his death in 1994.

Although Bazargan argues for the inseparable role of religion from the political realm (thereby attacking the seculars), he holds the individual responsible for his or her morality. This attempt invokes Emmanuel Kant in *Religion Within the Limits of Reason Alone* (Kant 1977) who talks
about the subject as if he or she can perform a moral act, and by doing this performs God's act.

Bazargan lays out the problems of a Muslim society in the following way: in his book, *The Secret of Backwardness of the Muslims Nations* (Bazargan 1977b) he attributes backwardness to an internal moral and social problem. Bazargan, in this much circulated essay, takes issue with the passivity of the Muslim world in changing their own world. "In reality, independence does not belong to the land but to the individual" (ibid., p. 66). He attributes this to the separation of religion and everyday life, specifically work. Furthermore, he holds that Muslim subjects are responsible for "dependence" on the West. He bases independence on individual effort. This line of thinking was criticized by his contemporaries because they thought he tended to emphasize individual moral conduct rather than collective demands for a change.

In "The Boundary Between Religious and Social Affairs" (Bazargan 1975b) he argues that the ulama have not been able to draw a map of these two different but porous domains. The ulama has either embraced politics and used it as an ideological tool of deception or abandoned it all together. Bazargan suggests that there is a significant boundary between religion and society. Boundary and directionality are important metaphors for describing how morality and society are related. So where is the boundary between religion and society? It lies in directionality, generality, effect and
separation. Its directionality means that religion affects society, and the reverse is not true. Its generality means that religion is not concerned with details of social life. Its effect means that within the boundary of generality, one should participate in politics. Its separation means that religion and politics should not be mixed. This essay by Bazargan, therefore, clarifies what he means by the role of religion in everyday life. It emphasizes society and de-emphasizes faith as a contemplative phenomenon.

Moreover, in his essay on pragmatism he argues that “God is practice” (Bazargan 1975b, p. 30). “If we Muslims have hit the dark days, it is because we are theoretical Muslims, not Muslims of practice” (ibid., p. 32). In his essays on pragmatism and *Islamic Work Ethic* (Bazargan 1977a), he suggests that there is a strong relationship between moral and ethical values, on the one hand, and work, economics, and societal interaction, on the other hand.

In this way Muslim society is compared to its other, as if there are borders that need to be crossed in order to bring change to a society. This problematization was a characteristic attribute of the late 19th century Muslim modernist (i.e., Salafists) who saw certain antinomies between Islam and Christianity. Laroui (1986), a scholar on Islam, illustrates these antinomies as follows: Islam is more favorable to reason, and yet, experimental science has flourished in the Christian world; Islam has
always accepted living with other religions, whereas Christianity has had difficulty with this tolerance and yet secularism was developed in the latter. Laroui criticizes this kind of comparison that uses ideas, texts, and verses of many different times and spaces out of context to explain its own reality. He equates it with a form of realism. There is a refusal of immanence in this style. The Salafists believed in no mediation, and this refusal came out of their experience of opposing the ulama for their control over the interpretation of Islam in the 19th century while encountering modernity. Therefore Laroui draws a parallel between the values of Salafists and the Enlightenment in their refusal of authorial mediation. In this context, we could compare Bazargan to the Salafists, in a sense, since he also tried to reconcile tradition with modernity, that is, to bridge the apparent antinomies that Laroui talks about. (I call certain categorizations antinomous because their conceptions are similar to legal categorizations. In contrast, social categorization is blurrier than legal categorization). He does this by importing a scientific theory. I would like to consider this by analyzing his usage of the theory of thermodynamics. I argue that the application of the theory of thermodynamics disjoins the connection between faith and knowledge, which share the same origin, religion, but keeps a porous passage between the two.

What seems to me to be the main point of Laroui's discussion, and I refer to him because he echoes Muslims' critique of the early reformers in
the Islamic world, concerns the sources of religion. Faith and knowledge are connected as two sources of religion in Islam. Kant, in *Religion Within the Limits of Reason Alone* (1977), talks about moral religion as it leads and conducts life. Moral religion is practiced and inscribed in the heart of the individual. The individual acts morally as if it were the act of god. Furthermore, he talks about self-reflecting faith and opposes it to "dogmatic" faith. Self-reflecting faith is practiced by the individual not for god but for his or her own salvation. Self-reflecting faith is different from "dogmatic" faith in that the latter claims to be the same as knowledge. The early Islamic reformers replicated this disjointedness between faith and knowledge, but conceived it as antinomous and oppositional, as did the secularists and Marxists. Larouxi notes that the Salafists' opposition to the ulama is based on the ulama's unwillingness to accept a floating, self-reflecting faith.

What I call heterogeneity or disjointedness of faith and knowledge has been explored in other ways by Shepard and Mardin as reification of worldliness or loss of identity in the modern world. Shepard (1989) has explored the idea of system, as applied to society, in the discourse of Muslim thinkers. He argues that the Egyptian Islamist Sayyid Qutb⁶, refers to Islam as a system when he tries to establish the relationship between

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⁶ For a detailed reading of the concepts of knowledge in the work of Sayyid Qutb see Ahmed Bouzid (Bouzid 1998).
rigidity and flexibility, the material and the spiritual, and modernity and tradition. Shepard argues that "worldliness" in a system such as Sayyid Qutb's is reified, like a set of interrelated parts or stages. This "worldliness" is a result of the "rationalization" process, but it differs from secularists worldliness in that there is a primacy of "other-worldliness." In addition, Serif Mardin (1997) argues that the loss of self is due to an absence of narrative that could help build a coherent memory, such as in the case of Necip Fazil Kisakürek, a leading Muslim Turkish intellectual in the 1940s. Mardin shows that Kisakürek tries to fill the gap between the diffuseness of self and the recapturing of memory through Islam.

Islamic thinkers, as I discussed through Larouï, Shepard and Mardin, have dealt with the question of faith and knowledge in society as a system. Here I ask the question of this relationship somewhat differently: what happens when one appropriates technoscience as an object or model that frame the ways of thinking about the subject. Generally, the literature on the Islamic world has ignored the appropriation of models or objects because they are considered empty of meaning. In what follows, I will suggest a way of looking at the effect of technoscience on culture. I am interested in Bazargan's appropriation of a technoscientific language that attempts to reconcile faith and knowledge.

The Theory of Thermodynamics as a Model
In this section I will talk about certain elements of the theory of thermodynamics that have been explored as significant in bringing changes in literature and ways of thinking in the 20th century. In the last section of this chapter, I will explore the significance of this theory to Bazargan's discourse. How would the theory of thermodynamics affect the debunking of faith and knowledge? How does Bazargan use the theory of thermodynamics to theorize about the role of morality in everyday life?

First, I consider Michel Serres who has written extensively about the history of science and the significance of the theory of thermodynamics as it affects the concept of time and its directionality. Serres (1982) asserts that time is no longer independent and reversible, it moves toward death. The motor as the metaphor of life creates and dissipates energy, thus entropy increases, whereas in a mechanical system time has no directionality and is independent of movement. “I have called mechanical systems “statues” or stateurs: they are based on fixity or an equilibrium. After Carnot they become motors. They create movement, they go beyond the simple relation of forces, they create them by energy or power. They produce circulation by means of reservoirs and difference of temperature” (Serres 1982, p. 71). The second law of thermodynamics, entropy, is about both dissipation of energy and the impossibility of perpetual motion. This law depends on time, and its direction is irreversible: there is a drift
from order to disorder as entropy increases. Serres further argues that this theory and the understanding generated by it changed social and philosophical understanding. The system, like an organism, becomes a model of understanding society: "we are in the presence of three types of systems: the first, logico-mathematical, is independent of time; the second, mechanical, is linked to reversible time; the third, thermodynamics, is linked to irreversible time. However, the three types all have closure in common." 7 (Serres 1982, p. 72)

19th-century thermodynamics, Serres argues, remains within an entropic scale. It was about studying systems that are producers of movements. The focus was the relationship between work and displacement of objects. By the 20th century, certain concepts were introduced through information theory, such as information, noise, and redundancy. It was shown that information is affected by entropy (as it goes through emission, transmission, and reception) although the calculation of this kind of energy happens on smaller scale than the larger

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7 Serres further demonstrates the earlier closed system is rather open and recent work on the theory of thermodynamics has just tried to reconfigure this earlier closeness: "Indeed, due to the energy and information torrent which passes through the system without interruption, it is henceforth impossible to conceive of it as an isolated-system. It is an open system. It should thus be regulated by a thermodynamics of open systems which has been developing over the past ten years and which provides a complex theory for this state of imbalance. In and by this imbalance, it is relatively stable. But here invariance is unique: neither static nor homeostatic, it is homeorhetic." (Serres 1982, p. 74) ["The word "homeorhesis" is formed from the Greek words homos, meaning "same," and rhysis, meaning flow." Serres replaces the normal term describing the equilibrium of a self-regulating system, "homeostasis," by homeorhesis” in order to emphasize the idea of continual movement and exchange as opposed to the less dynamic idea of stasis -Ed."]
scale of energy in physics. The joining of theories, thermodynamics and information, led to further theorizing on discourse, writing, and language in general.

By the mid-20th century, the closed systems of thermodynamics and information led to systems of signs. Examples of the influence of thermodynamics can be seen in the work of Thomas Pynchon, who was a forerunner for this change in literature. Pynchon uses concepts such as entropy, disorder, or disorganization to show the chaotic world of language (Mangel 1971). For instance, not only do metaphors such as redundancy, noise, and randomness occur in his text, but also the characters view the world in these terms, conceptually. The use of these scientific concepts distinguishes him from the writers of the earlier part of the 20th century.

The combination of information theory and thermodynamics resulted in multitemporality, that is the idea that things around us do not share the same time. Serres asserts

"Living syrrhesis [flow together - this word is used instead of system because in the original Greek it means to cause to stand] combines sea and islands. In a completely new sense, the organism is synchronous for meanings and directions, for the continuous and discontinuous, for the local and the global; it combines memory, invariance, plan, message, loss, redundancy, and so forth. It is old, mortal, and the transmitter of a new cycle. The organism is fixed on top of the temporal converter - no, it is a converter of time" (1982, p. 75-76).
What an organism does is to receive information out of the background noise and to convert it to meaning. Therefore the body, the organism, is the observer and the receiver of the information. The observer does not know everything because as it moves from one level of integration to another the conversion of information to knowledge from background noise changes. For example, Freud's discovery of the unconscious, which Serres suggests was modeled after the older theory of thermodynamics without coupling with information theory, remained mechanical because there were no levels of integration. There was only one level, one which was based on displacement of original knowledge into a black box. With information theory and a different level of integration of noise/information, the black box consists of several black boxes. One can draw several conclusions: the body is a complex system that creates language out of information and noise. These integration levels, or language utterances can be seen as mediations. These mediation levels are more or less autonomous; and there is only one type of knowledge that is linked to an observer.

For the rest of this essay I will explore Bazargan's appropriation of this model, particularly the linkage of a type of knowledge to an observer in the discourse of Bazargan. With the advent of the theory of thermodynamics, that kind of knowledge, Serres argues, is calculated at
mediation levels, and changes as the mediation level changes. Bazargan is precisely trying to argue for the same kind of knowledge whose linkage to faith is porous but whose content depends on these mediation levels. Therefore, a Muslim subject's faith is no longer measured by knowledge of the canons, but by application of them to ever changing situations in these mediation levels.

In *Love and Devotion: Or The Thermodynamics in Human Condition* (Bazargan 1978) which was first published in 1956, he explains everyday life in terms of the theory of thermodynamics. He calls his attempt a mixture of literary and scientific work. He uses this theory as a model that can help to explain how society, in general, works. As the title shows, Bazargan talks about three themes: love, devotion and thermodynamics. First, love is that which is connected to faith but expanded to biology. Love is the source of human activity: “under the rubric of love, we want to gather all human goals and sources of human activities, whether it is food, clothing, libidinal feelings...” (1978, p. 13). Second, devotion is the movement of love to its ultimate limit, which is god. Third, thermodynamics is the mathematical relation of this activity: how human activity works according to a set of laws that is based on the relation of heat, time, and energy. How does his application of the theory of thermodynamics compare to Serres' discussion of it? How does he figure in the individual, or observer, in his rendition?
I think the most important part of his argument is advanced in his interpretation of love or faith. He insists on not defining it but assessing it. This assessment is done in a “system:” how much energy is spent during certain time depends on how much faith or love there is. I also think this is an argument for “ijtihad” [individual mediation], a view associated with the reformist movement in the Islamic world. Devotion cannot be assessed, but its sign, which is love, can be. Therefore a Muslim subject’s faith is transformed into a sign that can be in turn transformed into knowledge, which can be measured.

The assessment of faith and knowledge in society is based on a certain conversion of energy in a system. Life consists of many cycles. Each cycle works according the laws of thermodynamics: “human being, for satisfying his needs that is to fill in the lacks that he feels in himself, is in constant movement. As soon as he attains his love (i.e., fulfill his need), the movement slows down. It may even die...” (ibid., p., 16). The limit of death is the boundary of living, that is, entropy will lead the organism to death. Absolute death, in terms of thermodynamics, changes to relative “passing.” “It is true that the second law of thermodynamics cries out “death” but it is not an absolute one. It is asleep...” (ibid., 144).

Bazargan identifies two points resulting from the application of these laws on life: First, by going through different “cycles” of life and giving energy, one “acquires” something for oneself and does not lose everything.
This has to do with values that are created through action which are stored in the organism. Second, in time of death all the sources of energy are not emptied inside the body, that is, if there were a search for newness it could go on. Death is due to the external factors that do not mobilize or stimulate the internal ones. How is an observer or individual conceived in this rendition of thermodynamics of life? What are the values, and where are they stored and retrieved?

Bazargan's argument for how a society functions invokes Max Weber work, *The Protestant Ethic and the Spirit of Capitalism* (1976). He not only argues for a systematicity in anonymous mass society, but also a continuity of metaphysical values in the system. He conceives of this continuity in the form of a storage of information that is linked to social stimuli but connected to the past. This form of storage contains values or *moktasabat*, which includes ethical and moral traits, and they are dependent on behavior. “[Ethical traits] are always measured by their exterior manifestation and its amount is proportionate to how much an individual has spent of his own properties, or in fact has sacrificed.” (Bazargan 1978, p. 129) So, \( W = U - TS \), which is the formula representing what was discussed in the previous paragraph, works here too: \( W \) is how much energy he or she will have spent to attain and adjust to a new level of moral and ethical status. \( U \) is the internal desire. \( S \) is the *moktasabat*, or those things that one has gotten from other cycles of life, with \( T \) that is degree to
which the person has *moktasabat*. Bazargan uses this formulaic rhetoric to argue against the dyad of modernity/tradition, which in its ideological form of the time denied continuity of tradition in the new society that was being planned.

Tradition is mobilized and refigured at the mediation levels that Serres discusses. Bazargan believes that at these micro levels, individuals must reactivate what society, culture, and Islam have entrusted to them. These values (*moktasabat*) are stored in individuals and in order to mobilize them one needs to act (i.e., in a sense of *jahd* or *ijtihad*), in lieu of *taqlid*, which I briefly defined earlier. He says, “When each cycle ends and love is consummated, a new “thing” emerges out of this. If the being has lost W, it has gained something, that is “*ektesab*” (*pl. moktasabat*)” (Bazargan 1978:60). Moreover, there are both biological and cultural *moktasabat*. The inheritor of the former is human and the latter is *nafs*. Things that may be attributed to *nafs* include both physiological and ethical habits. It is through these kinds of habits that he formulates a system that is at the same time moral and social- *aql* (mind). Mind plays its role within this system, not outside of it.

Michael Meeker (1997) refers to the relationship between *aql* and *nafs* as the important dyad of interpersonal communication in the modern Turkish state. In his study of two monuments in Turkey, Kemal Atatürk’s tomb and Kocatepe mosque in Ankara, Meeker argues that in a dialogue
between modernity and tradition, what is left out in the former monument is addressed in the latter. In the former, he thinks, there is the undermining of the interpersonal experience in the new anonymous society that was founded by Atatürk. What he calls the theory of aql/nafs can explain how people communicate and understand one another in an anonymous society. He translates nafs as passion and aql as intellect. Aql can control the passion, but nafs is the equivalent of drive, and both constitute the social eros of interpersonal relationship. Bazargan's interpretation of aql and nafs and their connection to morality is conceived in a system where "worldliness" of individuals and their faith is understood socially. As Meeker suggests, the Kocatepe mosque, addresses an intimate interaction that was lost during the Kemalist era.

Bazargan's attempt to argue for a different subjectivity other than that of his secular cohorts, too, is to address what was lacking in their discourse, namely the significance of Islamic values. However, he does so, by using a scientific theory. It is paradoxical, on the one hand, to argue for Islamic values, and on the other hand, to use a scientific model to inscribe and reinterpret those values. Appropriation of the technoscientific, in this case, raises both the question of the inevitability of penetration of techne into culture and the possibility of reinscription of culture into technoscience.
Concluding Remarks

Bazargan's usage of the theory of thermodynamics is not metaphorical. His arguments are followed by direct application of concepts and formula. What he achieves is quite creative: Faith and knowledge become intertwined but disjointed. Since the turn of the century, faith and knowledge have either been separated, e.g., the triumph of positivist modernity (Iran or Turkey), or put totally under faith. Bazargan keeps the disjointedness of faith and knowledge, but by regarding them both as the sources of religion, he does not oppose them to one another.

The effect of this disjointedness is the fact that individual becomes responsible to act morally, as if he or she performed the act of god. Second, as argued by Bazargan through the theory of thermodynamics, faith is self-reflecting, it changes through time and adjust to new changes in life. Faith also dies if there is no effort by the subject to revive it.

The cultural context in which this appropriation occurs is Iran of the early to mid-20th century where tradition was suppressed in such a way that appears to Bazargan to be unnecessary. He tries to prove that by taking a personal journey, in a way that a Muslim ought to do, one can become a hybrid but remain the same. As I tried to show, the event of appropriating this model is not only intellectual but also experiential with a topological boundary that goes beyond Iran. For example, earlier in this
chapter, I alluded to Bazargan's experience in Europe where he almost exaggeratedly observes that people are not only religious but they are also modern. This observation contrasted with those of his secular cohorts who did not see the same thing. I interpreted this discrepancy not so much as the truth about the Europeans but as something between Europe and Iran, namely the ideology of that era which asserted that "the reason for the progress in Europe is the suppression of religion." Bazargan "proves" that this is not what he understands from life in Europe.

Bazargan's techno-cosmopolitanism was rare in his time, and was out of fashion by the late 1960's. And yet, the debates in the early century over technoscience and cultural translations are important because they provide a source for cultural critique. In the next chapter I explore, via a consideration of positioning of debates in contemporary Malaysia, how these dynamics are picked up anew in the current era.
Chapter Three:

The Scene of Technoscience in Malaysia: Institution Building in the Context of Islamic Resurgence

"Technoscience extravagantly exceeds the distinction between science and technology as well as those between nature and society, subjects and objects, and the natural and the artifactual that structured the imaginary time called modernity. I use technoscience to signify a mutation in historical narrative, similar to the mutation that mark the difference between the sense of time in European medieval chronicles and the secular, cumulative salvation histories of modernity." (Haraway 1997, p. 3-4)

"Postcolonial theory, therefore, enables a different kind of understanding of indigenous practices and discourses, one which does not seek to determine whether something is authentic, original, or uncontaminated but which accepts cultural hybridity as a starting point in political projects that seek to empower subaltern, poor and marginal groups." (Gupta 1998, p. 20)

In this chapter I reflect on the scene of competing specters in the Malaysian world of technoscience. This chapter is about the building of institutions and about the shifting ground from which they are built.

In the spring of 1998, I visited a number of Malaysian Muslim intellectuals and educators who have been involved in institution building. Following on interviews and conversations concerning the development of science and technology with scientists and engineers at the Massachusetts Institute of Technology (MIT), the main aspect of my fieldwork in Malaysia was to follow the developments of an initiative with MIT. These
interviews and conversations, as well as the writings of Malaysian
intellectuals and educators, form the basis of this chapter. In addition, I
have used anthropological monographs (Abaza 1994; Bowen 1997; Hefner
1998; Milner 1995; Nagata 1984; Nagata 1994; Nagata 1997; Peacock
1968; Shamsul 1997) to build my understanding of the cultural context of
South-East Asia.

Whereas in science studies it is commonplace for anthropologists to
follow the scientists, I have instead followed an institution. The result is
not about this particular institution, whose building process has come to a
halt due to the recent crisis in Malaysia, but to write about the event of
technoscience by entering the scene through this particular venue. During
my fieldwork at MIT, I was informed that MIT is involved in helping to
build an institute of technology in Kuala Lumpur. From the very
beginning, I was struck by the lack of interest of the MIT experts in
understanding the cultural context of Malaysia in general, and Islam in
particular. Symptomatic of this, in their initial investigation of the
conditions of Malaysian higher education, they did not include the Islamic
institutes and universities which have international recognition and
prominence. I later found that this lack of understanding was due to a
certain time/space disjunction of the landscape of technoscience in
Malaysia. This is what I will explore here.
Three months after my return from Malaysia, the economic crisis in the South East Asia had spread deep into the country, which had until then one of the steadiest economies in the region. Prime Minister Mahathir Mohammad jailed his deputy, Anwar Ibrahim, as well as a number of Muslims from the U.S. (transnational Muslims with U.S. citizenship) in an attack on "America's Islam" blamed for interfering in Malaysia's affairs. Among this latter group was Munawar Anees, whom I met with as a part of my research. Anees is a U.S. trained biologist who is interested in Islamic science and has been among Anwar Ibrahim's speech writer. Pakistani born and married to a French-Algerian woman, Anees lived in the suburbs of KL until his arrest on charges of sexual misconduct in relation to Ibrahim. This tragic case is not only an index of struggle over reformasi in Malaysia, but more importantly a symptom of the larger performative landscape where local/global relationships plays out.

Islamic tropes intersect with tropes of other specters, such as national and transnational discourses, to play out as elements of what I am referring to as "radical critique." I will show, for instance, that a radical critique of the transplantation of an institution such as MIT to Malaysia in the neoliberal age is an act of continuous engagement and dialogue between Islamic and Western claims to programmatic truths. In this chapter I describe this performative landscape where technoscientific identities are contested and in the process defined.
Fastforward to the Present

The resurgence of Islam in Malaysia since the 1970s has aimed towards recasting the socio-political structure of the country. Since this resurgence, Islamic groups in Malaysia have created many intellectual, academic, non-governmental, interest groups and agencies to suggest new policies to, or criticize, the Malaysian government.

In 1984 Islam was introduced into the national curriculum of primary and secondary education. Almost ten years later, in the 1996 Educational Act, a yet different direction was forged when the government allowed for the privatization of the universities, thus ending the enforcement of a national unified curriculum and yielding the creation of a variety of private schools. Foreign universities could now establish themselves in Malaysia and Malaysian universities could open branches in foreign countries. For example, Monash University of Australia has opened a branch in Malaysia while there has been initial talk by the Malaysian education minister of opening a university in Indonesia (Chok 1998).

There are at least three arguments given for this move to internationalize education: first, to take advantage of local resources such as campus facilities; second, because students will save money by staying at
home; and third, to cater to the trend and prestige of having a foreign
degree. This move towards internationalization is not only toward big
industrial countries, as has been common in the past, but also at regional
levels. The Second Industrial Plan, 1996-2005 also makes a case for new
technical institutions. The plan outlines intended efforts to create
indigenous designs and developments in technological and scientific arenas,
thus moving beyond a simple manufacturing base. Such efforts require a
combination of industry, university and the market to meet the need.

The Malaysia University of Science and Technology (MUST) is one
of these initiatives. Designed in collaboration with and modeled after MIT,
it is hoping to start a new trend in science education in Malaysia. The
major sponsor and mobilizer of the idea of establishing a university
modeled after MIT is Datuk Effendi Norwawi. Effendi, as he is known,
was in boarding school with Osman Bakar, a proponent of Islamic Science
and head of the Science and Technology Program at University of Malaya.
Effendi is one of the bumiputra billionaires whose prominence is tied to the
affirmative action act of 1974 which addressed Malay's participation in
economy. He was born in Singapore and educated at the University of
Tasmania, one of the few of his generation who went to college. His
economic fortune came from the state of Sarawak where he became the
chair of a private company, SEDC. SEDC is often considered one of
Malaysia's best run companies, at least in part due to using a merit system
to run the company in contrast to the established state sponsored industry in which ethnic quotas were being enforced. His recent association is with Encorp, a corporation with an array of investments. Two of Effendi's current ventures are a TV station and the opening of a branch of Parsons School of Design (CENFAD) in Kuala Lumpur.

In both ventures there is sense of grafting through technology. The idea is that a school of design can bring aesthetics into industrial design so the product can be sold abroad. As far as the new TV station is concerned, it supposes to bring, above all, national unity through serving all ethnic groups, undermining the existing TV stations. It also claims to have the goal of generating "feel-good" programs (Proctor 1998).

Effendi is advocating that the MUST/MIT project also use a merit system. Since he has been a beneficiary of bumiputra privileges, to use a merit system is a political act to undo some of the Islamization measures which were the initiatives for the advancement of Malays in the multi-ethnic society. In fact, there is broadening attention to reevaluating the quota system in the universities. At the University of Malaya, for instance, the faculty and administrators I spoke to often mentioned the fact that they are multicultural. UM was a branch of the University of Singapore before the countries split and it still retains some pre affirmative action characteristics.
There was interest from the Malaysian side initially to build MUST physically on the model of MIT with the idea that this would serve to maintain American interest in attending to it. Timothy Mitchell's analysis in Colonizing Egypt (1988) of the design of educational environments in colonial Egypt suggests that a similar reasoning was at work there. School lay-outs needed to be enframed so as to be measured by the British. But given this contemporary era of post-colonial Malaysia where this mode of calculation is already in place, then this appears as a exaggerated quality, working at the level of the production of desire.

From the MIT side, the project is supported by a program at MIT whose goal is to help create technical institutes and teaching programs in other countries. Dr. Fred Moavenzadeh heads the program. Iranian born, Dr. Moavenadeh (now a U.S. citizen) completed his secondary education in Tehran (Alborz High School) and received a Ph.D. from MIT in civil engineering. The program was started from seed money through a grant by the USIA in the early 1970s. Moavenzadeh has been with the program since 1975. Involved in development projects in Argentina, Brazil, and Colombia, the program is also involved in projects in Egypt and Kuwait. The main goal of this project is to export programs based on an MIT model and to create a large community of scientists and engineers as a foundation for a globalized project of technoscience.
This program works as a virtual program, run from a relatively small office. Should the occasion arise, the program uses MIT resources to mobilize a planning group. Retired faculty members who have years of experience at MIT and lots of time at hand, are often used. Typically a project starts with a proposal, followed by designing curriculum, hiring faculty members, and recruiting students. At each step, everything is negotiated by local administration, but the curriculum and ways of running the program remain modeled after MIT, especially at the initial stage.

I was told that the MUST campus is supposed to be ready around 2005. The 100 acre campus will be north of Kuala Lumpur, on a 500 acre parcel of land, within a larger 6000 acre land that will be developed. The campus will be built in conjunction with other commercial developments by the architect Nicholas Ayoub's Paris based architecture firm, Conceptuel. The commercial developments surrounding the campus are expected to pay the costs of the campus.

At this point it is not clear who will win the bid to build the campus. The MIT group had already suggested someone from the department of architecture at MIT, Michael Dennis, who also has a firm in Boston which specializes in building universities. The MIT brochure, which shows a model of the proposed campus, has already announced that Michael Dennis has worked on the plan (he told me he spent one week in Kuala Lumpur to study the site). However, upon arriving in Kuala Lumpur, the Malaysian
architectural consultant on the project, Nazin Razak, reluctantly informed me that neither Michael Dennis nor anyone else has won the bid yet. Though politically charged and undecided, the issue does not appear to have to do with the hiring of foreign firms. In fact, the new campus of the International Islamic University is being built by a Syrian architect.

MIT brings with it the opportunity to develop and access sources of funding and legal procedures from many additional sources beyond government budgetary allowances. This is mainly done through researchers finding corporate sponsors. These efforts further depend on the creation of particular laws and practices surrounding such matters as the patenting of inventions and the copywriting of authorship. One existing site for the further development of these directions is the research division of SIRIM. SIRIM carries out the strategic research agenda set by the government, and endeavors to create connections between government, industry and the universities. SIRIM will also serve as the interim campus for MUST.

This corporatization of science in Malaysia, it is claimed by some, will result in at least two changes. First, science and technology will be more connected to the West and the larger community of scientists and corporations. Secondly, it will stimulate an increase in numbers of scientists and engineers through market incentives and the exigencies of the larger arenas of science and technology. Critics, on the other hand, point
to the fact that this is at best a mixed blessing. Though it aims at increasing
the number of researchers, it will do so by top down incentives and
importing values from outside.

Rewind to Resurgence

After Malaysian independence from Britain in 1957, Islam became a
frame for the constitution as well as for social change. Legal codes were
changed to support different affirmative action initiatives. The term
bumiputra was invented to refer to a form of ethnic affirmation of Malay
over non-Malays. In addition, in 1970 the New Economic Policy known as
the NEP was launched with some ethnic and educational quotas built-in in
favor of Muslim Malays\textsuperscript{8}. In 1984, "Islamization" became an official
motto of the Malaysian government.

A number of reasons for the Islamic resurgence have been suggested.
Mutalib (1994), for instance, identifies four key events, the racial riots of
1969; the coming to power of the current prime minister, Mahathir
Mohammed; the gaining of control of the Kelantan state in the 1990 by
PAS, the Islamic political party with the greatest support of the ulama; and
the emergence of dakwah, an urban based national revival movement
intended to bring people back into the fold of Islam.
As it is elsewhere, the scene of techno-scientific activity in Malaysia is filled with the mobility of people and ideas across institutional, national, political and ideological boundaries. Mona Abaza has focused (1994) on the relationship between the Middle East and South East Asia, and the ways in which exchange of students, print, and culture material have effected local politics. Both Nagata (1994) and Abaza suggest that this resurgence has not only affected nation building in Malaysia, but has also resulted in the strengthening of transnational ties.

An instance of the transnational character of the resurgence movement is evidenced in the establishment of transnational universities and institutes, such as the International Institute of Islamic Thought (IIIT), based in the U.S. and with a branch in Kuala Lumpur, and the International Islamic University (IIU), still under construction on the outskirts of the city. Anwar Ibrahim, the ousted deputy prime minister of Malaysia, was instrumental in arguing for and gaining government support for IIU, the first non-state university. In order to build the university, the government had to make an exception in order to legally allow the constitution of this university. The emphasis at IIU has been on Islamic theology and civilization courses, at both undergraduate and graduate levels. Science and engineering are currently offered only at the undergraduate level. The languages of teaching are English and Arabic. IIU is probably the most

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8 For a full account of chronology of events see Judith Nagata (1997a).
international institute in Malaysia (I met, for instance, with a Bosnian student of IIU while I was there).

Within the University of Malaya, the department of science and technology combines history of science and social studies of science. This department is the only program in Malaysia that studies the philosophical, historical, and social dimensions of science and technology. Osman Bakar, who was a student of the Iranian Sufi scholar Seyyed Hossein Nasr, was the head of the department up until recently. He is now involved in the administration of UM as well as consulting for the government.

In and of itself, the *dakwah* movement (the Malay rendering of the *dawa* movements spoken of in the introduction), another instance of the transnational character of the resurgence movement, reveals the complexity of the dynamics at work. One important leg of the *dakwah* movement was the student movement. This movement connected English educated Malay to the villages in Malaysia. Out of the student movement of the 1970s came the Islamic youth organization, ABIM (Angkatan Belia Islam Malaysia), founded by Anwar Ibrahim. This group was a youth organization first and subsequently evolved into a religious movement. One of the characteristics of this group is that its leader Anwar Ibrahim was

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9 For a study of *dakwah* as a student movement, see Zainah Anwar (1987) who describes the movement in different moments of its transformation. Nagata shows that the origin of *dakwah* in Malaysia goes back to post-colonial nation building. In its current form "these groups have been labeled "anti-Hadith" by secular Syari'ah officials, for their bypassing of
inspired by the late Ismail Faruqi, the American Muslim who is considered
the first to talk about Islamization in the global context.

Within the *dakwah* movement, there are many groups and
individuals who have been influential in their critiques of science and
technology. For instance, Chandra Muzaffar (1987), a proponent of the
resurgence and the leader of the human-rights organization Aliran, makes a
sweeping critique of development as a way of criticizing the politics
governing the development of science and technology. A proponent of
dialogue among different ethnic groups, and representative of the kind of
approach that I am referring to as a radical critique, Muzaffar's critique
considers the effect of the market on labor, corruption and other practical
challenges of neo-liberal capitalist enterprise. Another source of critique
comes from the Islamic political party, Parti Islam Se-Malaya, or PAS.
PAS forwards an ideological negation of science and technology, warning
against placing too much faith in science and technology, and lacks an
interest in participating in a constructive dialogue about them. These
ideological negations of Western science and technology from within the
*dawkah* movement lie in contrast to other voices from within the
movement, such as, ABIM, which keep active the question of how to
continue an engagement with science and technology.

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the deeds and sayings of the prophet in favor of the original Qur'nic text." (Nagata 1997a,
p. 135)
Syed Muhammad Naquib Al-Attas, the head of the Institute of Islamic Thought and Civilization (ISTAC), an internationally renowned institute of Islamic higher learning with faculty and students from various parts of the Islamic world, lays the foundation for a different outlook on the development of science and technology (Al-Attas 1978; Al-Attas 1995). Al-Attas supports the Islamization of science, but he argues that an Islamic science does not yet exist. It is a science to come. And according to Al-Attas, it will happen by changing existing modern science into an Islamic framework. Thus there is a need for developing a methodology of Islamic science.

Many scientists who are interested in Islamization of science have been influenced by Al-Attas. An Arab Malaysian, born in Bogor, Indonesia and educated in Malaysia, England, and Canada, Al-Attas holds a Ph.D. from McGill University on Islamic theology and metaphysics. His early education includes Royal Military Academy, in Sandhurst, England. He built ISTAC in 1992, designing it with distinct Islamic architecture (more Mediterranean in style than Malaysian). Before the establishment of ISTAC, he taught at the University of Malaya, one of the centers of the resurgence and where he inspired many student activists.

Many scientists themselves were politically affiliated with *dakwah* movement and their politicization coincided with their interest in Islamic science. In 1978, the Islamic Academy of Science (ASASI) was founded by
Azzman Shariffadeen. Shariffadeen was at the time of resurgence at the University of Malaya, and later became the director of Malaysian Institute of Microelectronics Systems. ASASI plays the role of advocating Islamic science. Under the new director after Shariffadeen's departure, the academy has continued to propagate Islamic science, mainly through actively formulating curriculum for secondary education as well as organizing conferences on this topic. Notably, the main language of use at ASASI is Bahasa Malay, used in order to create a new indigenous scientific language. However, this localization raises questions about the relationship between Malay, Arabic, and English and the translatability among them.

The mathematician Shaharir bin Mohamad Zin, the current president of ASASI, whom I met at the National University of Malaysia (UKM), emphasizes the importance of Anwar Ibrahim's becoming a part of the government, particularly when he worked in the Ministry of Education in 1984, for introducing the Islamization of knowledge as part of the secondary education. Initiated by Anwar Ibrahim, in 1986, curriculum reform included and increased traditional Islamic subjects. According to ASASI, this has provided another step in creating a fertile ground and base for Islamic science.

The focus on education and the teaching of Islamic values are the achievements of the dakwah movement in changing the scientific outlook. These efforts notwithstanding, such matters as inter-ethnic relations still
factor strongly in decisions about school choice. For instance, as Chinese students are perceived to do better in science, some Malay parents choose to send their children to Chinese schools.

Another site for the pursuit of Islamic science is university based groups such as reading groups. As I will discuss below, there is a gap between the discussion about the Islamic science and the practice of science that needs to be explained. A member of one such reading group is Prof. Khalijah Mohd. Salleh, a physicist from UKM who helped organize a seminar on the Islamization of physics in 1989 and who is planning to teach a course on Islam and science and technology at UKM. Another member of this reading group and also a physicist is Prof. Mazlan Othman, the director of the Space Science Division (BAKSA) for the Ministry of Science, Technology and Environment. This agency is responsible for the first Malaysian telecommunication satellite to be sent to the orbit, as well as for running the Planetarium, where I met with her.

Within this reading group, then, different approaches to Islam and science are revealed. In contrast to Prof. Salleh, who directly concerns herself with philosophical issues related to Islam and science, Prof. Othman uses Islamic idioms to legitimize her own practice of science. In a conference on Islam, science and technology (Ab Razak and Abdul Majeed 1997), for instance, Prof. Othman uses Islam as rhetorical strategy to argue
for the advancement of space science. This shows how certain Islamic idioms are useful rhetorics for different purposes.

These three scientists, all who have been affiliated with the *dakwah* movement, now work in different directions. At opposite ends of the spectrum are Shaharir Mod. Zin, in his activities at ASASI focused on propagating and advocating Islamic science, and Prof. Mazlan Othman who directs the Planetarium and is involved in the activities of global scientific work. Shaharir Mod. Zin is increasingly involved in the Islamization of science, writing between the narratives of Islam and nation which means that he writes more in Bahasa Malaysia, and less in interactions with larger community of scientists. On the other hand, Prof. Mazlan Othman is getting involved more and more in the global community of scientists and less in Islamization.

Finally, government sponsored efforts to create a sort of "professionalized Islam" are lead by the Institute of Islamic Understanding (IKIM). IKIM is supposed to create a kind of 'Islamic correctness' and works at the federal level. Indeed some Muslim intellectuals try to distance themselves from IKIM because of their 'official' version of Islam. IKIM produces publications, such as the 1997 *Islam, Science and Technology*, offers public statements to the media, and sponsors events.

What is interesting is that such dynamics -- the professionalization of Islam, Islamic correctness and the pursuit of modernization, civic religion,
and *mosharekat madani* (civil society) -- which used to be powerful as mobilizing tropes, now must be interpreted in the boundary of institutions and policy making. This review of some of the sites and actors involved in questions regarding the Islamization of science and technology in Malaysia hints at the complexity of the scene of this work.

**Pause to discuss**

My theoretical frame throughout this dissertation has been to situate what I called the epochal understanding of the West in global/local modalities of discourses and speech acts. Here I will first discuss the intellectual roots of resurgence, then, I will situate it in a global/local modalities.

The intellectual roots of the epochal understanding of the West are twofold. First, framed especially through the high Sufi tradition of *tassawuf* which provides a cultural base of philosophy, there is a growing critical stream of reflection on the Malaysian situation from the perspective of a merging of philosophy and theology. Secondly, there is an underlying understanding of the West *not* as a set of incoherent elements but as a frame that orders these elements in a particular way, that can be called essence or episteme, whose meaning must lie in its original conception. The secularism of the West resides within this essence.
It is here that a key distinction and difference of understanding resides. It is argued that Islam is not similarly framed by such an essence. In response, there has emerged an intellectual strain to counter the condition that is perceived to have been caused by that conception of the West. Within this intellectual strain, the notion of return, that is return to origin, i.e., the golden age of the Prophet, acts as the mechanism for rethinking and re-imagining the future.

In this dissertation I contend that for Malaysian Muslim intellectuals the mechanism of return is about finding another possibility of promise or hope. I wish to suggest, further, that it offers this through what can be understood as two aspects of the notion of return, revelation and its messianic structure. Revelation describes the process by which certain original ideas can be found, thus allowing for the potential of appearing. It thus allows the possibility that abstract idioms can be a source or base for different structures of meaning. Referring to certain teleological aspects of religion, there is a messianic structure to the promise of hope being offered. Even in its secular ideological form, it offers a sense of salvation and promise. This messianic structure is linked to the notion of return in that return is a way of activating those kinds of hopes and promise. It is this aspect of return that I am particularly interested in here.

Al-Attas (1995) has argued that any idea of "change" or "development" has to do with this structure of promise. I consider
Islamization as a trope that connects the messianic/revelability characteristic of development and change to their social and institutional articulations. Below I discuss what Al-Attas argues, through an interpretation of secularism in the West, about this return. I will then juxtapose some of the mobilizing notions at work, namely the ideas of development and education in Islam, to what is happening in the Malaysian scene of activity. Finally, I will conclude by posing questions emergent from this juxtaposition and which have important implications for technoscience.

Al-Attas's work is collected in two volumes, *Islam and Secularism* (1978) and *Prolegomena to The Metaphysics of Islam* (1995). The former is a critique of secularism as a Western construct. Secularism, he argues, emerged out of a desacralization and deconsecration of religion as a way of life. Secularization, for Al-Attas, is defined as a historical process by way of which religious symbols will eventually disappear. As Al-Attas describes, the word "secular" is a Latin derivative of *saeculum*, which "conveys a meaning with a marked dual connotation of time and location; the time referring to the "now" or "present" sense of it. Thus *saeculum* means "this age" or "the present time," and this age or the present time refers to events in this world..."(1978, p. 16)

Al-Attas argues that the roots of secularism lie in the hybridization of Judeo-Christianity-Hellenic and Roman elements. According to Al-
Attas, secularism is based on a rationalistic world view that sees the world as historical "development." Invoking Weberian rationalistic processes, he says that within this context, development becomes a tool of the enlightenment to lead society to maturity. At the core of his argument is the notion that Christianity becomes hybrid and detached from its origin. The effect of this detachment is that secularism is turned to ideology. And as an ideology, secularism must continually change with time and space. Secondly, through this expropriation, this detachment, moral and ethical values become human values. In Christianity, then, god becomes personalized and dead in that process of becoming human values, and as a result, values become relativized in time and space. Consequently, he does not see Christianity as a universal religion. The implication of this, in my view, is that Christianity instead should be understood as a global religion. While "universal" is often used interchangeably with "global," I specifically make a distinction between the two. The former has to do with the eternal, the ageless, while the latter is transmitted as a human construct in time and space, but as if it were universal.

For al-Attas, Islamization is a process of going back to the Islamic golden age in order to recreate Islamic values, values that are universal, revealed, and ageless. Al-Attas does not entirely dismiss these Western values – some are a continuation of Islamic rationalistic values and thus are not at odds. According to Al-Attas, the process of Islamization happens
first through the Islamization of language, then the Islamization of secular values, the stage he claims Malaysia is going through currently. The Islamization of language occurs by adopting key concepts that are based on revealed knowledge, that is, that are not framed by ethnic or national constructs. In the Islamization of secular values, the idea is to translate secular values into an Islamic frame. As should be clear by now, Al-Attas is striving to create a relationship with the West, not negate it. For him, Islamic science is a science to come. It needs to create its own methodology as well as to translate Western science into its own making. For Al-Attas, it is not a matter of creating a new science *ex-nihili*.

Al-Attas's thinking can be placed in the broader context of thought about the West and secularization. The idea of secularization of eschatology is not new in the West and the question of the origins of secularism has been dealt with for some time among Western philosophers. This idea is new, however, to those who subscribed to a certain secular ideology that marked the state formation of many countries in the Islamic world. In Malaysia, however, that form of secular state was never strong, thus there the scene is much more volatile.

What is important here to the Muslim intellectuals is to pick up on the thinking that has gone on in the West striving to find some kind of legitimacy for secularism. This has to do, further, with their consideration of the legitimacy of their own secular states. For most Western writers
since Rousseau, the secularization of eschatology is a process of
denaturalization in the sense of moving away from origins. Marx's work
on capitalist fetishism and Weber's work on Protestant ethics in relation to
capitalism, for instance, are part of the effort to define the character of the
"age", a character which has everything to do with secularism. It is
Heidegger, though, who has influenced many Muslims. In order to define
the character of the age, he took the radical step in saying we must go back
to the original metaphysical foundation of the West. And in his thinking,
the West appears as an "essence." Al-Attas, as I have shown, takes the same
approach. In contrast, early Muslim modernists such as Al-Afghani did not
see the West as an essence and therefore see no fundamental difficulty in
reappropriating Western science, in that they saw Western science itself as
a continuation of Islamic medieval science.

Secularism, ethnographically speaking, means different things to
different people and different situations. Here, I have dealt with the
struggle to define secularism in the more abstract sense, at the level of the
critique of Western secularism as a critique of the "modern age." What I
would like to do now is show, at the level of detail, the generative potential
of these abstract idioms. My point, and the point of those engaged in these
debates, is to show that a movement of rethinking can be generated from
these abstract ideas.
The following two examples show how philosophical critiques of "development" and "education" can be posed from this perspective. These two examples are taken from the text of Wan Nor, a student of Al-Attas. The purpose of his argument, addressed directly to policy makers, is to critique some governmental policies on education and development, and he does that solely by evoking the root differences of Western and Islamic cultures. Although these kinds of critiques are similar to those of the turn of the century modernists, e.g., Al-Afghani, here they are being mobilized in new ways.

In the first case, to critique "happiness" as it is acquired through consumption, Al-Attas gives an interpretation of the Qur'an that equates happiness with certainty. The word, falah, he argues, has been used in the Qur'an as "success", as it is observable from outside. On the other hand, happiness or sa'adah has the same connotation but it has to do with "soul" and certainty. With this presupposition, Wan Nor argues:

"The development philosophies and programmes of nations, whether implicitly implied or explicitly stated, seek to provide happiness to the largest number of its members. While understanding of what constitutes happiness and the ways of attaining it differ among individuals and nations the aim of seeking it is indubitably clear and singular. The comprehensive success (falah) of man will ensure him happiness (sa'adah) here and more importantly in the hereafter." (Nor 1994, p. 861)
In the second example, education in Islam is supposed to create a good human (*Ainsan al-kulliy*), as opposed to a subject or a citizen, Al-Attas argues. The emphasis is more on *ta'dib*, which is an inculcation of certain key concepts according to which there is a hierarchy of knowledge.

"Referring to the world of knowledge, *adab* means an intellectual discipline...which recognizes...the hierarchy of knowledge based on the criteria of degrees of perfection...such that the ones that are based on revelation are recognized and than those based on the intellect; those that are *fard'ain* are above *fard kifaya*; those that provide guidance (*hidayah*) to life are more superior to those that are practically useful..." (Nor 1993, p. 58)

In this scheme the words *ta'lim wa tarbiyyah* refer to mere cognitive aspects of education and are abandoned for *ta'dib*, a more inclusive term.

In these two formulations, ideas of development and education are argued to be different from the West. I am arguing that, as I showed earlier in this chapter, with the resurgence of Islam ideas and thinking such as these were generative for actual changes in the practice of institution-building. I have identified at least four global/local modalities that cut across these generative idioms. These modalities are: (1) Islamization in its local institutionalized forms of affirmative action; (2) Islamization in its global and transnational forms; (3) regional internationalization of collaboration; and (4) global projects such as MIT/MUST in the context of the neoliberal political economy. In the remainder of this chapter, I
explore these modalities to show how the presuppositions examined above -- the epochal understanding of the West and the Islamic eschatological character of change -- are framed.

Global/Local Modalities and the Performative Landscape

The fact that many Muslim intellectuals are now active in the critique or construction of Malaysian society through governmental and non-governmental structures, especially in form of consultants, has made the task of social change far more complex, and therefore difficult. Ethnographically, a symptomatic of this difficulty can be seen in the reproduction of discourses such as development, civil-society, universal human-rights and narratives of the nation. These dynamics point to the incompletion of this (or even other) alternative project(s).

The modalities that I noted above frame the performative landscape refiguring technoscientific identities in Malaysia. Through these interconnected modalities (a kind of global metalinguistic space), social action is enframed and actors participate in semiotic processes of identity formation.

The resurgence of Islam since the 1970s in Malaysia, by drawing on notions of return, introduced hope and promise as structures of the future and inserted Islam as a base for rethinking social processes. Local
institutionalized forms of affirmative action (modality #1) acted as a process of subjectivation, of individual/institutional identity change, and drew on the idiom of the revival movement, *dakwhah*. I interpret this move through Austin's broadening of the category of speech act (Austin 1962): that is, the "illocutionary-locutionary-prelocutionary" typology. This frame provides a way of showing how these Islamic idioms are connected to and have an effect on social action; the typology indicates the way that words are connected to action in specific ways. What I interpreted above as the epochal understanding of the West can be understood on the performative ground that it utters promise, it acts as an illocutionary force. Its locutionary force is enacted with Muslims' references to a list of Islamic imperatives such as education or happiness or when they refer to an index of different possibilities of being. Finally, these idioms are performed as a set of rhetorical strategies to persuade others, constituting its prelocutionary effect. In this way, these emergent understandings can be situated in both national and global contexts. For instance, the fact that Malaysia is a multi-ethnic society sets limits on performances of these promises.

Transnational activities of Islamization (modality #2) provide an overlapping frame. These activities result in the production of texts, transnational spaces for education, and other objects and venues for mobility and exchange. Institutes such as IIIT, IIU and ISTAC serve as
prime sites of subjectivation through which processes of identity formation are channeled. Some of the signifiers that are generated through these processes get played out in the realm of politics. Prime Minister Mahathir, who tried earlier to use the opportune moment of economic disarray to out-maneuver his opponents and take a stab at transnational Islamic activities, called "America's Islam" an important element in disturbing the social order. "America's Islam" acts as a stereotypical shorthand to refer to the disruptive effects of Muslims trained or educated in the U.S. The term is itself ambiguous, a symptom of the metalinguistic space referred to above.

The third modality, a regional internationalization of collaboration (modality #3), generates its own political economy and semiotic systems. The opening of the Australian University, Monash, in Malaysia suggests an instance of this. A larger picture of what I mean by a regional modality includes a range of activities, from the Sufi order activities such as Nakhsbandiyya, extending from Central Asia to Turkey to Kelantan, Malaysia and beyond, to exchanges between the Middle Eastern Islamic institutions and the ones in Malaysia and Indonesia. Through this modality the perceived categories of Islam from Malaysia and Islam from the Middle East, a Geertzian Moroccan Islam and Indonesian Islam, for instance, does not capture the complexity of these processes of identity formation.
Rather, it is precisely through regional (and global) crossovers and cross-cutting interactions that these identities emerge.

Lastly, global projects in the context of neoliberal political economy (modality #4) comprise a modality which comes from the expropriation and appropriation of discourses and objects whose effect on local settings should be studied with their own specificity. For instance, the implementation of such global initiative as the MIT/MUST project have been argued for according to such cultural values as excellence, merit, and (an unqualified) science. When I spoke with people on the MIT side of the project, there was no mention of culture and local tradition. The assumed division of labor seemed to be that MIT would, based on its experience, attend to the ideas and concepts necessary to set up a technical school. On the Malaysian side, a small but very influential group of people would take care of the practical elements such as securing its local legal status, financing, logistics, and so on.

The expropriation of such projects to the non-Western world, however, is done on the assumption of there being a continuity of time/space, as the epigraph from Donna Haraway suggests and as is easily identified in the development rhetoric and activity of the 1960s. The aim of my work is to theorize about the conditions in which these projects are happening. This continuity of time/space, I am arguing, is out-of-joint, there is time-lag. While it assumes that people will "catch-up" to western
standards, in fact they become something else. If there is not continuity of time/space, one has to start understanding the other culture to recognize that there is a discrepancy, from the other culture's standpoint, in the value of the projects as they are expropriated. It requires an ethical turn from the Western side to consider not if there will be effects of the project, but what the effects will be and how they will interact with other contemporary and local cultural dynamics. A different understanding of "local" culture should emerge in this context.

In conclusion, I would like to recapture the essence of what I called "radical critique" in the scene of Malaysian technoscience. In the context of different modalities that cut across, or constitute, the landscape of technoscientific identities, radical critique is both deconstructive and reconstructive. It is deconstructive because it takes the claims to singularity of Islamic critique of the West seriously. That is, there is an effort to understand the meaning and root of these oppositionally structured claims, i.e., the claims that "we are different." Radical critique is reconstructive because at the same time it goes beyond the singularity of these discourses to show the way these modalities play out in different kinds of situations, thus recognizing its own position as part of these competing discourses. As I have shown in this chapter through exploration of this complex scene of technoscientific activity in Malaysia, and resonating with Gupta's assertion that postcolonial theory should not create
a vantage point but take hybridity as starting point of understanding, radical critique is a performative act of meaning making through dialogue among emerging views.
Chapter Four:
The Hoodbhoy Affair: Meaning and Social Drama

"The individual takes on a history or histories through the construction of narratives in conversation with an interlocutor, aligns itself with ideologies, becomes the "subject" of an ideology. But, like the Javanese uncle that Geertz encountered, the subject is inconstant in its loyalties and usually oblivious to its own inconsistencies." (Ewing 1997, p. 35)

"Languages and their locally recognized variants become emblems (iconically essentialized indexes) of their users' positions in a shifting field of identities. So, studying the distribution and dynamics of such emblems (tokens of words and expressions in particular languages) in discursive deployment is an important kind of evidence about what is happening in the larger societal matrix." (Silverstein 1998, p. 411)

In this chapter I illustrate how Islam has become part of the landscape of technoscientific identities in the Islamic world. Although this case focuses on a Pakistani situation by no means it is confined to Pakistan. I have argued that Islam was the radical other of the constriction that, under the duality of modernity/tradition, imposed a technoscientific identity that marginalized Islam as a constituent element of this identity. I have also argued that radical critique is a deconstructive/reconstructive act which involves undecidability; that is, making a decision about identity is not a stable, consensual process. In what follows I show that in the event of radical critique many competing discourses play out against each other in
order to reconstruct a technoscientific identity. This includes a positivistic discourse, exemplified in the case at hand here.

Dr. Pervez Hoodbhoy is a physicist who teaches in Quad Azam University in Islamabad, Pakistan. He is also a political activist and travels around the world participating in many forums. Trained in Nuclear Physics with Philip Morrison at MIT, he is now an outspoken scientist against the nuclear weapons escalation between Pakistan and India. He is also an organizer of NGOs in Pakistan.

His book, *Islam and Science: Religious Orthodoxy and the Battle for Rationality*, came out in 1991 and provoked lively debate among both scientists and scholars of Islam. The book is a statement on the state of science in the Islamic world and can be read as a response to the call for the Islamization of science and knowledge. In it he uses Islamic historical references to demonstrate that there is no coherent Islamic context to provide a base for the development of science and technology. This book is highly polemical in that it uses historical argumentations for the purpose of establishing truth about some present events, namely the state of science in the Muslim world in general and Pakistan in particular.

Hoodbhoy's argument is clearly an anti-Islamization one. My interview with Hoodbhoy (1995), included in its entirety at the conclusion of this chapter, throws light on the social drama in which the book participates. While Hoodbhoy claims in the interview that the book was
aimed at the former military dictator Zia al-Haq's Islamization measures, the book had a larger reception which is the theme of this chapter. My interview, conducted in an open-ended fashion and covering his family, his experiences in Pakistan and MIT and the ways he perceived the unfolding of social and historical events, gives a linear account of the context in which Hoodbhoy has lived and worked. His account in the interview is an un-nuanced, almost ideological account of events in Pakistan.

My argument in this chapter is that even an anti-Islamization argument such as Hoodbhoy's is framed by a local/global metalinguistic space in which the argument plays as a speech act to reconstruct a technoscientific identity. The book has been used as a set of speech acts, in the forms of quotations and references, and the book has become a signifier in academic discourse in the debates regarding the relationship between Islam and science. For instance, in Malaysia, I observed that the book was referred to in debates over the possibility of Islamic science in the condition where science is a Western enterprise. Though many Muslims disagreed with Hoodbhoy's argument that science and Islam can not be reconciled, it was accepted as pointing to a truth about the current conditions of science.

Further, I argue with Hayden White (1981) that there is a historically constructed distinction between narrative and discourse. In the instance of discourse there is an "ego" whose presence generates the
subjectivity of the discourse. However, in the instance of narrative, there is an absence of reference to the narrator and existence of an order in the story in which events "speak for themselves." Thus while discourse is treated as subjective, narratives are treated as objective. In interpreting Hoodbhoy's work on Islam and science, I argue that his book was treated as a subjective discourse and the narrativity was overlooked. I illustrate this by situating his book in a series of speech acts which, like Hoodbhoy himself, through their performativity, are trying to make sense of the Pakistani situation.

In a review of the book, a Pakistani professor of communication Sohail Inayatullah pays attention to the communicative aspect of doing science, Islamic science in particular, which illustrate the connection between the narrativity of Hoodbhoy's work and its discursivity. Inayatullah pays attention to topological aspects of the debates on Islamic science, that is he recognizes that the commentaries on this debate have situational aspects. He says, "While there have been numerous criticisms of Hoodbhoy, at the same time we need to understand the social structure that he resides in. What critics of Hoodbhoy fail to point out is that thousands of student are indeed denied chemistry books in Pakistan because the Muslim clergy believe that science as currently practiced is harmful. In fact, former president Zia al-Haq of Pakistan had agreed that all science books would have to be rewritten so that all formulae would have a note
after them saying, "by the will of Allah!" (Inayatullah 1996, p. 337) He goes on to mention some of what he calls the problem of structure, which I will address further below.

I have argued that Hoodbhoy's book can be seen as a set of speech acts that are addressed to various situations. And yet in addition, these speech acts, because of local/global context of Hoodbhoy's text, have been mobilized by others in different modalities to play different roles such as discursive and historical analyses. In the next section I will examine three other review's of Hoodbhoy's work. I lay these out in some detail not only to reveal some of the texture and content of the debates on Islam and science and the reactions that Hoodbhoy's work has engendered, but also to show that these responses operate as speech acts in the debate as well. These reviews have focused on the content and assumptions of Hoodbhoy's work. In doing so, they have taken the book in its discursive rather than narrative terms. In the section that follows the review articles, I introduce some ethnographic work as a way of situating Hoodbhoy's book in a social, and through it, narrative, context.

The Discursivity of Hoodbhoy's Text

Hoodbhoy's book can be read as a response to the call for the Islamization of knowledge and science. In his interview with me he situates
his book in a particular time and space, namely Zia's era. Despite this situatedness in contemporary events, critics have focus instead on the historical, logical and critical consistency of his text. The critics I focus on below all come from within Western academic discourse and treat Hoodbhoy's book within the context of Islamic history.

For example, Butt reviews Hoodbhoy's book as an uncritical text in defense of the "value-free" nature of modern science. Butt's review illustrates a critique that focuses on the formal-logicality of Hoodbhoy's text. He calls it "disingenuously selective," because by "concentrating on the issue of "progress in science," he ignores the revolutionary implication of Kuhn's insight, namely that the greatest value in science is consensus. Thus, it is not only in the context of scientific discovery but also in that of theory justification that non-quantifiable human values and emotions play a crucial part." (Butt 1992, p. 954) Butt not only judges Hoodbhoy's argument by its formal-logicality but also by using Kuhns' assertions about consensus in science as an authorial reference. (Such an authorial use of Kuhn is not adequate since science studies have rendered Kuhn's assertion insufficient.) Furthermore, Butt understands Hoodbhoy's position as: "in castigating the concept of Islamic science, Hoodbhoy, speaks as if modern science -- the handmaiden of capitalism -- functions on a clear and universally recognized set of principles. However, as is well known, there does not exist, indeed has never existed, any universally recognized model
of science... For a Muslim at least, Hoodbhoy has failed to prove his point about the universality of "secular" science." (ibid., p. 955) Butt reviews Hoodbhoy's book in the light of recent discussion on science studies in the West and advises Hoodbhoy to familiarize himself with this literature.

Secondly, in evaluating Hoodbhoy's *Islam and Science*, Dallal calls it positivistic and historically inaccurate. Dallal argues that Hoodbhoy's understanding of certain events in Islamic history takes the Orientalist construction of these histories as truth. Dallal asserts, on the one hand, that Hoodbhoy argues that Orientalism has been the cause of confusion among Muslims: "In discussing the slow development of science and modernism in Islamic countries, Hoodbhoy argues that the Orientalist notions of Islamic fatalism caused Muslims to confuse "all critical scholarship...with malevolent scholarship." " (Dallal 1993, p. 175) Dallal suggests that Hoodbhoy uses this argument to say that Muslim fundamentalism is about a reaction to this "Islamic fatalism." Dallal argues that Hoodbhoy, in this manner, puts all Islamists in the same bag. On the other hand, Dallal suggests that Hoodbhoy himself uses the Orientalist notions to argue for a particular interpretation of Mu'tazilites, a school of theological science or *ilm-ul-kalam* founded in the 8th century, as rational free thinkers who provided the only promising moment of Islamic history from the standpoint of the possibilities of science. He charges that Hoodbhoy is taking these interpretations for granted, to use for his own ideological
purposes. Indeed, Dallal convincingly points at the fact that this notion of Mu'tazalites as rational free thinkers was developed by 19th century “German positivists” and “French evolutionary Orientalists,” such as Spitta, Von Kremer, and Sacy, and argues that this notion is therefore questionable.

Finally, Ahmed is also concerned with Hoodbhoy's use of history. Ahmad asserts that Hoodbhoy “fails to appreciate the understanding of the relationship of science to religion that is emerging in the reconstructionist wing of the Islamic revival. This puts limits on this otherwise outstanding book.” (Ahmed 1993) Ahmed also examines Hoodbhoy's effort to prove the universality of science, an effort he sees as based on a series of mistakes. Ahmed points to Hoodbhoy's uses of the triumph of Asharite doctrine or the failure of Marxism as ways to argue against any ideologically-based science in general as unfounded. Furthermore, Ahmed shows another unfounded assertion in Hoodbhoy's book and that is the fact that he treats “the scientific revolution” as a thing that did not happen in the Islamic world: “What is commonly called the “scientific revolution” was not so much a revolution in science as the revolutionary impact which modern science had on Western Europe.” (ibid., p. 134) Ahmed concludes that “the real source of the fall of Islamic science was the “closing of the door to ijtihad (independent judgment).” (ibid., p. 135)
While at some level these critiques are valid, they do not address the intentionality of Hoodbhoy's effort. Hoodbhoy's *Islam and Science* is highly polemical in that, while not a historical book, he uses his historical understanding to argue against certain activities that involve science and technology in Pakistan. In addition, I would like suggest that the narratives that Hoodbhoy's selects to construct his polemical argument, however Orientalist or positivistic, gain their strength not from their own internal consistency but from the failure of other narratives to fulfill their own prophecies. This needs to be understood in terms of the performativity of the narratives.

**Hoodbhoy's Text in Ethnographic Contexts**

The Hoodbhoy affair is anthropological in the sense that Hayden White talks about the narrativity of discourse or in the way Victor Turner (Turner 1981) argues for the performativity of narrative. Turner argues that in the moment of crisis, where new cultural meanings are competing, the producers and actors of these meanings engage in looking back into the past as a source of reflexive evaluation. I am suggesting that Hoodbhoy's work must be read in the context where the narrative of modernity is being contested and new cultural meanings are emerging. In this section I use
ethnographic accounts of the relation of Islam and modernity in Pakistan to show the context of this social drama.

I include accounts written by an ethnographer, a political scientist, and a historian to provide a grounding to understand something of what has gone on in Pakistan in the past couple of decades. However, it is important to recognize that these accounts themselves use certain discursive models to talk about these contexts and can also be used as speech acts. First I review the work of Katherine Ewing (1997) on modernity, psychoanalysis, and Islam, then Seyyed Vali Reza Nasr's (1994) book on the Jama'at-i Islami in Pakistan and lastly, Jamal Malik's (1996) work on the dissolution of traditional institutions in Pakistan.

Katherine Ewing's *Arguing Sainthood: Modernity, Psychoanalysis and Islam* (1997) concerns the gaining of prominence of sufi masters (*pirs*) in the context where the dichotomy of modernity and tradition was imposed on South Asia by colonial powers. She uses a psychoanalytic frame to situate this prominence as a subjectivity that needs to be understood in the context of this dichotomization.

Ewing is interested in the ways in which different administrations have tried to incarnate Islam in different political bodies. The net effect of the imposition of the dichotomy of modernity and tradition by colonial powers was to get rid of traditional practices and conventions which were associated with ignorance and superstition. She further argues that this was
possible through "hegemony," that is, a historical set of premises that are taken for granted and are practiced as natural in conducting everyday life and politics. For example, pirs have been understood by both reformists Muslims and modernists as landholding, superstitious, and exploitative -- a view that has prevailed as a part of everyday ideology. Ewing shows how from the death of Mohammad Iqbal, a poet and writer who inspired the mobilization of the Muslim community in the Indian subcontinent, to the creation of Pakistan in 1947, the modernist-traditionalist dichotomy has caused the exclusion of the mullahs and pirs from the enlightenment and progress of society. In 1959, Javid Iqbal, the son of Mohammad Iqbal, attacked the sufis and mullahs and called for taking control of auqaf (religious endowments) by the government. This was adopted under the administration of Ayub Khan in 1959 and became a political signifier to change the structure of the ulama and pirs in Pakistan. From then on all subsequent governments distinguished between the original saints and the their families, the sajjada nishin, attacking the latter. Reference to the saints became a way of reshaping the day's political agenda and excluding the sajjada nishins. Zulfikar Ali Bhutto, for instance, tried to draw on "Islamic socialism" which he attributed to a saint, Data Ganj Bakhsh. These rhetorical strategies continued to the days of Zia al-Haq. With Zia, however, the political culture had changed enough that he was able to launch an Islamization project without recourse to this rhetorical style.
At the theoretical level, Ewing is trying to explain the survival of pirs through a Lacanian psychoanalytical model. Ewing shows that despite these Islamization attempts, which are affected by the ideology of the tradition-modernity split, the life world of sainthood is situationally determined. She suggests that pirs have manipulated the signifiers that were supposed to marginalize them into a particular relationship to their followers. In her psychoanalytical interpretation, pirs not only become the other of the master signifier of the symbolic structure, but also of the many other signifiers at play.

Ewing's assertion about the pirs being the marginals of the modernity-tradition dyad, who become the sources of other identity formations, resonates with Hoodbhoy's marginality after the creation of Pakistan. As a scientist, he himself is not marginal but he remembers his family's past: As Sindhis and Ismaili's they did not fair well after the creation of Pakistan. However, he did not want to lose his Hindu friends. As a young man, before he left religious practice altogether and entered the world of science, he tried to overcome this marginality by going to a Sunni mosque as he thought this is a more appropriate milieu to overcome a sense of marginality. Hoodbhoy's admiration of Abdus Salam also reveals his concerns for a perceived marginalization. He points to Abdus Salam's status as a minority (Ahmadiyya) fighting against marginalization in his country,
as well as his concerns for the marginality of the Islamic world in the world of science.

Ewing's discursive model becomes a way of interpreting events in which Hoodbhoy and his book participate. This discursive model, built on ethnographic interpretations and affording a narrative understanding of the context, allows one to ask different kinds of questions from those above framed by formal-logical or historical models. Why does he, as a scientist and a member of a community that is hardly marginal, seem to be concerned about a perceived marginalization? To what extent does his "positivistic" ideology in science act as a safeguard against this perceived marginality? And to what extent might this stance be interpreted in relation to others in the symbolic structure as source of identity formation, as Ewing might say about the pirs?

The mobilizing factor of ideology has been explored in Seyyed Vali Reza Nasr's work (1994) on an Islamist group in Pakistan, the Jama'at-i Islami. Nasr is concerned with the institutionalizing power of political movements. The Jama'at-Islami is one of the most important Islamist group in South Asia. Mawlana Mawdudi (1903-1979), the founder of the group, was able to use a neo-communaterian platform to mobilize a large constituency for political action. Nasr, in detailed ethnographic work, shows how this group has gone through changes, from the early neo-communaterian attempts, to becoming an important player for politicizing
Pakistanis, and finally, in the end, to failing to catch up with the changes which it helped to induce in Pakistan. For Nasr this failure lies in the inability of the movement to transform the mobilizing energy to democratic institutions. Moreover, Jama'at has failed to translate the revolutionary themes to actual bottom up changes. In fact these failures have led to the appropriation of these revolutionary rhetorics by other groups, as well as Zia, for their own political ends.

Although Nasr sees the positive side and the mobilizing effect that Islamic idioms have played in the advancement of the Jama'at-i Islami, he points at their failure to create democratic institutions. A similar rhetoric of failure was picked up by Hoodbhoy as well in reaction to Abdus Salam. He claimed that Abdus Salam failed to clarify his position regarding religion and science and thus created confusion in scientific development. Playing with the idea of Islamic science for a time, as a believer, Abdus Salam saw the connection between science and religion but as a scientist he thought they occupied different realms (Singh 1992). Hoodbhoy argues that he muddied the waters with his allusions to the medieval Islamic past in his Nobel Prize winning acceptance speech. Hoodbhoy argues further that the fact that Salam often emphasized the importance of Islam in inspiring his scientific work was not helpful either.

The appropriation of Islamic idioms is the source of anxiety for both Nasr and Hoodbhoy because it signifies a form of an ideological power
structure. Both Nasr and Hoodbhoy use the rhetoric of failure to argue that because Jama'at-Islami, in Nasr's case, or Abdus Salam, in Hoodbhoy's case, did not achieve their claims, their initial claims for change are questionable. Rather than using the rhetoric of failure to argue against the potential of idioms, I argue for a critical ethnography to show the institutional and social transformations that have taken place in the context of larger discursive frames. The point is not to understand the changes against their ideological claims, but rather in terms of the discursive changes that have taken place. This potentially provides a reflexive way of understanding enactments of idioms, which I will demonstrate below.

From another direction, Jamal Malik (1996) writes about the dissolution of traditional institutions in Pakistan. He resonates with both Ewing and Nasr in that Malik also shows that the dyad of tradition-modernity has remained unchanged. However, he is particularly interested in post-colonial attempts to re-institute what were considered dying traditional institutions. "Islamization" is what characterizes this reinstituting movement. Malik investigates three bodies of traditional institutions, *auqaf* (Islamic endowments), *zakat* system (taxes), and *madaris* (traditional education). He ties the reinstitution of these bodies to the state investing power in them, to the labor market, and to social and cultural diversity of Pakistan. The state has invested in Islamization as a tool for integrating new societal changes into the post-colonial state. For example,
as regards to the way this was done through the labor market, graduates of
the new madaris have been absorbed into governmental bodies without
changing the status quo, traditional schools remain inferior to the secular
one. Furthermore, Malik shows that all Muslim groups are not the
beneficiaries of a system such as zakat, since the government has used it as
a political tool to integrate groups that are more conformist against others,
inducing a greater potential for violence. The beneficiaries of the zakat
money are more often in urban areas than in rural areas, and therefore the
welfare system that zakat have promised has not been as successful as it
could have been.

Malik characterizes the Islamization process in Pakistan as a
preoccupation of Muslim fundamentalists that use the state apparatus for
ideological purposes to reclaim tradition. Malik demonstrates that the
appropriation of "Islamization" by the state has kept the quality of
traditional schools "inferior" and that there has been a decline in the
competence and quality of the bureaucracy and state apparatus, thus reflects
an overall change for the worse. This resonates with Hoodbhoy's concerns
about the appropriation of Islamic science as an ideological and top-down
process, referred to in the introduction of this dissertation as a kind of
Lysenkoism. In his book, as well as his interview with me, Hoodbhoy
ridicules "bizarre" theories of Islamic science. He gives the example, for
instance, of a senior director of the Pakistan Atomic Energy Commission
who spoke of solving the energy problems by extracting energy from the fire of *jinns*. He retells these kinds of examples as representative of Islamic science, displaying his own clearly ideological stance.

**Conclusion: Performativity of the Hoodbhoy Affair in the Making of Technoscientific Identities**

In this chapter I have argued for the narrativity of Hoodbhoy's discourse by showing how critics such as Butts, Dallal and Ahmed do not address the ways in which Hoodbhoy's book participates in the event of making technoscientific identities. I then worked through three ethnographies, by Nasr, Ewing, and Malik, that consider the dichotomy of modernity and tradition in the changing context of political, spiritual, and institutional life-worlds in order to illustrate a possible context for the narrativity of Hoodbhoy's work. These ethnographies are themselves based on certain discursive frames to address their topics. Both the work of critics and the work of ethnographers, in fact, have the capacity to abstract, to become detached from the lifeworld they intend to address, thus leaving an excess unaccounted for. As I argued in the introduction of this dissertation, in the global context, this capacity to abstraction -- in the form of academic texts or technology -- frames the negotiation of technoscientific identities occurring at the local level. I am also arguing
that this capacity to abstraction leaves other specters at play. Hoodbhoy's attempt to totalize a form of understanding is precisely an example his ideological fear of difference, of other ways of searching for technoscientific identity. And yet at the same time, his views play a function of truth-telling about events in Pakistan, as a specter that points at the lack of capability of other competing discourses to reveal certain understandings.

The performativity of Hoodbhoy's book lies in these various realms of locally produced languages that are connected to other linguistic processes. These are all forms of entextualization, in Silverstein's sense. The critics of Hoodbhoy's book ignore these ethnographic understandings, and by doing so they produce a kind of knowledge that can generate more violence since it effaces the condition in which it was produced. I have tried to mediate between different speech acts that have global and local modalities but that speak to the dynamics of the local. In this case Hoodbhoy's "positivistic" ideology of science is understood as a speech act in the performative landscape where technoscientific identities are being contested through an interaction between actors and institutions.

Interview
This interview was held in August of 1995 at the Center for Theoretical Physics at MIT. Dr. Pervez Hoodbhoy visits this center during the summers. I have met with Hoodbhoy in several occasions between 1995 and 1998, in addition to this interview. He also regularly spends time at CERN (Conseil européen pour la recherche nucléaire) as well as at Abdus Salam's international center for research in physics in Trieste, Italy.

ML: First, I want to start with a question on your family history, background... How do you describe your family history?

PH: My father was a trader before his business collapsed and he chose to retire. Like my grandfather, he traded in wool and goat hair -- buying this from shepherds, having it cleaned and packed into bales, and then shipped overseas. My grandfather was a prosperous man and a devout follower of the Aga Khan but, like other prosperous men of his time, he was quite illiterate. He had 16 children. None of my 5 aunts went to school. However by standards of his time my father, who was the youngest of the 11 brothers, was well educated. He won a Bachelor of Arts degree, and believed that education was something important. My uncles valued money and property over education, and so their children did not go to good schools or receive encouragement to study further. So, in spite of the fact that he had gone through very difficult financial times, he put us through
school. When I finished high school then it was time to do something. In Pakistan the universities have always been in a very bad state. There was no question of my being able to go overseas with money provided by my father, because those were bad financial times, he owed much money to creditors... We were afraid that the house we had always lived in would also be taken away from us.

ML: What year was it?

PH: This was 1967. In 1965 his business had collapsed. We lived in quite bad circumstances, which would have been worse had my elder brother not been in the US and supported the family in these difficult times. Then in 1968 I graduated from school. It was at that time that I applied to several universities, in particular to MIT and Cornell. On the basis of SAT scores they were willing to give me a partial scholarship which I accepted! That scholarship covered about one fourth of my total expenses. I made up the rest by working part-time in the MIT cafeterias, doing odd-jobs, fixing domestic appliances -- every kind of job under the sun. It was not easy, especially since I was extremely homesick and desperate to go back home as soon as possible. So I took almost double the usual course load. It was not easy!
ML: What part of Pakistan does your family come from?

PH: My family is Sindhi, although all my life I had lived in Karachi before coming to the US. My parents, however did not want us to be ethnic Sindhi, who they considered to be backward, so we spoke Urdu at home. That was, I suppose, the mark of those times. Sindhis today are much more nationalistic and their children speak Sindhi at home.

ML: What about religion?

PH: By birth I am an Ismaili. Ismailis are followers of the Aga Khan, who is the spiritual leader of this brand of Islam which originates from Hazrat Ali. But I was only 12 years old when the contradictions of this religion became glaringly obvious to me. So I started following standard Sunni Muslim practices such as going to a Sunni mosque for prayers, fasting, and so on. This lasted a couple of years, and that was about the time that I started reading a lot -- the works of Bertand Russell and Bernard Shaw. These had a very profound influence upon me and made me very skeptical of dogma.

ML: Were your parents upset?
PH: My parents were very open. They considered religion to be a private matter. Although, they are quietly religious, they've never tried to impose their religion on their children.

ML: How many brothers and sisters do you have?

PH: I have one brother and three sisters.

ML: Do they all live in Pakistan?

PH: They are all in Karachi in fact. I am the only person away from Karachi.

ML: Were you the only child who came to the US?

PH: No. My brother and two sisters came and one sister did not. However, they've all returned to Karachi.

ML: What were some of the historical events by the time you were graduating from high school?
PH: That was the time when General Ayub Khan had appointed himself as dictator after seizing power in a coup in 1958. I vividly remember the demonstrations and agitation against him in 1968 when he was forced to relinquish power. That was the last year of high school for me.

ML: After that...

PH: He was succeeded by General Yahya Khan and then subsequently Bhutto. There was the carnage in East Pakistan....

ML: Did your parents migrate after the creation of Pakistan?

PH: No. My parents, as I said earlier, are Sindhi and the province of Sind belongs to what is Pakistan today. My father and mother are from near the city of Hyderabad and are very much indigenous to the area.

ML: What did they feel when Pakistan was created at the time?

PH: Like many Sindhis my father was not enthused, especially since he had a lot of Hindu friends. He was extremely sorry to lose them. However, this was and is a minority sentiment in Pakistan. Muslims wanted a separate state for themselves.
ML: In terms of education what have your siblings studied?

PH: My brother is a computer engineer, my eldest sister is a doctor, the second one is an environmentalist, and the youngest sister is a journalist who works for a big newspaper in Karachi called Dawn.

ML: So when you came to the US that was 1969, a year of social crisis, the Vietnam war...

PH: When I came I was like most young Pakistanis of my age with no particular political or social consciousness. Two things struck me very hard and eventually caused me to become a very different person. One was the alienation I felt from my surroundings, and the difficulty I had with the American way of life. The other thing which profoundly influenced me was the spirit of revolt of those times. I was amazed and awed to see the people of a country protesting their own government's actions overseas. Through their protests I became aware of what atrocities the Americans were committing in Vietnam, and soon I joined in with them. I took part in several actions here at MIT, including sit-ins and building occupations. Also at this time Bangladesh came into being through a very bloody and protracted civil war in which the Pakistan Army had committed
unspeakable atrocities. Looking from a distance at my own country I could see we were behaving in a barbaric manner, and could also see that people in West Pakistan were quiet about the horrors. They appeared unwilling to accept the facts. This was extremely painful to me and made me an outspoken radical. I felt that change simply had to take place now. At this time I got into Marxism, the voice of social discontent of those times. I found it thrilling. I made up my mind to leave the US, go back to my country, and work for the Revolution. So, when I finished in 1973...

ML: That was your B.A.

PH: Well I got two B.S.s and an M.S. I was taking courses all the time because I wanted to learn so many new things and felt very attracted by this treasure of learning that exists at MIT. In the process, I earned enough credits to get these degrees.

ML: What were your degrees in?

PH: I got a bachelor's in mathematics, a bachelor's in electrical engineering, and a master's in physics. The master's in physics was useful because it enabled me to get a job as soon as I went back to Pakistan - in fact I had applied for it from here. But at that time to me the most
important thing was to work for the Revolution. I found myself engaged in a lot of things over there -- educating people in a village, running a Marxist study group for workers in a factory, fighting the university administration on a variety of issues. In the process I met my wife-to-be, Hajra Ahmed. I continued in this way for two years but then I felt the urge to get into academics in a serious way. So I applied to graduate school, again at MIT, and came back here to spend another 3 years. My wife accompanied me this time. Immediately after getting my Ph.D, I returned to Islamabad and started teaching again. Politically, things had changed a lot. Mr. Bhutto had been forcefully deposed and General Zia had taken control over the country. There was a complete disappearance of the right to speak and I soon became involved in an underground group opposed to the military regime.

ML: How much did your thinking change with time?

PH: With time there was a steady evolution -- I started out as a fairly radical Marxist but with time that became tempered by experience and I became more moderate. But I remained a Marxist for a very long time.

ML: Did your study group have any specific orientation at the time, like pro-Soviet or Chinese.
PH: No. It was neither Chinese nor Russian. It was not a doctrinaire group in that sense.

ML: Were the participants mostly intellectuals and academics?

PH: Yes. People from the university, but also workers and trade union people. Then with General Zia's coming the trade unions went underground. Political activity was banned.

ML: How did the Left change in Pakistan?

PH: The Left was always dogmatic. It spent as much energy fighting others in the movement as in fighting the state. There was a great deal of confusion about which was the true party of the Revolution. Groups were constantly splitting into pro this and anti-that... So, in real terms the Left never amounted for very much in Pakistan which is why it was so easily suppressed and broken. The real gains it had made were during the Bhutto period because he has declared himself to be a socialist -- which he initially was before he succumbed to his megalomaniac fantasies.

ML: How and when did you get interested in physics?
PH: I had not come to MIT thinking that I would study physics. I liked it a great deal, and while at school I had spent a lot of time building radio sets and various electronic devices. I had, in fact, a little repair shop where I fixed radios and appliances and made a bit of money off that. However, I came to the US thinking that I would be an engineer. I had some idealistic and completely wrong notions of what engineering was about. Instead, at MIT I became enchanted with the power and beauty of mathematics and physics. Among those who inspired such thoughts in me, I shall name Philip Morrison for whom physics was a passion. Ultimately, I found myself sharing this feeling.

ML: In physics how did the trajectory go, what kind of problems did you work upon?

PH: Well for my masters thesis I worked on a problem in solid state physics. It had to do with amorphous semi-conductors. But that's not where my heart really was. I wanted to learn more theoretical things. When I returned to MIT for my Ph.D, I started working in nuclear physics which I found somewhat more satisfying.

ML: What year was that?
PH: That was in 1975.

ML: How was it satisfying and at that time where was nuclear physics?

PH: I worked on a formalism for treating the dynamics of colliding nuclei. It wasn't a fundamental problem, but it kept me occupied and was considered important at that time. But science moves on very fast these days and I don't think people are much concerned with this particular aspect of nuclear physics any more. In retrospect I would have liked to do something more theoretical like particle physics or perhaps cosmology.

ML: I am actually trying to understand how you got involved in your projects.

PH: I had taken a couple of courses from an MIT professor, John Negele, and had quite liked his teaching style. He was one of the originators of the time-dependent Hartree-Fock method for treating colliding nuclei. So I had decided to work for him. It was a fairly exciting thing to be working on at that time.
ML: Now, going back to Pakistan, what is, briefly, the history of the nuclear industry and how do you relate to that?

PH: I don't relate to that at all. My work is entirely to do with the structure of matter, not any engineering applications. In Pakistan there is an atomic energy commission, and it is responsible for maintaining the 2 nuclear reactors in the country. But there's not much research.

ML: Are you part of the Commission?

PH: No. I have nothing do with the Commission.

ML: Is your current research a continuation of your Ph.D. work?

PH: Not at all. With time one develops new interests. My interest moved away from nuclear physics towards particle theory. This is much more interesting. As for specific areas of research, science seeks its own problems, raises its own questions, and then seeks to address them, using the best tools that are available at a given time. And so scientists move on to new problems all the time.
ML: We were talking about the internationalization of science; maybe at the micro level. How can you describe your own milieu in Pakistan as well as here?

PH: In Pakistan I face total scientific isolation. There is not a single person with whom I can meaningfully discuss a scientific problem. The only way for me to break this isolation is to periodically to come to the US or Europe and take advantage of the new literature, resources, etc. and above all to interact with people -- discuss new problems and ways of addressing them. This last is the most crucial, the human interaction.

ML: If you said that to a Western academic he would say that academics always work in isolation. What you are saying that is this different?

PH: It is more than geographical isolation. In Pakistan, academic achievement is valued very little. It is not understood or respected. The kind of atmosphere that you need for scientific investigation simply does not exist. The universities are not really institutions of learning or research.

ML: Are all developing countries like this in your opinion?
PH: No, Pakistan is a special case. Some developing countries, like India, have broken through the barrier and have substantial number of scientists who do interact with each other. They have more than a critical mass at this point.

ML: Well because of time constraints I would like to move ahead. I want to bring up the issue of Islamic science. How did you get involved in it?

PH: It was very hard not to be drawn into it. After General Zia had seized power and declared that he had come to save Islam, you could see these Islamic scientists parading before us with the most bizarre theories of "Islamic Science", making their claims to fame and promotions on those grounds. Many of these theories were absurd to the point that you could have a good laugh ... Like a senior director of the Pakistan Atomic Energy Commission, turned Islamic scientist, who suggested that the country's energy problems could be solved by extracting energy from the fire of jinns. In my book Islam and Science I give many other documented examples of such absurdities. Other than this insane element among "Islamic Scientists", there is another which is more dangerous for society and progress. This one claims that everything is to be found in the Quran - not just ethics and law, but also science and everything that human society needs. I consider this to be false, and its acceptance can have no effect other
than to move society back into medieval times. Solutions to the problems of a modern society cannot be sought by looking back into tribal societies unenlightened by centuries of human development.

ML: Would it be right to say that your interest came after these centers of Islamic science came into being and you were responding to them in Pakistan?

PH: Yes. You see what happened... The Islamization of knowledge and science in Pakistan was a corollary to General Zia's establishment as the Islamic dictator in Pakistan.

ML: Which was around...?

PH: He seized power in 1979, hung Bhutto, took over as chief marshal administrator, declared democracy dissolved. Indeed, democracy became a dirty word and he sought to redefine Pakistan not as a state where Muslims live but, rather as an Islamic state where laws would hence be those specified by the Quran, supplemented by the Hadith. This tribal primitivism led us to such a state of deprivation of human rights it was important to protest in whatever way possible.
ML: Your book was published after Zia was dead.

PH: I wrote and lectured on the subject while Zia was very much around. In fact my book was largely written during his life -- one didn't know if and when he was to go!

ML: There are various people who are interested in Islamic science of some sort. I am talking of those who were in the West, say [Seyyed Hossein] Nasr the Iranian scholar, and Ziauddin Sardar who is a journalist. They have different views, and I understand in your book you have addressed this. What do you say about this?

PH: First of all I don't consider Nasr or Sardar to speak for any kind of science. They know no science, having never practiced it. Perhaps they have studied some aspect of the history of science but that does not make them aware of the way science functions. Therefore they may well have views, but that may have nothing to do with scientific reality. However, the very fact that such opinions have gained popularity among Muslims is a reflection of how many Muslims in recent times have reacted against progress, and how science is being perceived as a force against religion.

ML: Are science and religion antithetical?
PH: Whether science is against religion or not depends on one's point of view. But science and doctrinaire religion are definitely incompatible. So is the notion of a personal god.

ML: The title of your book contains the phrase "Battle for Rationality". Can you comment?

PH: Yes. In Pakistan, as in some other Islamic countries, we have a situation where the majority of people in the society have not been exposed to liberal, rational ideas, or understood the power of reason. Many have studied in madrassahs (religious seminaries) or received no education at all. Mullahs are ignorant of what science is and how it functions, although they will use the products of science without reluctance. Centuries of human development have simply passed them by, leaving them ensconced in medieval times. As a mechanism of self-protection they rally those forces which will oppose modernity and progress. Hence they must oppose rationality and fight it in their mosques. People like Nasr and Sardar espouse their cause.

ML: Have you ever encountered Nasr or Sardar in person?
PH: No. But they came to Pakistan for a conference organized by the COMSTECH... and I am told that both of them have very nasty things to say about me! But I didn't go to that conference.

ML: But tell me, how did you get to know Professor Abdus Salam? How did he influence you?

PH: I can't say that he influenced my thinking about religion and science because I have a very different perspective from his. He is very staunch believer, as you may know. I first met him in 1972 when I was here at MIT as an undergraduate. Then subsequently I went to Trieste for a brief visit in 1979. I met him again in 1984. At that time I had written a long essay in Urdu seeking an explanation of Pakistan's scientific backwardness, and finding the answer in the religious and cultural milieu. It differed from Salam's writings on the subject totally -- he constantly sought the answer in paucity of resources committed to science. I was surprised that Salam should have liked it. He called me and said I want to talk to you about it. At that time he told me that you are crazy -- it is too dangerous to talk about these things. I think he was wrong because Pakistani society was tolerant enough, at least then, to admit such analyses. I should say that Salam has been attacked not for propagating rational views, but rather because of his affiliation to the Ahmadi faith.
ML: How so?

PH: This sect was excommunicated by an act of Pakistan's National Assembly in 1974 and they are the target of a great deal of persecution. That is why Salam has been effectively persona non grata at our universities. We have never been able to invite him at Quaid Azam University to give a lecture on physics!

ML: Is he in Pakistan?

PH: No. When he was there after receiving the Nobel Prize, many of us at the university in Islamabad wanted to invite him so that he could talk about his work. However, fundamentalist students of the Jamaat-e-Islami never permitted that to happen. They threatened violence if he came, and so he was not invited. Religious bigotry and fanaticism made Salam ineffective in promoting science in Pakistan.

ML: At one point he brought up the issue of Islamic science as well.

PH: Yes, he did. But Salam has muddied the waters considerably on this count. He very ably brought out the contribution of Muslim scientists in
medieval ages. In fact, he began his Nobel acceptance speech with the travel of Michael the Scott to Spain in order to learn from the Muslims. On the other hand he has also frequently emphasized how Islam had been important to him in inspiring his scientific works. Many people have therefore been left confused, thinking that he is advocating Islamic science. In personal encounters with him, I am glad to say that he always came out in a very forthright way saying that let science be science and religion be religion. That's also what he says in the preface to my book. But some of his earlier writings have created a certain amount of confusion in people's minds.

ML: And also his cultural style, I have seen his picture with a turban and costume when he received the Prize. But you say that he was still not accepted in Pakistan?

PH: It is to our eternal shame that we rejected a man of such great scientific brilliance. Also one who created the foremost institution of science for the Third World, the ICTP in Trieste.

ML: How old is Salam?
PH: Around 65. But he is a dying man, suffering from irreversible
degeneration of motor controls and neural disorder. He has lost control of
many normal body functions.

ML: Where is he?

PH: He is in Oxford. He is in a wheelchair, can't speak, can't recognize
anybody.

ML: Well I'd like to finish and not take your time anymore. Can you give a
last commentary on Islamic science?

PH: I think the prerequisite for scientific progress in the Islamic countries
is to let science be science and Islam be Islam, and not allow one to get in
the way of the other. Further, we have to encourage children to think
independently and sharpen their faculties of reasoning, while de-
emphasizing obedience. I see great dangers for Pakistan because our
educational system is one which continues in the old mold. I can only hope
that other Muslim countries will not go the same way. The great Muslim
renaissance that supposedly occurred as a result of the Iranian revolution
should have led to the rebirth of Muslim consciousness. In fact it has not
produced any scholarship or signs of a brighter future. The rebirth of
fundamentalism is another dark chapter in the history of Muslim peoples. Until these forces of darkness are forced to retreat, there shall be little hope of progress.
Chapter Five:

Aporias of Technoscientific Imagination: Cultural Inscriptions

"Sometimes, without noticing it, a narrative, a story, or a poem adds together various forms of knowledge. I would like to give each of these texts the authentic title of unknown masterpiece [chef-d'oeuvre inconnu]: unknowing, rather, because the sciences converge there in a transparency through which the eye passes without seeing anything; just as the colors in a rainbow dissolve in the white limpidity of everyday light, in the same way different forms of knowledge merge in speech that seems banal." (Serres 1997, p. 56)

"Metaphysically, the Third and its law found physics, while linking it to proof, by giving nature its general objectivity, as well as by making natural phenomena function outside the intention of those concerned with, and within the purview of, discourse." (ibid., p. 48)

"...the distance between scientific perspectives and humanistic ones are not necessarily opposed as is so commonly assumed, and that the multiplicity which some people fear as destructive of traditional pieties is not a pandering to irrationalities of postmodern irresponsibility, but on the contrary is ever more a feature of the contemporary condition, of rationality, and of grounded positions of critique that allow understanding (perhaps reconstruction) to advance." (Fischer 1995, p. 74)

Michel Serres argues for the importance of a "third space" in the construction or understanding of knowledge. In Le Tier-Instruit (Serres 1991), he argues that through education and instruction the student is taught in a particular way through which the subject is created. This is a process through which certain points are included and others excluded. He relates the becoming of the scientist as a universal subject to travel -- one picks up 'new knowledge' but one remains the same. The fixity of the
subject is challenged by Serres' concept of the third space where he shows how the subject is always multiple in its construction. He asserts that since any discursive frame, model, or subject works through inclusion and exclusion, then re-imaging other forms must rely not on the representations of those discursive frames or models, but on how and why things are excluded and included, which is the thirdness. That is, we must look not at what science represents but what actual scientists do to accomplish their work.

In the second chapter, I told the story of Bazargan's travel to Europe to attend technical schools. In his return to Iran, he claimed that he had become a stronger believer as a Muslim. That is, he is telling his fellow Muslims that it is possible to become a modern through this travel but remain a Muslim too. Bazargan never tried to give a critical view of the third-space where he reasserted his subjectivity as a Muslim. As I have shown, he used the theory of thermodynamics to show the duplicity of the space, but never was he concerned with his own alterity. For him, the crossing to Europe was aporetic and porous, as opposed to his fellow seculars who thought that they have to become Europeans.

His story is an early to mid-20th century one, where the construction of the scientific community was taking shape under the secular state, where the culture-free, value-free rhetoric of technoscience became hegemonic, requiring that Muslims appropriate what is European and Western and
abandon what was their own. By the 1960s, the kind of techno-
cosmopolitanism (Rabinow 1996) that I attributed to Bazargan was already
old-fashion. The scientific community in the Islamic world became
increasingly integrated into a global community of scientific practice.

Another example of the shifting context of scientific practice can be
seen in the lifeworld of the Nobel Prize winning physicist, Abdus Salam.
Abdus Salam was a devout Muslim who often spoke of the importance of
his faith in his science. But by the end of his life he asserted that science
and religion should not be mixed. Muslim activists today criticize him for
not being able to reconcile Islam and science or advocate Islamic science.
(But they ignore the fact that Abdus Salam, as a member of Ahmadyah
sect, was shunned away from his country, Pakistan.) Abdus Salam used the
money of his Nobel Prize for the cause of third world science. He
instigated the creation of the Institute of Physics in Trieste, Italy, which
eventually became an international center where scientists from third world
countries, including Islamic countries, would get together. This effort now
seems out of place as this center is but one of many places for the practice
of international science.

This chapter will focus on the transnational landscape where
scientists work and live. I have been interested in Muslim scientists who
received their education before and after World War II and who position
themselves in transnational settings and centers of science. The biography
and auto-biography of migrant scientists have shown that the cultural background of scientists has always been part of their creative achievement. Similarly, feminist critiques of science have pointed at gender as an important component of scientific work. And yet these critiques have only focused on Western science. In this chapter I explore the importance of non-Western scientists' culture as part of their work. The question at hand is whether the exploration of this third space, in Serres' sense, or what Rabinow calls, and that I use here, a "third-culture," is an important route to the reinvention of technoscientific identity.

What does it mean to talk about the third-culture ethnographically? In my interview with Cumrun Vafa (1995), he referred to *qias*, a process of induction from empirical facts and a form of Islamic jurisprudence for establishing evidence. Vafa uses this term unselfconsciously, but he uses it in a situation where he tries to break with scientific formalism in order to be able to imagine new ways of thinking about his project. In another case, the Malaysian mathematician, Shaharir (who I referred to in the third chapter) was interested in using the concept of *qias* as a methodological basis for gathering data in Islamic science. Indeed, it is known in the Western history of science that many mathematicians had their early training in theology and casuistry. The third-culture that I am exploring, therefore, is not about the factual possibility of alternative scientific
epistemologies, but rather is about the ways in which this might lead to experimental moments which in turn can lead to new models.

What I call aporetic in the double-vision that Vafa's narrative points at is the fact that non-Western scientists have recourse to their own cultural imaginary to conduct their science. In the last turn of the century, there were many aporetic moments, passages between culture and scientific development in the Islamic countries. By the 1920s the passages were closed off, mainly through the strong ideological separation between what is modern and what is tradition. In this turn of the century there are again indications of new aporetic moments between culture and religion and science.

At a somewhat anecdotal level but as an indicator of this moment, during my fieldwork at MIT and Harvard (1994 to 1998) I have noted a seeming increase in the number of talks, seminars, and conferences held on the relationship between science and spirituality and/or religion. In 1997, for instance, a lecture series entitled "God and Computers" was held at MIT. More generally, there seems to be a resurfacing of interest concerning this relationship. While particular topics have varied, much emphasis has been put on individual scientists' ways, in a cognitive sense of the word, of doing their science. Many scientists themselves have attested to the importance of religion or spirituality to their practice. Scientists from the past are being studied again as to how faith was important in their
work and in what ways there were efforts by the scientific community to erase this connection. There was a lecture series on this topic held as well at MIT, entitled Faith of the Great Scientists (held in 1998).

This resurgence of interest will add to the cataloguing of individual and personal activities of scientists. However it is doubtful that a meaningful attempt to suggest what these experiences might say about scientific discursive practices will emerge from them. As Rabinow (1996) asserted in response to C. P. Snow's *The Two Cultures and the Scientific Revolution*, it is not enough to devote a small percentage of the scientific budget to ethical evaluation of scientific practice. What is needed is to ask in what ways and why scientists do or do not engage in understanding how their work is done, and to show what is left out and why.

Through the cases I present here, I would like to show how experience in a particular field and in transnational spaces are important in scientific development. I argue here that cultural inscription happens at the level of scientists interacting with their milieu which consists of a double-vision and composes the third culture.

**Cultural Inscriptions**

"There are holes in science here [referring to the West]. I think the axiomatic and rigorous situation in science has created a
contradictory situation in science that is against generation of ideas (or imagination)." Cumrun Vafa

I had many conversations with the Iranian physicist, Cumrun Vafa, in his office at Harvard University over the period of 1995-97. In my first interview, Vafa asserted that there is a marked difference of style (the meaning of which I will explore further below) between him and his colleagues. Here I focus on the personal techniques that he uses to overcome the formal rigidities of his scientific discipline. This is particularly interesting in light of the focus of Vafa's work, string theory, a field he became involved in following his graduate work in physics at Princeton University under one of the preeminent researchers in string theory, Dr. Edward Witten. This case is specially interesting because the field of string theory is new and its novelty\(^{10}\) has been associated with blurring the boundaries of authorship and established codes of credit, experiment and theory, and what is "appropriate" as scientific versus what is "just-another-conjecture." This case will show how in this aporia of

\(^{10}\) The question of cognitive style has led philosophers to ponder about how judgements are made, the ways in which scientists include and exclude criteria for reviewing each others work. For instance, Thomas Khun (Nelson and Nelson 1996) argued that scientists use five criteria to guide their judgements to narrow the theoretical choices. These are simplicity, accuracy, breadth of scope, and internal and external consistency. Helen Longino asserts (1996) that these criteria are a matter of philosophical consideration. She argues instead that scientific criteria should be related to community and social values as these values change in time and space. Longino adds other values emergent from feminist discourse: empirical adequacy, novelty, ontological heterogeneity, mutuality of interaction, application to current human needs, and diffusion of power. She calls for an expansion of scientific values as they are social constructs and as such they need to be re-evaluated.
novelty, Vafa uses techniques which he calls cultural, and how these techniques provide him with a creative environment.

In science studies, style is used to refer to the formats and conventions of scientific communication in general, such as in report writing or article writing. Style is construed to be part of the tools of creating the scientific community. Individual style, however, is different in that it includes psychological, spiritual, and cultural traits. As Persian was the language of our conversations, I translated salighe to "style" in English, but it also means "taste." In our conversation, this aesthetic meaning of salighe was implicit in Vafa's use of the term, but other meanings were also implicit. In an interview in the Iranian journal Physik (Bahari 1993), for instance, Vafa uses the term, elham, interchangeably to describe his creative thinking process. This word connotes "intuition," "inspiration" and "revelation." When discussed in our conversations, Vafa asserted that all of these meanings are relevant: intuition is longer lasting, whereas there are times that something sparks and that can be called inspiration or revelation. My interest here is not so much on the semantics of these words, but rather on the space of negotiation and translation. The act of translation occurs in a situated context, namely, what I call "cultural inscriptions" and what Vafa refers to as "discipline."
Mazyar (M): You have mentioned that you have some difference in opinion methodologically with your colleagues?

Cumrun (C): When I say there is some difference between me and them, it means as a non-Western physicist. It is from that sense, not because of scientific difference. It is a difference in taste or style [salighe]. For someone like me, many ideas are taken seriously as they first appear. And this helps a lot in terms of developing our thoughts. For many physicists here this exists but to a certain degree they try to suppress them. If they have a strong sense about some idea, it is secondary to what they actually have to do to prove it. I think “Eastern” sciences, or what I sense of Eastern culture, allows people to take seriously their strong feelings about something. At least in my case this seriousness has helped me a lot in my work. But, at the same time, it has created difficulty when I want to explain to my colleagues that strong feeling or sense about something!

**Personal Experiences**

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11 These excerpts from my interviews with Vaфа, and all those that follow, are my translations from Persian.
The formalization of scientific styles and method can be seen to create certain barriers to scientists' imaginaries. The question then becomes how to overcome these barriers. Michael Polanyi points to a kind of passionate activity to experience breaking out of a heuristic. "The most radical manifestation of this urge to break through all fixed conceptual frameworks is the act of ecstatic vision. When we abandon ourselves to the contemplation of the stars we attend to them with great interest but without thinking about them..." (Polanyi 1962, pp. 196-197) The mind experiences the content of an intuition rather than controlling it by method. That state involves pondering on the tacit component of science, according to Polanyi. It is living between "the practice of hackneyed exercises on the one hand and the heuristic visions of the lonely discoverer on the other." (ibid., p. 195)

In one of our conversations, I asked Vafa to comment on the possibility of a completely different way of doing science.

C: I disagree with the issue (massaleh). It is possible to commensurate the Western and Eastern science. I am a melange of these two. I think of myself as an Easterner/Westerner (sharqil/gharbi) in the first place. However, I learned Western science. I don't believe these are so different from one another that one cannot commensurate (talfiq dadan). Always the most beautiful
things come from combining different cultures. One should never separate things artificially. I believe that, concerning science and culture, this applies: Western science and Eastern culture must mix up in order to come up with something more beautiful. I, as a sharqi, am lucky that I come from another culture. As a consequence I have two point of views. Here, they have one foundation, I have two. If I can help the sciences, it may be very little and may come from the fact that I have a different culture which may not have been exposed to the Western discourse. I may be a source of new ideas, etc. But if there were other Iranians, similar to one another...[then maybe there could have been more]. But there aren't. I feel I am alone. Not only am I working in Western science but also as an Easterner I am a representative of something Eastern that I can bring up in a Western frame. This way of thinking is very important for me, therefore I don't feel contradictory. The only thing is that when I make a conjecture that is very hard to explain, they might say "he is throwing things out." When I attempt to explain some of my feelings about some of the ideas that I have it is often very hard to explain them in tangible examples and this creates some tension [contradiction]. That non-tangibility causes them to not be able to figure out how to deal with
me – what are they gonna do with me, kind of thing. This is what creates some friction, but the rest of it is easy.

Vafa suggests a double-vision that is important for his personal way of practicing science. This double-vision is also known in mystical traditions as via negativa, a process by which intellectual control is relaxed, helped by ritual. The ritual provides a process of successive "detachments" where one seeks to see things as a whole. Derrida calls via negativa the process of self-difference which finds itself contested at its roots (Derrida 1995). This state is called "non-event" because it frees itself from language, authority, all narratives, and decision-making processes, all of which create an event. Therefore via negativa is the anatomy of non-event, where decisions cannot be made.

The journey to non-event, however, can be thought of as an act of re-imagining the event. Cumrun Vafa's self-difference is an act of finding himself contested in his own cultural makeup. The index of this activity can be found in additional parts of his narrative where Vafa makes references to such things as "strong feeling," "the importance of depth in Iranian culture," "Iranian students' interest in paradoxes," and "aesthetics as source of imagining new things." This contestation occurs as a remainder — not only have established scientific styles not been able to
erase certain cultural activities, but these activities themselves are necessary for scientific activities.

Vafa asserts that culture is important in nourishing science. Throughout our conversations he uses culture as an unarticulated difference -- he never speaks of culture as anything specific. This unarticulated difference perhaps satisfies his position more than if he were to reflect on the particularities of culture. Perhaps in the world of science this is a "safer" position for him to take. For him, a culture includes philosophical and societal dynamics. Thus one cannot talk about science in a vacuum. Cultural interests are different in different contexts. For example, for Iranian students, as Vafa perceives them, scientific paradoxes are very fascinating, they ponder about these paradoxes at the expense of the practicalities. When they are asked, "where do you want to go with this? they respond, I don't necessarily want to get anywhere, I want to know what the root of this problem is." They are willing to spend more time on this. Is this good for science? he asks. In the West, they no longer focus on these paradoxes, he says. Therefore, in order for Iranian students to learn science, they need to suppress their desire for fulfilling their cognitive style. For instance, if a student is trying to learn quantum mechanics and is interested in theoretical paradoxes, Vafa asserts, there is not even theory to follow out that interest. Everything in quantum mechanics has been concretized. Therefore, for Vafa, learning science
means to be able to perform under such circumstances, to be able to suppress some of one's cultural style in order to learn the language of Western science.

M: A point that you brought up is this Iranian-ness (*farhange irani*), (or however you put it), which gives you the ease and comfort to take your intuitions seriously. How do you see this culture and its effects on you?

C: I don't know. I have told you before that I don't know where its effects come from. It may be my society where I grew up, my town, family, school, the books surrounding me, papers — all these have effected me. How? I don't know. I can't say how my culture is different from an Egyptian. I don't know what is Iranian, what is Eastern (*sharqi*), I only know that we have somethings in common [with each other] and not others. I hope there is not a misunderstanding that we are Martians!

M: If I may now go off track and return to the Alborz [the high school Vafa attending in Iran] days... What kind of effect did they have on you?
C: Everyone, either Westerner or Easterner has some good memories of their childhood, but what I think is relevant here is, you know it too, that what Alborz gave us primarily was a strong discipline, that we should take our work seriously. Also, some sense of not being afraid of competition -- which is rare in us, in an Eastern society, but is very strong in a Western society. In our case, it is very rare that we are encouraged to compete and not to use favoritism. Although this was a bit harsh at Alborz [laughter], in other respects this has encouraged us to follow up and not be afraid of competition. I don't know about comparing it to here, because this is a capitalist society and there is always competition in it. But in Alborz laziness did not exist, and I think that was our luck. At the same time it has taught us -- and I think this is the Eastern side of it -- that we always want to think deeper. We want to know what the essence of things is. We take homologies seriously. The sense of aesthetics in our culture is very strong. In our poetry similes have complex techniques and are very well developed. I can only stress that Alborz has given us a sense of seriousness and hard work, but this seems to be more a Western thing than Eastern.
M: This is an interesting point because in Iran there has been a melange of different systems, German, French, American, and also the local disciplining tradition.

C: Of course, I might have said this wrong, I don't mean that we have no discipline. For instance, consider the maktabis (students at religious schools) and the way they would receive flogs for disciplining. Maybe I mean a kind of discipline where you would develop things. For instance, even if you don't like history, you nevertheless have a personal system that allows you to sit down and take it seriously. In Eastern culture, depth is very important. If you go to the center of the Earth you can be close to all its surface, whereas in the West there is a tendency to move on the surface fast -- maybe this is the simplest analogy.

Vafa narrates his experience of cultural inscription in between East-West. It is in between these categories that his training as a scientist takes place, which is the space of the thirdness that Michel Serres (1991) refers to. This is the space in which training, discipline, and learning take place. Serres argues that this space is geometrically constructed: the center, where education also creates its subject, is at the middle. He asserts that through this geometrical construction of the center, a kind of forgetfulness
of the multiplicity through which it was constructed emerges. This multiplicity is embedded in language, but it is represented as singular. The multiplicity of Vafa's experience shows not only the richness of his becoming a scientist but the importance of this richness to being a good scientist.

*Parallel Example*

In this second case I include an ethnographic clip about an Iranian scientist who alludes to Persian poetry as a way of restoring a continuous relationship between the arts and sciences. Resonating with Vafa's references to an unarticulated culture, in this event a poetic aesthetic is used in addressing an audience primarily composed of engineers.

On December 1, 1994 the Society of Iranian Professionals (SIP) in Houston, Texas, organized a ceremony for Professor Fazllolah Reza, a celebrated Iranian mathematician, a former ambassador, and a poet. The event was part of the annual series of the SIP program in which famous Iranian scholars are honored. The SIP claims to be a non-religious and non-political organization that is dedicated to promote professionalism among Iranians. Indeed at the gathering a slide projector was set up displaying such slogans as "promote technical excellence" and "identify and support Iranian professionals."
Fazlollah Reza is a transnational scholar in both mathematics and Persian literature. At the time of this event he taught at the University of Concordia in Canada. Reza helped promote the Americanization of Iranian technical universities in the late 1960's and early 70's. He was one of the first products of the University of Tehran's technical college. He later went to New York where he received his M.A and Ph.D. in Electrical Engineering at Columbia University and the Polytechnic University of New York. His transnational prominence in mathematics made him a key player in the Iranian scientific community.

The SIP event happened late in Reza's career, and includes a quality of reflection. Mohammad Jamshidi, a professor of electrical engineering and one of the evening's organizers, opened the event and introduced Fazlollah Reza as follows: "He is a Universal Discourse. Universal discourse means that it goes all the way from negative infinity to the positive infinity." Projected from the slide projector was an image of a dim sun setting over a Nordic city. "What you see here is the midnight sun shining over the dark Helsinki." Jamshidi continued: "The reason why I show this slide is because it reminds me of Faz Reza who shone in a country, in a place where people don't know how to spell, in a very, very dark time of the history of Iran. As you know Faz is the first electrical engineer to ever graduate from Iran...."
As part of the introduction of Reza Jamshidi tried to introduce him not only as a specialist, but as someone who is a *roshanfekr* (i.e., enlightened mind). In Persian, *roshanfekr* is not only an engineer or scientists by virtue of his or her job, but is someone who can engage in various intellectual activities, who can think clearly and can have something meaningful to say on all matters.

In his lecture at the event, Reza himself deals with comparisons of poetry and science. Reza compares epic and mystical poetry with "problem solving" in science and abstract science, such as mathematics. He says that epic and lyrical poetry are usually confined to the scene that they are describing, they are "nailed to the earth." In this kind of poetry no abstraction is allowed. In contrast, mystical poetry allows the words to correspond with a range of thoughts. What the mystic poet wants to say is veiled. He goes on to say that from the 18th and 19th centuries on, science has been involved in "problem solving" while abstraction is allowed in mathematical science. He concludes that he prefers in poetry and science the ones that generate more than one meanings.

He calls his poetry "shaer-é nab" which means "unpolluted poetry." "Shaer-é nab" is a poem that is close to nature, it is universal. He equates all other forms of poetry with techné or in Persian *nazm* ("orderly poem"). The relevance of this kind of poetry for scientists and engineers, Reza suggests, comes from the fact that they too are involved in a sort of *nazm,*
performing the tasks of solving a problem by piecing together a solution. If they rise above themselves they can do nab scientific projects. Every poet has good poems, or nab, and they also have nazms (or techné). Reza is suggesting that every scientist should have both as well.

What is the effect of reading poems to an audience of engineers? I am suggesting that Reza uses poetry to construct a rhetorical strategy to define and argue against "bad science." His rhetorical strategy relies on connecting mathematical science and nab poetry, as a critique of problem solving in science. He does so by equating problem solving with pollution and nab with purity. Similar to Vafa's double-vision, I take this example as an instance of what Polanyi calls intellectual passion.

Novelty Effect

Another instance of double-vision has been induced by the aporia of novelty. The novelty of the field of string theory, for instance, has opened up the ground for re-evaluation of scientific practice. Vafa's own sensibility to philosophy and culture is partly due to this opening. String theory has opened up a new way of looking at the objects of physics, raising questions about the way theoretical physics used to look at particles. Peter Galison says of string theory: "Behind the idea of string theory is this conviction: to unify gravitational, nuclear, and electromagnetic physics, it
is necessary to move beyond a world of point particles and quantum field theory. Instead of structureless point particles as basic, string theory has one-dimensional objects (strings) held under enormous tension..."(1995, p. 374) String theorists claim that they might find a "theory of everything" based on a highly mathematical theoretical model. Critics, mostly from the experimentalists side in physics, argue that this highly theoretical field borders with metaphysics and aesthetics. Some string theorist, such as Vafa, agree but do not see that as a problem since there is a lag between the availability of technology to test a theory, and the conception of certain theoretical conjectures.

M: My understanding of string theory is that in it there is more weight given to theory than experiment. Galison has suggested that it is like beauty to truth. This is an important point for me. Could you talk about the differences in physics and theoretical fields with engineering?

C: I don't know how one can talk about intuition in experimental work. I am sure they have their own intuition and should not be taken for granted. It is not mechanical, they have intuitive thinking (fekre hese) that is so important. In our work what is new, or maybe not so new, maybe its importance has gained some attention...
In our field, there is no experimental proof for what we are talking about. It is all about relating whatever we know from the scientific point of view to one another. For example, we know there is gravity, there is quantum mechanics, thus there must be gravitational quantum. One of the results of gravitational quantum is a particle called graviton. Has anyone seen the graviton? No! But no one doubts that there is gravitational quantum. If you were to solve this problem it would give you infinite answers, but from the point of view of string theory, it gives you a reasonable answer. Then one says this is right. Now what has happened? It is this beauty that makes you think that there are two things, you don't believe they are irrelevant. You have gravity, and you have quantum, in order to fit them together, you will search for a new framework, a new foundation. As a result of lack of experiment we need to do this.

M: So, the beginning of it is that, but when experiments have reached the same conclusion...

C: Yes.

M: Therefore, when experimental science reaches the same conclusion...
C: We have no doubts that we are talking about nature and it needs to be testable at some level. The problem is that the technology is not at the level to test things sometimes, not that we don't like it... We are talking about physics not mathematics... We have no recourse but to test whatever we have to say about nature, no matter how beautiful it is. Our ability to test is usually behind. Therefore we need to search for inconsistencies and foundations that can render things reasonable or thinkable and connect them.

M: Therefore testing always lags?

C: Yes. In reality there is purely a technical lag. Unfortunately, the case is usually that technology is not at the stage that we can perform a test.

This novelty effect is another opportunity for the discussion over what science includes and excludes in its approaches and methods to take place. This is another instance of the third-culture where the work of critique and reconstruction can happen.

*Parallel Example*
This ethnographic clip concerns Lotfi Zadeh, the inventor of fuzzy logic. Also Iranian, he is in the same generation as Reza. Zadeh may be more known as a transnational figure because the scope of his research goes beyond the U.S. In fact, he made his name first in Japan, China, and Europe. He has never had any political positions in Iran. His father was a journalist in Soviet Azarbijan. (Indeed, in the 1980s Zadeh himself was known as Soviet, further estranging him in circles of Western science.) But they later move back to Iran, where he attended Alborz High School, then a missionary school, and later, the newly established Tehran University.

I interviewed Zadeh (1996) in 1996 in Berkeley where he works at the Center for Soft Computing, and occasionally teaches. I see two commonalties between his experience as a scientist and Vafa's: the novelty of his theory in terms of opening the ground for rethinking cultural inscriptions, and the question of authorship in cultural inscriptions.

Zadeh was first interested in multi-valued logic. In the 1950s he worked under S. C. Kleene at the Institute of Advanced Studies at Princeton. In 1965 he wrote his now famous paper on fuzzy sets. Since then Zadeh has been strategizing about how to advance fuzzy logic in the market through technological applications.

What is important in this case is the ways in which fuzzy logic, as a newly invented concept, opened the aporia of doing things differently.
This is reflected in the generative effect it had, for instance, on new ways of thinking across multiple disciplines. Though Zadeh himself denies any cultural connotations of his mathematical invention, it has been taken up in a range of fields: from linguistics, where George Lakoff extended the theory to his theory of "hedges" and lead him to his interest in connectionism (Lakoff 1996); to anthropology, where Paul Kay used it to work on a new theory to explain indigenous ways of categorizing colors (Kay 1996); to religious studies where the concept has been used to argue for the relationship of logic to Buddhist thought (Laughlin 1993). It has also lead to different mathematical models of knowledge structure.\(^{12}\)

### Culture and Authorship

What I refer to here as aporetic, that is the passage between event and non-event, often manifests as "strong feeling." The inclusion and exclusion of what is considered scientific fact occurs through the process of authorship. Vafa offers a revealing illustration of this, a story about negotiating the truth with his graduate adviser as a bet. Vafa makes a bet

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\(^{12}\) There are now at least these following competing models of knowledge structures: There are the following architectural structure: Expert Systems (ES), Fuzzy Systems (FS), Neural Networks (NN), Connectionisms (CN) as knowledge structures, and Probabilistic (algorithm), Genetic (algorithm), Genetic programming, and Fuzzy Sets (algorithm) as numerical models. These names refer to either rule-based systems (i.e., knowledge structure) or numerical models. Knowledge structures are representational in that they
with his adviser. The word for bet is *shart* which means to make a pact, or here, to defer the decision about the truthfulness of an observation to something other than the immediate perception. In high school days in Iran, students would claim to know the truth about something with little proof, then they set to prove it. Both sides know that the claim can go either way, so they compete to gather the best argumentation and data for their claim to prove their initial intuition. In the case of this bet, for which Vafa is rewarded with an ice cream, he uses another cultural move: using analogy to justify an observation. Analogy, or *qias*, is used in Islamic jurisprudence to establish rules of what is considered a fact. Therefore, this *shart* played a supplementary role between he and his advisor to the established communication styles — what could not translate to the rules of scientific communicative style was deferred.

C: I have made some conjectures. When I make these conjectures, there are few proofs for them. Thus, when someone looks at these conjectures from outside one can conclude two things: one is that this conjecture is only hot air, or you've got some more and you are not saying. I think that in my case it is the former -- about some of my conjectures, they say, "so he has said something and we are not going

symbolically organize the data, whereas numerical models create units of mathematical analysis.
to take it seriously until there is more evidence for it." When the proofs are gathered, the credit goes to the person who has gathered the proof rather than the one who developed the idea. This, I think, exists in the West — that the emphasis is on the evidence and concrete. Of course, this is right to some extent and to some extent it is not because some ideas, at their conception, cannot be precise and one cannot find enough evidence for them. The example can be found in my conjectures. One of them is called "near symmetry" which is that the two spaces that strings move in can be analogous despite the fact that they are mathematically different. It means that the strings don't see the difference between two spaces... I said that there can be such a thing before there was enough evidence, and I wrote about it [referring to the article, Vafa and Witten 1994].

Then, as time went by, the proofs were gathered. But I talked about it before it was considered proved.

M: Concerning near symmetry in the US, has anyone paid attention to how this actually came about?

C: Not much. For instance, if you pay attention to the references that are given to this conjecture, it is a reference that is given to the first non-trivial example of this space; it is not a reference to me. It
is given to those who write in popular magazines. For instance, one of them was one of my students. When I told him "you should go after this idea," he said that mathematicians have said that this is not possible, but nevertheless he went ahead and found the evidence for it. I mean, he who was not even convinced, when he went after it, he found it. This was the most famous example.

M: ...another example?

C: I wrote an article with Witten when I was a graduate student. In this article we found some evidence that appeared that it might have something to do with strings while we were dealing with particles. We were following some particle theory and what we found appeared to be relevant to string theory, if you've studied the string theory. When I saw this I immediately thought of the similarity. We didn't understand what it meant and we had to go after it. I even made a bet with Witten on an ice cream [laughter] that it is meaningful for the strings and it will have its influences. (This bet in this situation is also something Eastern.) And about a month ago, I wrote an article, I found the relation -- and the bet was about a year ago. I mean that what I felt [sensed] was important and I told Witten that what we found turned out to be more important than
what we were after. A 100 page or 120 page article talked about this, and one page was about what we were after!

M: What was the name of the conjecture?

C: I'll show you now. I made a conjecture at the time named "string duality." It says that a string can be similar to another string and this is not from one space to another. It is more complicated than that. But generalization was the expansion of a smaller thing to a more developed thing. Yet I didn't publish it, I only made a conjecture and told the result to Witten. This kind of talk at the time was so weird that no one dared to publish it! Five months later two people wrote about this conjecture -- I don't know whether it leaked out or not. One of the most important results of string theory now is this conjecture. Some evidence has been gathered for this conjecture. In my opinion, the reference is not given to my conjecture, that was very intuitive at the moment, but to the evidence. I think the way these are utilized is a Western construct, not ours. Generating ideas has less value. Branching it is more important than growing the roots of it. What we call branch and root is called differently in the West.
M: Have you ever thought of how such explaining should be done? I mean that part of explaining involves authorization.

C: I think the only way is to establish a track record. It means that when one tells a few important ideas and when a few [others] have understood them, after a while they won't dismiss you easily. I think they will be forced to listen to you by establishing a good track record. I feel now that I am establishing my own track record. My goal is that they listen. They must be convinced over time, because there are people like me that are coming from other perspectives in life. They [Western colleagues] should stop being simplistic.

M: Let's go back to string theory. Last time I asked you how you got interested in this theory. Now that I have read more about it, I think some of it was mentorship and some personal interest in foundational and theoretical issues. Were there other attractions in it for you?

C: One person cannot be my mentor. Say Witten was my mentor, I don't think I agree with that, he was my advisor. He told me that I should study string theory when it wasn't popular. I didn't listen to him. I studied about it and found out that there are a lot of beauty in
it but I felt it is yet very primitive. A few years later, when Green and Schwarz did their important calculation, Witten was affected by this, as was everyone else in the field, including myself. As a result of their calculation there was a direct effect on physics, and [this affected me,] not mentorship. That was the beginning of my work, although two years before this important calculation Witten had told me to do string theory.

M: This was before your dissertation.

C: Yes, in 1983 or 82 Witten told me to study string theory. He told me in a serious way that I should do it. I studied and concluded it is very primitive at the time. The Green and Schwarz work convinced all physicists. Of course Witten was very important in the popularization of string theory. He made it happen faster. One of the things that he is good at, he takes the important issues and spreads them really fast. He has a very good track record and everyone listens to him. The effect that Green and Schwarz had, had it not been for Witten, it might not have been possible. He took their work and developed it. From that point of view he was a mentor.

M: Green and Schwarz did the math part?
C: No. In physics they did a calculation according to which many qualities in other theories would work in string theory. They call it anomaly cancellation. Gallison has only written about that period. This was just a year before I got my Ph.D. The paper came out, and in my last year at Princeton I studied more and more about string theory and wrote about it. This was the beginning of my work.

Witten had another affect on me that I wanted to talk about.

M: Yes.

C: He has an amazing internal consistency. In many ways he is very different from other Western physicists, he is not a good example of a Western physicist. Yet, when he cannot prove something he says that it is wrong. Ideas, from his point of view, need to be developed and then they can be proved from a mathematical point of view and if they aren't, the ideas are wrong. From this angle he has influenced me a lot. What he hasn't had any influence on is me as an Easterner. Last time I made a conjecture he told me "I don't know how you think." That is why I made that bet with him.
Parallel Example

Yet another aspect of Lotfi Zadeh's work is the way he had to establish a track record, as did Vafa. Although the theoretical novelty of fuzzy logic generated a great deal of intellectual interest across disciplines, exploration of the technological implications of this concept became as crucial, if not more, in establishing it as a viable project. Therefore, one important aspect of Zadeh's project is to strategize about the advancement of his project. For Zadeh this has involved distancing himself from earlier connections with the philosophical aspects of fuzzy logic and focusing more on fuzzy sets as an algorithm. For this approach, Zadeh found a fertile ground in the early days not in the U.S., but in Japan and later in China, Russia, and Europe. By the 1970s, the strategy consisted of seeing that fuzzy logic would be appropriate for mechanistic systems, the realm of control. After that, a number of applications began to grow rapidly, particularly in the area of control systems. This lead to marketing new technological devices that worked with fuzzy logic, such as dishwashers or automobile breaks. In some cases the objects worked and in other cases they were not so successful.

Cultural inscription is related to authorship through the establishment of credit. In Vafa's case, the historicity of earlier

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13 In 1996 there were approximately 2500 papers on fuzzy logic and fuzzy sets published or presented, and of those about 1600 were in the area of control.
mathematical work became a part of the structure of authorship. In Zadeh's case, technological development played an important role in the establishment of credit. The formalization of scientific authorship leaves other personal and cultural activities, such as the ones that Polanyi refers to, out of what is considered scientific work. Both of these cases, but as is explicitly evident in Vafa's narrative, show the way these other activities are in fact inscribed into the work. These otherwise lost cultural inscriptions are part of the third-culture. Therefore understanding them becomes resourceful for the reconstruction of technoscientific identities.

Conclusion

In this chapter, I have shown how non-Western scientists from Islamic backgrounds working in transnational settings have integrated parts of their personal and cultural backgrounds as a critical part of their work. I have argued for the notion of a third-culture that uses these cultural inscriptions as possible resources for the rethinking of technoscientific identity. My point has not been to establish the factual possibility of alternative scientific epistemologies, but rather to show how the third culture provides a space for imagining other forms and models.

This third-culture provides a resource for radical critique. This happens not by objectifying the elements in this third space, but by
providing the possibility of critique through experimentation using these cultural inscriptions to show how science is done. This in turn acts as a resource for imagining how science can be done differently. Further, it reminds us that radical critique relies on the hybrid space of the third culture and not on the representations of science.
Chapter Six:

Conclusion: The Performative Landscape of Technoscientific Identities as Radical Critique

Technoscientific identities in the Islamic world are changing. An epochal understanding of the West marks a new moment in the history of the Islamic world. This is in contrast to the activities of the late 19th century. The late 19th century discourses of Muslim reformists as well as secularists saw Western science as a modern version of medieval Islamic sciences; they did not see a historical and epistemological break with the past. In this context the task of creating a technoscientific identity consisted of appropriation of Western science and technology. The late 19th century was marked by intellectual debates on the relevance of Western science (such Darwinian evolution or Galileo's astronomy) to Islam, the creation of new imaginaries through the work of cultural translation (e.g., theater and cinema, or the formation of the "new curious individual" as a knowledge seeker through the direct relationship with others through travel or with nature), and the adoption and implementations of new models of technoscientific enterprise from the West.

Timothy Mitchell’s early work, Colonizing Egypt (1988), illustrates how, in order for the new institutions to be implemented in Egypt, a whole new set of practices enframed this activity. From a Foucauldian perspective,
Mitchell tries to understand these formations not in terms of ideas but the effect of certain European ways of desiring the knowledge of the other. "Planning," in Mitchell's interpretation, was crucial. Egypt appeared to the Westerners as un-planned, the Egyptians un-disciplined. To enframe was to re-order and organize in such a way that can be measured according to scientific methods:

In modern Egypt, as in every modern state, order of this kind was to claim to be order itself, the only order there has ever been... The essence of this kind of order is to produce an effect I am going to call enframing. Enframing is a method of dividing up and containing, as in the construction of barracks or the rebuilding of villages, which operates by conjuring up a neutral surface or volume called "space"... The plans and dimensions introduce space as something apparently abstract and neutral, as series of inert frames or containers.... Within these containers, items can then be isolated, enumerated, and kept: three large animals and three small per courtyard; two beds end to end (and hence two persons) per room; even the positioning of pots, water jars and food supplies was specified in the French plans. (ibid., pp. 44-45)

Enframing, in Mitchell's reading of Foucault, creates a setting that enables a particular knowledge of the other. In addition, it marginalizes other forms of knowing such as traditional Islamic schools and informal ways of measuring. Would this marginalization of other forms of knowing mean exclusion of those traditional ways? If it does, would that imply that those traditional ways will eventually go away? In so far as these questions relate to Mitchell's interest in planning and building, the recent situation in
Egypt, or Turkey, for that matter, where grassroots level Islamists are
calling the state's Western style of city planning, inclines us to think of
it rather as a dialogue between the modern European institution and
reemerging Islamic institutions.

Alberto Moreiras (1998) similarly suggests that these positions are
shifting. He argues that there is a shift from position and identity, or the
highly ordered and categorical positioning evident in Mitchell's example of
the British colonial construct, to mobility and anonymity. This, he argues,
is occurring in a state of global disjunction in which social processes cannot
be understood within the clearcut boundaries of those categorical
positioning. In what he calls "the second Lantinamericanism," there is shift
to the control of contingency, or what he calls "whatever," where the
management of social order is not necessarily based on content but on
whatever will perpetuate social order. This is in contrast to Mitchell's
example of control defined by giving order through explicit positionalities.

This global disjunction signifies that the state together with the
oppositionality of social movements need to be explained within this
mobility and within the porous state. The positionality of social
movements within the boundaries of state should be understood within the
ambiguity of economic, cultural, and political disjunctions (or Appadurai's
notion of various "scapes") (Appadurai 1990).
The formation of the secular state, where the hegemony of value and culture free technoscience, put a constriction on these late 19th century activities. My argument in this dissertation has been that with the epochal understanding of the West and with the demise of secular hegemony, new debates are emerging concerning technoscientific identities. These debates, I have argued, are part of a radical critique, and as such I have tried to delineate a landscape for it. I have tried to reveal the changes in technoscientific identities through a focus on practicing Muslim scientists and engineers. I did not use the criterion of whether these scientists and engineers were self-consciously Muslim or not -- as transnational scientists the landscape in which they operate is nonetheless shifting as a result of these competing specters of debate. These Muslim scientists and engineers, thus, are themselves important players in this shift in identities.

Consequently, this conclusion concerns how anthropological and critical work can contribute to the understanding of the actors who are involved in the making of this identity.

In the context of the secular state, one aspect of the change in technoscientific identities has been a shift from adopting technoscience as utilitarian to instrumental. The utilitarian attitude was concerned with problem-solving and appropriating Western science and technology to that end, whereas the instrumental attitude was concerned with the definition of ways of life and societal relationship through science and technology. In
this state of global disjuncture, with the weakening of the secular state, moreover, a hybrid situation has taken place where there seems to be an oscillation between these two attitudes.

Bazargan marks a transitory moment between these attitudes. There were attempts at this time to somewhat uncritically combine Western technoscience with local culture. Bazargan's usage of the theory of thermodynamics, where he tries to reconcile tradition with modernity by creating a continuity between the two, was precisely of this genre. His involvement with major civil engineering projects of the time -- reorganizing the oil industry and the Tehran water project -- are instances of this utilitarian approach in that he operationalized what he had learned from the West and applied it to specific needs by using local traditions.

By the 1970s technoscience was appropriated and expropriated as instrumental: abstract notions such as progress and lifestyle were contained in the models driving the development plans of modernization efforts, where programs based on these abstract notions were transplanted and superimposed on to other cultures. By the 70s, in the context of the resurgence of Islam, discourses of authenticity criticize the appropriation of technoscience as value free and as a result would lead to an alienation of culture, but did not provide a guideline for an alternative.

In fact, at the same time that such intellectual critiques were raised, one can see throughout the Islamic world the reemergence of a utilitarian
approach. This return of utilitarian identity of technoscience has had different manifestations. At the cultural level, religious references became important components of social engineering. For instance, in the early 1990s the mayor of Tehran argued that water is sacred and garbage should not be mixed with it. As a very successful mayor, this was one of his strategies to clean the city. Another example is in the combining of religious tropes with economic and banking systems for reorienting funds to other sectors of society. Although the concept of Islamic banking has been criticized, the utilitarian combination of Islamic communal values and finance has been successfully used in many places throughout the world.

Another example of the new emergence of the utilitarian approach is evident in the case of engineers’ relationship to the state. Through social mobility and education, members of the economically poor social strata not only move upward but also learn to further their political interest through social engineering. For example, Nilüfer Göle (1993a) notes that within the ranks of Islamists in the 1980s there were a large number of engineers. Most Muslim engineers come from modest backgrounds. She argues that the upward mobility of Muslim engineers was not so much a function of the resurgence of Islam but rather a result of state education. One might argue that the persistence of cultural utilitarianism is due to the fact that the Islamic grassroots is closer to the community and therefore there are attempts to accommodate technoscience to local culture.
The return of utilitarian identity has not reduced the effect of the appropriation of technoscience as instrumental objects and models. The transplantation of a technical institution that is modeled after MIT in Malaysia, for instance, is an example of the kind of global project based on instrumentality. The basic assumptions according to which this project tries to find its relationship with local culture has not change since the 60s, although the condition in which this project takes effect has.

The landscape has shifted to one that floats between these global and local institutions and places. One element of this landscape is the transnational community of scientists and engineers. Abdus Salam, once concerned with resources, built an international scientific institution in Trieste to bring Third World scientists in contact with Western innovations. This was done during a time when there were no massive flow and migration of Muslim to the West. Since the 1970s this picture has changed: in this late 20th century, the growing communities of Muslim diaspora is not only in contact with Western institution but also trying to change the make up of these institutions. For example, the flow of students’ from Islamic countries to the West is not only based on the dispatch of students from abroad, as was the main flow in the early part of the century, but now a large number of science and engineering students either live in the West with their families or with members of their extended families. In addition, the already existing communities of Muslim
host incoming students and influence their views. Institutionally, global institutions are still important nodes for connecting Islamic countries to the West, but are by no means the only ones. Public universities and colleges such as University of Illinois at Urbana Champaign train more Muslim students as engineers than MIT.

Transnational experience itself is not singular. There are different modalities that frame these experiences. My interviews with entering students at MIT illustrate these elements. In one occasion I interviewed two Pakistani students, one from Karachi and the other an American-Pakistani from Long Island. They each had transnational ties and were differently positioned towards Pakistan and the U.S., a positioning that was constantly changing. The parents of the student who came from Pakistan studied in the West, then returned to Pakistan, and then shuttled between the gulf countries and Pakistan for work. The student who came from Long Island experienced Islamic culture through her immediate family as well as local Islamic institutions such as schools and cultural centers in the U.S. These two experiences would typically be constructed as "Western" Muslim and "non-Western" Muslim; I am suggesting that when viewed ethnographically, there are in fact numerous overlaps and cross cutting elements.

The transnational ties of scientists also increasingly cuts across state and national boundaries. Cumrun Vafa's experience happens to take place
in an American scientific setting. What makes his experience resonate with other scientists in Islamic countries is not so much the locality but the fact that they have to practice within Western epistemology. But the difference is that Vafa takes for granted an already existing Western set-up in the U.S., whereas his counterparts have to create such a setting. My conversations with the Iranian physicist Reza Mansoori from Sharif University in Tehran are revealing in that he expresses concerns about the ability to sustain a vibrant community of scientists in Iran. By that he meant recruiting students, training them, and having scientific tools of communication to practice. Mansoori, who also writes for popular science journals, argues (1996) that Persian should be the scientific language of Iran. In a rhetorical style he uses the Sapir-Whorf theses on the relationship of language to imaginations to make the following arguments: 1) that Persian has the capacity to be a scientific language, 2) students shy away from science because they think science is difficult, whereas some of the difficulty is in fact in the language rather than the science, and therefore they get caught in semantics, and 3) creativity in science is lost because scientists always depend on vocabularies that are imported from the West. Mansoori’s concern differs from Vafa’s in that Vafa copes with the rigidity and formalism in science and seeks relief through his personal and cultural references, whereas for Mansoori it is not a question of the personal but rather the creation of a community.
Mansoori's concerns are not only local but transnational as well. He is trying to connect the Iranian scientific community to the larger global context. I argue that with the demise of the secular state the scientific community is finding itself at a loss. Mansoori's rhetoric on language is an index of this event in post-revolutionary Iran after many years of relative isolation. He further complains about the interference of politics in the daily affairs of scientists which was once protected by the secular state. The hegemony of the ideology of universal Western science that was once maintained by the secular state can no longer hold. Global ties are becoming more necessary.

These global ties, where the transnational connections of scientists transcend national boundaries, nonetheless have a political dimension, but one that is not easily mapped out. Activism around nuclear weapons is an example of this. The case of nuclear bomb escalation between Pakistan and India is interesting in that it shows how hard it is to create a coherent narrative account of the scientists' ties to politics. In addition to being an activist against the Islamization of knowledge, for instance, Pervez Hoodbhoy, who initially studied nuclear physics, is also an anti-nuclear activist. He travels between India, Pakistan, and the U.S. to give speeches and participate in anti-nuclear escalation meetings. Hoodbhoy blames the military for the problem. However other activists believe such a picture is too simplistic. For one thing, scientists themselves have interests in nuclear
science. Abdus Salam, for example, was part of the highest commission of Atomic Energy in Pakistan and the former Prime Minister Zulfiquar Ali Bhutto, who was a Berkeley graduate, instigated the atomic energy program in Pakistan in 1963. Salam's involvement has raised the question of whether scientists who have transnational connections are responsible for nuclear escalation. Do foreign educated Muslims cause problems? And yet the situation is not so simple. A growing number of scientists involved in nuclear proliferation have not been educated abroad. Both Pakistan and India are capable of making their own bomb without Western educated scientists.

In this global setting, narratives flow through individuals, institutions and technologies. I call this space a metalinguistic landscape. One question that I have tried to address is how the narratives of transnational Muslims flow in this landscape and affect different localities.

The recourse to religion happens in this global space as well, and in fact questions the traditional authority of Islam. Within this metalinguistic landscape, the discourses and narratives of transnational Muslims focus more on generative aspects of tradition, by-passing the authorial interpretation of the ulama. For example, idioms and concepts that either reference the "golden age" (Sardar 1989) of the Prophet or stress the significance of the Qur'an (al Faruqi 1986) as sources of generative
authentic thoughts, become the subject of different modalities that interact with competing discourses.

The movement of individuals and their students, through which such ideas as those just mentioned travel, are of key importance. Not only do scholars such as Seyyed Hossein Nasr, Zia Sardar, and Munawar Anees travel all over the world, but they have supporters and students in numerous global localities as well. Ideological affiliations notwithstanding, they have to perform within the frame of where they work, becoming entangled, with local politics and national narratives. For example, Nasr has many students in Iran and Malaysia who hold high level governmental positions. One such student, Osman Bakar, is the head of the department of science and technology at the University Malaya. This position, especially in the form of consultancy, puts him in a position of performing in different language modalities. Bakar talks about *towhidi* science while he is an administrator of a secular university. Another example is the experience of Munawar Anees, the U.S. trained biologist and proponent of Islamic science in Malaysia. His affiliation with Anwar Ibrahim, at an unfortunate moment was politically used by Mahathir to discredit both him and Anwar Ibrahim evidence of how transnational Islam mixes with national politics.

Transnational mobility is also evident in Islamic institutions. For instance, the International Institute of Islamic Thought (IIIT) whose
establishment was first inspired by al-Faruqi's notions of Islamization, is now a transnational institution with branches in several places in the world, including Herndon, Virginia, and Kuala Lumpur, Malaysia. This is another instance which shows how global ideas of Islamization become local. As I showed in chapter three, the resurgence of Islam and Anwar Ibrahim's support were both vital for the emergence of the IIIT. Therefore, the discourse of the transnational status of institutions is about the process of subjectivation that they go through to become local or global.

In addition to individual and institutional transnational mobility, there has been massive investment by Muslims in Internet and information technologies. The Internet affects locality or redefines locality in at least two important ways: First, through homepages, Muslim activists hold transnational discussion groups, mailing lists, and run their publications. This has delocalizing effect, but at the same time these technologies create new modes of "entextualization" (Silverstein 1998) -- that is, through these technologies, abstract ideas affect local discourses. Secondly, Internet technology is increasingly being used for education, especially in science and technology. This is especially the case in Malaysia and Singapore where new forms of technical subjectivities are being formed that bring together global institutes such as MIT and technical institutes in those countries. As a result of this change, students will engage numerous kinds
of pedagogical models on the net without having personal experiences of the cultural context in which these models are formed.

I have described a metalinguistic landscape where transnational activities of individuals, institutions and technologies take place. These narratives and discourses, that are part of radical critique, are also speech acts that address local phenomena. In the remainder of the conclusion I would like to recapitulate what I have been theorizing about radical critique.

At the start of the dissertation I spoke to the relevance of the epochal understanding of the West by Muslims, an understanding of the West that sees it as a particular epistemic and historical construct. As a consequence there has been a critique of secularism as a process of disenchantment and inauthentification. It is inauthentic because through the process of rationalization culture drifts away from its origins. Furthermore, this process is revealed to be not that of a universal ontology but based on Christian theology.

The epochal understanding of the West has enabled Muslims to think of technoscience not as a value and culture free phenomenon. In addition, the discourse of authenticity (in its various forms) presumes a shift to technoscience as metaphysical. By focusing on where science is practiced, my ethnography sets out to find a relationship between the epochal understanding and authenticity, on the one hand, and the existing conditions
of technoscience, on the other. The discourse of authenticity assumes that language and culture become denaturalized through technoscience. And yet, the discourse of authenticity has not found an alternative that can account for alterities. The transnational movement of scientists, activities, global institutions and usage of technology concerns the inevitable process of alterity.

In the event of radical critique, the rationality of the methods through which the secular state was formed have been challenged by Islamic revelational references. In the formation of institutions and methods of scientific knowledge Islamists have argued for the inseparability of revelation from the rational. For example, in the third chapter, I talked about the critiques of the ideas of development and education as value free. These arguments are advanced not because these ideas are faulty in terms of their rational consistency but in order to argue for another rationality, one not separate from revelational. The dilemma of those Muslims, such as Manzoor, who are interested in finding a balance between the two and not falling prey to a kind of theocracy, is a real one. Iranian Muslim intellectuals have been addressing this dilemma. Soroush argues that there is a temporality in revelation -- revelation is not fixed and atemporal -- and thus in each epoch this will be different for the umma. Moreover, the discourse of authenticity raises the question of, if the return
to the revelational is a way of imagining an authentic cultural context, how can the forms and norms that relate to this context emerge?

In my ethnography of institutions and individuals floating between different local/global modalities, I have tried to show that alterity and hybridity challenge the notions of revelational and authentic. Although the discourses of authenticity have been important for imagining new ways, radical critique points at the impossibility of achieving "pure" forms. For example, Bazargan's use of the theory of thermodynamics says to both his fellow seculars and the ulama that the division between the West and non-West is not sharply oppositional but porous. His discourse might appear contradictory for today's Muslims because of his utilitarian approach to culture and technology. And yet, the specter of his discourse haunts the discourses of authenticity of today's Muslims.

The Hoodbhoy affair suggests a different specter. His discourse is a positivistic one -- science is universal, value and culture free. However, the narrativity of his discourse is revealing of social and cultural changes in Pakistan. One thing is to detect his positivism through the work of criticism, yet another is to situate his discourse in the ethnographic context of different speech acts. There is a dialogical link between the narrativity of his positivism and the claim to pure forms of other discourses. It is as if the specter of positivism has been detached from its roots but is floating
around haunting other projects that try to detach their identities from the context which they share with other discourses.

Pure institutional forms are also not possible. The float of individuals and institutions feeds into processes of subjectivation in which the utterances of authenticity get interpreted in a variety of forms, thereby subjecting their meanings to a semiotic process. There are interconnected modalities that enframe social action which have a global scope. These modalities can be interpreted in what I call a metalinguistic landscape. In Malaysia, these modalities have the following forms: first, Islamization in form of local institutionalized affirmative action for Malay Muslims; second, transnational activities of Islamization, e.g., IIIT and ISTAC, which produces texts, transnational spaces for education, and other forms of entextualization; and third, regional internationalization, which includes entrepreneurial activities among regional educational institutions. Finally, the fourth modality is the context of the neoliberal economy that frames decision-making processes.

The metalinguistic landscape is the condition of undecidability. It is a condition of undecidability because the act of making decisions about changing the technoscientific identity can not be achieved through consensus. Undecidability is an act of open-ended critique that allows competing speech acts to perform in this landscape. As is suggested in the scene of technoscience in Malaysia, the bifurcation of identities in the
forms of Westernization and Islamization is potentially violent in that it subjects the dialogical process to everyday politicking. I am not arguing here for an emancipation of communicative processes, as Habermas does, but a hybrid landscape that allows for non-ethnocentric understandings in the remaking of Muslim technoscientific identities. Muslim discourses of authenticity, as far as they attempt to achieve a kind of emancipation through redemption, resonate with Western discourses of authenticity. Therefore the question remains, what would be an alternative project of remaking technoscientific identity that does not deal with technoscience through a rationalized and utopic thought process, and yet takes the role of religion and culture seriously?

Muslim hybrid situations are about the third culture where forms on the margin can provide new possibilities. At the turn of the 20th century, hybrid situations consisted of asking what the relevance of modern science was to Islamic cultures. This led to attempts to appropriate the Western techniques that were perceived to be reasons for the advancements of the West through translation. This moment in translation came to an end by the 1920s when the formation of the secular state put a constriction on technoscientific identity by accepting a universal and culture free understanding of modernity and the West. I have argued that in the event of radical critique, the act of translation will be renewed.
However this time the scene of translation is enframed by the epochal understanding of the West and a sense of the instrumentality of those elements (e.g., institutions, technologies) that come from the West. A brief illustration of this is suggested in Kyoko Inoue's (1991) interesting work on Japan. Inoue suggests that the constitution imposed by MacArthur on Japan after World War II was intended to promote changes in Japan so that it could be regarded as an equal to the West. Inoue shows that instead, the illocutionary act of imposing a foreign constitution required an enactment of translation, which meant that different parties had to interpret and reinscribe meanings onto the imposed constitution.

In transplantation of new institutions, as for instance in the case of MIT in Malaysia, is largely based on assumptions of a continuity of time and space such that all models can be and should be transplanted as is. In my work, I found no effort on behalf of the MIT consultants to understand the context, in which the state no longer had a monopoly on education, in which the institution was to be transplanted. In this post-hegemonic condition of secular state, the rise of various Western institutions raises the question of how an act of translation can work to counter-act this assumption and turn it into a local institute. To what extent can a dialogue among many models be productive?

That such a dialogue is not greatly in evidence may in part be due to the presupposition that exchange and reciprocity should be calculable --
ambiguity in understanding is not desirable. A misrecognition of social reality happens in the locus of transcultural interaction, as Inoue indicates. This ambiguity can be seen in Turkey, where social institutions are under pressure from the Islamic resurgence and in fact have given way in some areas, such as education and urban development, to Islamists institutions. The European community considers this new situation as a threat, especially in the case of the acceptance of Turkey's application to enter the EU; cultural heritage that creates ambiguity is seen as a threat to calculability.

Another obstacle to an inter-cultural dialogue is the Western notion of duty, which is interpreted legalistically as an obligation to owe. This can be seen, for instance, in World Bank policies, developmental plans, or creation of institutions. Consider the Marshall Plan and its effect in Turkey: the Marshall Plan was meant to include Turkey into the general economy of expenditure without "return;" that is, Turkey did not "owe" anything. But in the ideology of "value-free" technoscience a kind of owing was present in that there was a duty to exclude Islam and local cultures from the social formation.

This scene of translation is a part of the third-culture. The third-culture takes the experiences of scientists and engineers as ethnographic instances that teach us about how science is done. Cumrun Vafa and the other scientists discussed in the fifth chapter show pragmatic instances of
the interaction of Muslim scientists with Western science. I have asserted that scientists use their cultural background to enrich their scientific work. I have further argued that the personal experiences of scientists can be potentially resourceful for rethinking technoscientific identity. The third culture, distinct from the formal-logical constructs of science, is precisely this double-vision of scientists. I have assumed all along that science is based on Western epistemology -- I agree with Muslim's epochal understanding of the West. However, my effort concerns the ways in which these personal experiences can become bases of reconstruction in the event of radical critique. They can be used as ethnographies (Tyler 1987) and experimentation that makes us imagine different ways of doing science.

Radical critique relies on these ethnographic instances that are revealed in the third culture as important elements for the rethinking of technoscientific identity. They are important because they are not about the representations or formal-logical constructs of science but are the elements out of which technoscientific representations and methods are constructed. My argument is that these ethnographic instances can provide ways of reconstructing Muslim technoscientific identities. Islamic metaphysical idioms can be mobilizing aspects of a project of reinvention based on this hybridity. At this point, ethnographic work on Muslim scientists is virtually non-existent. This dissertation, and projects such as this, can provide an opening to an interesting direction.
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IMAGE EVALUATION
TEST TARGET (QA-3)

1.0
1.1
1.25

1.0
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150mm
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