THE PLACE OF SCIENCE IN THE TURKISH MOVEMENT OF WESTERNIZATION, AND ATATÜRK

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The Turkish movement of Westernization, in its maturer phase represented by the Gülhane Edict of 1839, involved quite a substantial and heroic effort to contribute to the amelioration of human happiness and dignity and to the eradication of fanaticism and bigotry. In its genesis and initial phases this movement manifests itself as a general process beset with many difficulties and interruptions. In its preliminary and less complex phases it may be said that it is not marked more clearly by any other single event than by the foundation, after European models, of a naval military engineering school in 1773 and of a ground forces military engineering school between 1789 and 1795, both in Istanbul. These are the twin ancestors of our present Technical University of İstanbul. The first evidence of a Turkish decision to adopt Western ways was thus unmistakably discernible in institutions representing technology and education, and the foundation of these two engineering schools in the last quarter of the eighteenth century constituted clear signs of a deep concern of the Ottoman Empire for self-defense and self-preservation.

The first clear and substantial impulse for the Turkish movement of Westernization thus came from the need felt for the adoption of European techniques in military training and from military technology. Technology, on the other hand, had, by the nineteenth century, come to involve, in an ever increasing measure, the harnessing of scientific knowledge to human needs. Hence the importance, generally speaking, of the place occupied by science in the Turkish movement of Westernization.

In his *General Historie of the Ottoman Empire*, written first in 1603, Richard Knolls wrote thus:

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"At the present if you consider the beginning, progress and perpetual felicity of this the Ottoman Empire, there is in this world nothing more admirable and strange; if the greatness and lustre thereof, nothing more magnificent and glorious; if the power and strength thereof, nothing more dreadful and dangerous,..., prefixing into itself no other limits than the uttermost bounds of the earth, from the rising of the sun unto the going down of the same."[1]

Concerning the peace treaty of Carlowitz of 1699, Creasy, writing in 1878, says that the treaty of Carlowitz is memorable in particular on account of the magnitude of the territorial change which it ratified and also because it marks the period when men ceased to dread the Ottoman Empire as an aggressive power, and then he adds, "At the beginning of the war Austria trembled for the fate of her capital and saw her very national existence seriously menaced; at the end of the confflict the empire of the House of the Habsburg was left not merely in security, but permanently strengthened and consolidated; while the House of the Othman saw many of its fairest dominions rent away. ..."[2]

This was the second siege of Vienna, which took place in 1683, and the city could have fallen, had the Turkish commander-in-chief shown greater proficiency in the conduct of the war. But even that could hardly have changed the general situation. The Ottoman Empire had fallen behind Europe; she had already entered upon a period of decline, especially when compared with the West. To bring the idea more clearly home to us that the tables had already been turned on the Ottoman Empire, we may note that, after a considerable delay due especially to some diffculties he had in connection with the orbit of the moon, Newton had finally published his monumental work, the *Principia*, in 1687, only four years after the Turkish siege of Vienna, while Ottoman men of learning were not as yet quite ready even to give Copernicus the credit that was due to him; nay, they were not even duly aware of his great work, nor of those forming its more immediate sequals, such as the masterworks of Galileo and Kepler.

[1] Edward S. Creasy, *History of the Ottoman Turks*, Beirut 1961, Introduction by Zeine N. Zeine, p. V.

[2] Edward S. Creasy, *History of the Ottoman Turks*, London 1878, pp. 319, 321.

The naval and ground forces' military engineering schools set up after the European models, in 1773 and 1789–1795 respectively, represented official acknowledgement of the superiority of Europe's knowledge in general, its technology, its methods of training its armed forces and especially its engineers. It also constituted a solemn though partial commitment to a program of Westernization. These schools, after a short interruption, were continually developed, modified, and enlarged during the nineteenth century.

The Naval Engineering School was instituted under the sultan Mustafa III (1757–1773), and the Army Engineering School during the reign of Selim III (1789–1807), who was deposed by an insurrection of the *Yeniçeri* soldiery, that is, the old-style standing army, with the cooperation and instigation of the *ulemâ*, i.e., the class of intellectuals who were the representatives and the custodians of the *sheriat*, the religious law, which was tantamount or equivalent to a veritable constitution.

Selim III was profoundly attached to the reforms he had introduced and was thoroughly convinced that they would be very beneficial to his country, but he had to pay for it with his life. Mahmud II (1808–1839), however, who came to the throne after a brief interregnum of Mustafa IV, reintroduced the reforms of his ill-fated predecessor, acting with much greater energy and success, and during his reign Turkey's adoption of European ways came to gain a deeper meaning and a more comprehensive scope.

Mahmud II brought, from 1831 on, certain administrative and social reforms which were fundamental in the process of Westernization. These were culminated by the Gülhane Decree, the so-called Tanzimat-i Hayriye, i.e., the Edict or Proclamation of Beneficial Adjustments (or Propitious Arrangements), which was promulgated by Mahmud II's son and successor Abdülmecid I (1839–1861). This decree or edict was prepared by Mustafa Resid Paşa, the minister of foreign affairs. It guaranteed the security of life, honor, and property of all Ottoman subjects regardless of religion or sect, and it contained provisions and stipulations to the effect that taxation and conscription laws would be reformed. The period from 1839 to 1876 thus inaugurated has been referred to as the Tanzimat Period. It was a period of enactment of various remedial legislations.

With the advent of modern scientific revolution in Europe ushered in by men like Copernicus, Vesalius, Bacon, Descartes, Harvey, Galileo, Kepler, Huygens, and Newton, with the formidable achievements involved in the Humanism, Renaissance, and the Reformation movements and the eighteenth century's so-called Enlightenment and the industrial revolution, Europe had gone through extremely important phases of development and had increased its efficiency tremendously in all fields of human endeavor. It also had developed its military strength and prowess at a brisk pace.

The upshot of all this was that Ottoman Turkey had thus naturally and automatically fallen behind Europe. But it had not only fallen behind due to its failure to keep abreast of the rapidly advancing European civilization; it had actually gone through a process of decline whereby its original social and administrative institutions had become transformed into more or less degenerate versions of the vigorous initial Ottoman institutions of the more glorious days during which they originated.

At any rate, Ottoman social and economic prosperity, and the financial and administrative machinery upon which it rested, had been geared up with Ottoman military superiority over its neighbors. The prodigious advances realized in Europe had made it peremptory therefore for the Ottoman Empire to readjust its financial and administrative procedures. Furthermore, the opening up of the Oceanic trade routes and the discovery of new continents had reduced the importance the Ottoman lands occupied in international trade.

In short, the causes of the decline of the Ottoman Empire were many and multifarious, although the fascinating advances in scientific knowledge in Europe were undoubtedly among the most fundamental and trailblazing of these multitude of varied and divergent factors. And in the face of humiliating defeats, and also of the undeniably superior knowledge, technology, and power of her European rivals, Ottoman Turkey felt the need of modernization, of copying Europe in those respects that made Europe's superiority patent and paramount.

Considered in its totality, i.e., including its social and administrative aspects, the movement of Westernization embarked upon

by Turkey during the eighteenth and nineteenth centuries was quite a major enterprise. For Turkey was leading a prolongation of the medieval theocentric way of life. She was ruled by the religious law considered basically sacrosanct and essentially unalterable. The sultan, being at the same time the caliph, possessed a *de facto* absolute power, and his secular authority was buttressed through the institution of the caliphacy. A thorough Westernization implying decisive change in the concepts of state and society as reflected by the teachings of the guiding spirits of the Age of Enlightenment, as well as rising in science and technology to a footing equal to that of Europe, would be tantamount to changing at one fell-swoop from some sort of medieval backwardness to the modern European level of civilization. In fact, Mustafa Reşid Paşa firmly embraced the opinion that the survival of the Ottoman state depended on a modernization of its administration which would make her a member of the European family of states.

Nowadays Westernization is a very widespread movement. We speak of "developing countries", implying by this term that all underdeveloped countries are endeavoring to reach the level of more developed ones by adopting the latter as models.

Renaissance was such an attempt and Classical Antiquity was the model chosen to be emulated. True, the Renaissance movement would have lost much of its greatness if it had limited itself to imitating the past era it admired. But there was essentially much truth to what it claimed it was doing.

Arnold Toynbee says, "The encounter between the World and the West may well prove, in retrospect, to be the most important event in modern history. It is an outstanding instance of an historical phenomenon of which there are other famous instance in the past, and the comparative study of the course and consequences of the encounters between civilizations that are one another's contemporaries is one of the keys to an understanding of the history of mankind." [3]

These comments are seen not to be applicable to the sixteenth century Renaissance movement, however, except through a stretch of imagination and by superadded interpretation. For the admi-

[3] A. Toynbee, *The World and the West*, 1952, p. V.

ration felt by sixteenth century Europe for classical Antiquity was not the result of the encounter of two contemporary civilizations. Speaking of the nineteenth century Turkish attempts of Westernization, on the other hand, the same author writes:

"The verdict of history on this old school of Turkish Westernizers is 'Every time too little and too late'. ...The reason why this policy of a minimum dose of Westernization failed, and was bound to fail, was because it flew in the face of a truth to which these early Turkish military reformers were blind. ... This truth was that any civilization, any way of life, is an indivisible whole in which all the parts hang together."[4]

This pronouncement is in need of some modification and reservation with respect to science and technology, however, and in fact Toynbee subsequently modifies this dictum of his by introducing the idea he calls "the common psychology of encounters". He says:

"We may begin by reminding ourselves of a general phenomenon which came to our notice in the last chapter when we were taking a comparative view of our Western civilization's two successive assaults upon China and Japan. We saw that, on the first occasion, the West tried to induce the Far Eastern peoples to adopt the Western way of life in its entirety, including its religion and technology, and that this attempt did not succeed. And then we saw that, in the second act of the play, the West offered to the same Far Eastern peoples a secularized excerpt from the Western civilization in which religion had been left out and technology instead of religion had been made the central feature; and we observed that this technological splinter, which had been flaked off from the religious core of our civilization towards the end of the seventeenth century, did succeed in pushing its way into the life of a Far Eastern society. ...

"Here we have an example of something that seems often to happen when the culture-ray of a radio-active civilization hits a foreign body social. The assaulted foreign body's resistance diffracts the culture into its component strands, just as a light ray is diffracted (sic.) into a spectrum by the resistance of a prism. In optics we also know that some of the light strands in the spectrum have

[4] *Ibid.*, pp. 25-26.

a greater penetrative power than others, and we have already seen that it is the same with the component strands of a culture-ray. . . ." [5]

It should not be surpresing at all to see that different sociaties should appropriate and adopt from each other most easily and readily things falling within the compass or scope of science and technology. For these are fields of human endeavor which overstep national, linguistic, and religious or racial boundaries. They represent matters in which human beings are of one mind, where they cannot easily fail to agree.

Ulugh Bey (1393–1449), Turkish astronomer prince, praises the secular or "intellectual" sciences because they overstep religious and linguistic boundaries. This amounts to considering the universal validity and objectiveness of scientific truth as a criterion for its superiority; a very interesting and keen observation, considering the fact that Islam was a thoroughly theocentric society and that in medieval Islam revealed knowledge was almost universally accorded a more elevated status among the various branches of knowledge and it was accepted as more exalted in dignity. Ulugh Bey's view must have been rare, but it can be traced at least to Muayyaduddîn al ʿUrḍî in the thirteenth century.

He says, "Intellects are in agreement and minds are in accord as to the excellence of science and the worthiness of scientists. Through science happiness is obtained and ranks are elevated; it sharpens the intellect and strengthens it; it increases sagacity and augments perspicuity. It is by it that the indolent is embellished and the obscure is rendered illustrious, and it is with its help that the true is distinguished from the false. All this is especially true for those sciences whose object of investigation is demonstrative and whose principles are indisputable and self-evident. Indeed, this kind of science is common to people of different religions and does not show variation with the passage of time or change of location."

Ibn Ṭufayl, philosopher of the twelfth century had a similar notion in that he considered the truths susceptible of independent discovery to constitute a superior brand of knowledge. According to his conception the branches of knowledge which satisfied this criterion were quite numerous, however, and apparently the exact

[5] *Ibid.*, pp. 66-68.

sciences were not first and foremost in his mind. This was, very likely, part of a more widespread philosophical scheme of thought which was, in its widest form, connected with the conception of intellects ruling planetary spheres. [6]

R. J. Forbes, who considered science and technology to be well-nigh undistinguishable in primitive cultures, says, "Civilization in late Neolithic times shows strong local traits, but the cultures are knitted together by many common bonds notwithstanding the growing local experiences. But this local tradition is diffused and as Gordon Childe puts it rightly the subsequent history of science is more or less that of the diffusion of useful ideas beyond the pales of the tribe and the environment where they were born. They were diffused to foreign parts where they were stripped of their traditional trappings and absorbed if they were found worthy when compared with local techniques. Thus human experience was pooled over the entire Ancient East." [7]

This shows that even with primitive peoples the diffusion of objective knowledge is conducive to its enrichment and improvement and that science and technology do not only constitute paths of least resistance in international contacts but that they also are bound to lead to some degree of cooperation and collaboration between different cultures. In fact, we meet in history periods of massive transfers of culture, and some of these happen to be or to constitute extremely important turning points in the intellectual history of mankind, in the general history of civilization.

Indeed, if we trace back in history the past developments of our present-day science, we will find ourselves in Mesopotamia and Egypt of some four or five thousand years ago. About the time of Homer, and, later on, Thales, we see the Greeks come to the forefront in the history of science and thought. But the Greeks learned much from the Egyptians and Mesopotamians. However, had not the Greeks appropriated that knowledge from those older civilizations, science would surely not have advanced in its original homes to any degree

[6] See, A. Sayılı, *The Observatory in Islam*, Ankara 1960, p. 11, New York 1981, p. 11.

[7] R. J. Forbes, "Man and Matter in the Ancient Near East", *Archives Internationales d'Histoire des Sciences*, 1948, pp. 558, 558-559.

comparable to that of the Greeks. After a number of centuries Greek scientific and intellectual work began to lose its vitality. In fact, a period of decline set in, and the Greco-Roman World sank into the depths of the so-called Dark Ages. In the eighth century the Islamic World decided to unearth the onetime glorious Greek knowledge; it appropriated the scientific, philosophical, and medical knowledge of the Greeks as a result of about two centuries of systematic and intense translation activity and enriched that legacy of Greece through its own original contributions. This lifted the World of Islam into the position of the most advanced civilization of its time, and this situation served to jolt Western Europe from its deep slumber of the Dark Ages.

During the twelfth century Arabic works of science, philosophy, and medicine were translated to Latin, and this so-called Twelfth Century Renaissance put Europe into the position of giving fresh impetus to scientific and intellectual work. These late medieval European efforts finally culminated in the sixteenth century scientific revolution, which put science into a path of progress that continues still in our own day.

Now what is remarkable for these periods of transition is that they were all periods of rejuvenation or even regeneration. Had science not passed to the Greeks in the first instance, it would surely not have made the tremendous leap it actually did. But then science was dead, apparently for good, had it not been regenerated in the hands of the thinkers of Islam. Had it not passed from Islam to Europe, on the other hand, men such as Copernicus and Galileo would have never been produced in Islam by all appearances. For the World of Islam was hardly ready to appreciate their work for quite a considerable length of time.

All this creates the impression that the historic development of scientific knowledge, and, with it, of civilization, owes much to these priods of transition, these periods of transmission of science from one cultural sector of humanity to another. A simplified explanation of this may be sought in the situation that science is progressive and will advance provided scientific work gains an intensity exceeding a certain minimum level. Now, if a society is willing to appropriate a certain body of scientific knowledge, this means that it attaches sufficient value to it to cultivate it with a sufficient degree of intensity. Science should therefore advance in

such cultural environments until that intellectual climate has exercised all its favorable influences. But a period of stagnation is likely to set in after these favorable factors have spent their force. And under such a circumstance the transfer of this body of scientific knowledge to a new cultural sphere likely to endow science with a new virility and supply it with fresh opportunities would be conducive to its advancement and growth in new directions. After the utility of science reached such degrees as to make its dividends more manifest and tangible, and after the experimental method came to gain a relatively solid and formals status, on the other hand, the likelihood of the appearance of periods of stagnation must have been considerably reduced.

Such periods of transition have obviously the important characteristic that the community entering into such an era chooses for itself a model it considers worthy of emulation and embarks upon a plan of transforming itself in conformity with that model. This is a very important characteristic or distinguishing trait for this type of periods of transition. There is some kind of a feeling of guarantee of the coming of the "golden age" in this procedure. There is not much of a leap in the dark; the factor of risk or adventure is thus reduced to a minimum, though the launching of a major project is involved.

Indeed established or traditional patterns may break down before new and satisfactory norms have become established, and such a situation does quite often obtain in history. The copper age, the iron age, the steam age, the machine age refer to such periods of transition and upheaval. Epochs of the latter type are likely of course to cause greater crises and to be accompanied with greater shocks. For the transformations taking place in the course of such periods of change-over would be more unforeseeable because of not having planned in advance.

But, on the one hand, although they involve more adventurons enterprises and greater epochal crises, such periods need not be necessarily of greater stature; they need not necessarily represent transformations of greater magnitude. It is undoubtedly not easy to find parallels in history to the Renaissances of the twelfth and the sixteenth centuries and to the other examples referred to above. It would seem reasonable to think that as the ties between technology

and science become closer and more intimate and as our grasp of the nature of social change grows profounder and more rigorous the surprise element in the process of social change and cultural transformations will diminish correspondingly. For it could reasonably be hoped that under such circumstances periods of cultural interlude or interregnum will be less critical or that the problems they involve will be more easily resolved and appraised, more easily assessed and evaluated.

On the other hand, even copying another society in some respect, or following a certain model faithfully, is believed and estimated not to be easy at all, strictly speaking. To make a brand-new plan or program for future change and transformation of a comparative magnitude should therefore be all the more difficult, to the point of being well-nigh impossible, comparatively speaking and by the force of logical inference. There is, moreover, what may perhaps with good reason be called a point of fine distinction because not infrequently it is overlooked. This is the fact that really important changes can rarely be planned in advance; and conversely, that truly great transformations are bound to transcend all previously made programs and plans anyway. This point too serves to bring home to us the importance of eras of transition owing to the endeavor of conforming to or adopting a certain chosen alien model.

In fact, it could peremptorily be stated that the preparation of plans of such importance without being inspired by ready models is out of the question. It would have been entirely impossible indeed for Ottoman Turkey, and for Europe itself for that matter, to conceive and prepare, in one single installment, a plan equivalent to what it had found ready to adopt as a model in the West. Western Europe had arrived to that stage after some centuries of transformation. The same could be said for eighth century Islam and twelfth century Western Europe. What they had found ready to appropriate was the result and the product of centuries of work. Moreover, it is notable that such pooling of excerience occurs in science and, perhaps also to nearly equal extent, in technology, and not so much in other types of human endeavor, as, e.g., in the fields of fine arts. This is undoubtedly one reason why in the major periods of transition in history through foreign borrowings and cultural contacts, e.i., in the truly epoch-making ones, science has been, or should be considered, in the foreground.

Furthermore, in the light of the examples gleaned from the whole range of history, it is clear that the process of picking an appropriate model need not be tied up with the verbal connotation of the term Westernization. The Renaissance of the Twelfth Century and the Greek Cultural contacts with, and borrowings from, Mesopotamia and Egypt might as well be referred to as "Easternizations".

The process of choosing a model in order to attain to the superior level represented by it is of course not necessarily tied up with Western man. It so happens though that in modern times such movements of reform or trends of modernization have been inspired by the West. For in modern times the West has been the scene of the greatest achievements in the advancement of civilization.

Rudyard Kipling has said, "East is East and West is West, and the twain shall never meet". But this is belied not only by history but also by the widely endorsed and quite old aphorism *ex oriente lux, ex occidente lex*, referring to two major constituent elements of modern European civilization. Those referred to here are the Christian religion and the Roman law, the former being an Eastern and the latter a Western contribution.

The twofold classification of humanity into the East and the West rests on prejudices arising from their being the seats or constituting the spheres of competing religions. The Crusades represent one dramatic phase of this antagonism, the one that has undoubtedly made the most deep-seated impression. The Trojan and the Græco-Persian wars of Antiquity and the imperialistic exploits of Western Europe in modern times form the prologue and the epilogue, the prelude and the concluding version, of the conceptual scheme serving to keep this idea alive.

Beyrûnî, the great scientist and thinker of medieval Islam (born in 973 A.D.), who solemnly stated that he was neither an Arab nor Persian and who was very likely Turkish, conceived of the World of Islam as a part of the West, according to Zeki Velidi Togan, and he considered India and China as the East, while he regarded Classical Greece as part of the West together with Islam.[8] This is a very

[8] Zeki Velidi Togan, *Umumî Türk Tarihine Giriş*, Istanbul 1946, pp. 75-76, 88-90, 420 (99); Z. V. Togan, "Bîrûnî", *Islam Ansiklopedisi*, vol. 2, 1949, pp. 635-637, 638, 643.

broadminded and interesting outlook. Indeed, as a result of translations the Islamic realm was in almost full possession of the intellectual heritage of Greece, while the West had almost entirely lost contact with it until the mid twelfth century, and even for the Greeks of the Byzantine Empire their ancient literature of science and philosophy had fallen into the status of closed books relegated to dusty shelves.

Under Peter the Great Russia went through a movement of Westernization. Hayes, Baldwin, and Cole write, "... Already eager to gain for Russia 'windows' on the Black and Baltic Seas, Peter in 1697 sent a special embassy to seek the aid of Western powers against the Turks. ... But Peter, who accompained the Embassy in the guise of a sea captain, avidly absorbed useful knowledge about armies, navies, forts, ship building, industry, and trade in Prussia, Holland, England, and the other countries he visited. Everywhere he went he enlisted sailors, craftsmen, engineers, and technicians, and sent them back to Russia to work on his projects.

"Impressed by the superior culture and technology of Western Europe, the Tsar was determined to 'Westernize' Russia. ..." [9]

There is no doubt, moreover, that Peter the Great (1672–1725) had considerable interest in science itself. He is known to have visited Antony van Leeuwenhoek in Holland in 1698. "to inspect his misroscopes and their revelations." [10]

Concerning his relations with Leibniz (1646–1716), Martha Ornstein writes, "Within the last five years of Leibniz' life he was seriously engaged in projects for two more scientific societies. Russia had always attracted him since it was as yet a *tabula rasa*, had not acquired the taste for studies, and could from the start be kept from the worst errors of the old system. Moreover, its hugeness and proximity to Asia fired his imagination. In 1711 he met the Czar and outlined to him his program of establishing learning in Russia; the study of the *realia* must be foremost; laboratories and observ-

[9] Carlton J. H. Hayes, Marshall Withed Baldwin, and Charles Woolsey Cole, *History of Europe*, MacMillan 1950, pp. 616-617.

[10] William A. Locy, *Biology and Its Makers*, Henry Holt 1936, p. 80; Roger Hahn, *The Anatomy of a Scientific Institution, The Paris Academy of Sciences*, 1666–1803, University of California Press, 1971, p. 74.

atories must be founded; scientific expeditions to Siberia and China should be made; extensive magnetic observations be arranged; *dictionaria technica* devised, in which the terminology of arts and crafts should be explained in words and pictures. All this could be done if supervised by a learned society such as he had established in Berlin. In Peter the Great, Leibniz felt he had found that patron of science he sought for. Peter in turn gave him a pension of £ 1,000 — but no society was established. Yet the founding of the Academy of St. Petersburg (1724) can clearly be traced to Leibniz' suggestions." [11]

Toynbee, on the other hand, writes, "What then, has been the world's experience of the West? Let us begin with Russia's experience, for Russia is part of the World's great non-Western majority. Though the Russians have been Christians and are, many of them, Christians still, they have never been Western Christians. Russia was converted not from Rome, as England was, but from Constantinople; and, in spite of their common Christian origin, Eastern and Western Christendom have always been foreign to one another, and have often been mutually antipathetic and hostile, as Russia and the West unhappily still are today, when each of them is in what one might call a 'post-Christian' phase of its history." And the same author adds, "... and a fifteenth-century Western attempt to impose Western Christianity on Russia had been a failure. In A.D. 1439, at an ecclesiastical council held at Florence, representatives of the Eastern Orthodox Church in what then still remained of the Byzantine Empire had unwillingly recognized the ecclesiastical superiority of the Roman See in the hope that, in return, the Western World would save Constantinople from conquest by the Turks. The metropolitan archbishop of Moscow, who was a suffragan of the Greek Patriarch of Constantinople, had been attending the council, and he had voted the same way as his brethern who were representing the Greek Orthodox Church; but when he came home to Moscow, his recognition of the Pope's supremacy was repudiated there and he himself was deposed." [12]

[11] Martha Ornstein, *The Role of the Scientific Societies in the Seventeenth Century*, University of Chicago Press 1938, pp. 195-196.

[12] Arnold Toynbee, *The World and the West*, pp. 4, 12.

It is seen clearly that Peter the Great's rather efficient Westernization of Russia too conforms to the pattern of transition and secular cultural change referred to above, as Greek borrowings from Mesopotamia and Egypt, Islam's contact with the remnants of Greek intellectual achievements, and the Renaissances of the Twelfth and Sixteenth Centuries. Christian missionary activity seems to be kept outside of the pale of the extensive Westernization movements that are in progress at present too, or they have at least receded much into the background.

Russia's movement of Westernization seems not to have escaped notice in Ottoman Turkey, where Europe's spectacular success in establishing extensive colonies accross wide oceanic spaces was likewise being watched with great concern. This is discernible in particular in some of the books printed by İbrahîm Müteferrika in the newly established printing press of the first half of the eighteenth century.[13]

It should be appropriate therefore to look at the Turkish Westernization also from this vantage point in particular. Indeed, a tentative attempt of this nature is seen to have begun in the so-called Tulip Period during Ahmed III's reign (1703–1730), at a time when many of the drastic reforms under Peter's leadership had barely started. Though this period was abruptly closed with an insurrection and many luxurious mansions representing the Tulip Period were demolished by the insurgents, interestingly enough the printing press introduced from Europe in 1729 remained intact. This was perhaps because, though the introduction of the printing press had long been delayed, its establishment had finally been secured with a *fetva*, i.e., it had been duly backed by the formal sanction of religious authority.

The printing press with moving types may be regarded as the symbol of this growth of interest in Europe. Again, a weaving mill for the manufacture of woolen cloth was set up in 1703 and another one in 1777 in Istanbul. Still other attempts of a similar

[13] Ahmet Hamdi Tanpmar, *XIX. Asır Edebiyatı Tarihi*, Istanbul 1967, pp. 12-13; Aydın Sayılı, "Üçüncü Murad'ın İstanbul Rasathanesindeki Mücessem Yer Küresi ve Avrupa ile Kültürel Temaslar", *Belleten* (Turkish Historical Society), vol. 25, 1961, pp. 297-435.

nature seem to have taken place in this period. But these enterprises were in general unsuccessful. In 1726 under the patronage of Ahmed III and the grand vizier Nevşehirli İbrahim Pasha, İbrahim Müteferrika and Said Mehmed Efendi set up the first modern paper mill in Turkey in Yalova. This paper mill was not long-lived either. This is attested by the report prepared for the construction of a paper mill at Beykoz in Istanbul in 1805. İt is stated there that paper is not manufactured in Islamic countries. It was from Islam that Europe had learned paper and its manufacture back in the early Middle Ages.

Both paper and textile industries in Ottoman lands had suffered heavily from European rivalry already before the industrial revolution. The older methods and procedures current and prevalent in the workshops of Ottoman Turkey had grown outmoded in the face of superior techniques developed in Western Europe.

A cloth mill was also set up at Beykoz in 1805, during the reign of Selim III (1789–1807). There is a report concerning urgent need for repairs in the water way and equipment of this mill already twelve years after its construction. The needed repairs were carried out. An eye-witness report reveals that the cloth mill lay in ruin in 1836, although Mahmud II (1808-1839) felt great interest in these industrial works. He in fact made frequent visits to these two mills. So much so that a mansion was built in the vicinity for him to take a rest when visiting these manufacturing establishments. It seems therefore that maintenance and upkeep were critical problems connected with these undertakings. [14]

Thus, we seem to have a meager attempt of industrial Westernization already in the first half of the eighteenth century. Indeed, this impression is corroborated by other relevant developments. The grand vizier Ibrahim Paşa gave instruction to Yirmisekiz Çelebi Mehmed Efendi, his extraordinary ambassador to France during the reign of Louis XV, to "duly become acquainted also with the mainsprings of prosperity and the system of education (in France) and to report on those aspects that would be capable of utilization." [15]

[14] See, Adnan Giz, "İstanbul'da İlk Sınaî Tesislerin Kuruluş Yılı: 1805", *İstanbul Sanayi Odası Dergisi*, 15 January 1968, No. 23, pp. 25-26.

[15] Enver Ziya Karal, "Gülhane Hatt-ı Hümâyununda Batının Etkisi", *Belleten* (Turkish Historical Society), vol. 28, 1964, p. 586.

M. Münir Aktepe says concerning the Grand Vizier, "İbrahim wanted Turkey to engage in no more foreign adventures, but applied himself to measures of economy and reconstruction; ... At the same time, however, he and his master encouraged perhaps by the report of Yirmisekiz Çelebi Mehmed Efendi on his Embassy to Paris and his description of Versailles and Fontainbleau, engaged in the building of romantically named *köşks* and palaces ... along the Bosphorus ..., at Eyyüb and at Kağıthane ... which were scenes of elegant parties of pleasure, of music, and of poetry ... This genuinely cultured but reckless and extravagant indulgence is epitomized in the 'tulipmania' which won for İbrahim's grand vizieriate the name of 'Lale Devri'. One important reflection on this tendency to 'Westernization' is the introduction into Turkey of the printing of Islamic works. ..." [16]

H. Bowen writes, "... The gradual abandonment of the *dewshirme* during the seventeenth century had led, with the occupation of the chief government posts by free-born Muslims, to a growth of interest among the powerful in the arts and learning, side by side with a decline in military and administrative efficiency. Moreover, the Greek community of the Phanar quarter had at the same time acquired both a stronger influence than before in metropolitan society and some familiarity with contemporary Western thought. In consequence the twelve years ensuing on the peace of Passarowitz witnessed a remarkable change of taste in poetry, music and architecture and a new inclination to profit by European examples. During this short period ... pavillions and gardens were more often built than mosques and mausoleums, and they were built to designs imported from the West. An ambassador accredited to Louis XV received specific instructions to study French institutions and report on those adaptable to Ottoman use; and in 1724 his son associated İbrahim Müteferrika to establish the first printing press in Istanbul. A French officer of Engineers was invited by the Porte to prepare plans for the reform of the army on Western lines, while a French convert to Islam organized a fire service (the *odjak* of the *tulumbadjis*); and though the reform of the army came to nothing, the organization

[16] M. Münir Aktepe, "İbrahim Paşa, Nevşehirli", *Encyclopedia of Islam*, vol. 3, 1971, p. 1002.

of the Admiralty was overhauled and the building of three-decker men-o'-war was undertaken for the first time. Some of the *ulemâ* further founded a society for the translation of books (from Arabic and Persian); ... and no less than five libraries were founded at the capital, including the Sultan's own Enderun-i Hümâyûn Kütüphanesi of which Nedim was made curator. China factories at Kütahya and İzmit were revived and a new one founded at Tekfur Sarayı at Istanbul; extensive repairs to the Byzantine walls were carried out from 1722 to 1724; and a barrage was built to provide water for the capital. ... The most notable extant architectural monuments of the period are the mosque of Ahmad III for his mother at Üsküdar and his *çeshme* outside the Bâb-ı Hümâyûn of the Topkapı Sarayı, for which he composed a chronogram himself." [17]

In the year 1716, during the grand vizieriate of Nevşehirli İbrahim Paşa, a French officer by the name of De Rochefort, submitted to İbrahim Paşa a project recommending the establishment of a corps of foreign engineers in the service of the Subline Porte. It is not known whether İbrahim Paşa made any attempt to put this recommendation into effect. It may also be mentioned in this connection that at least one of İbrahim Müteferrika's books which he printed in the new printing press contains references to the new techniques of the military art. [18]

In 1729, a veteran French officer, Claude Alexandre, Comte de Bonneval (1675–1747), took refuge in Turkey and offered to serve in the Ottoman army. He accepted the Moslem religion, was made a general and called Humbaracı Ahmed Paşa. He was appointed head of a newly instituted corps of bombardiers by Mahmud I (1730–1754) and was charged with the reorganization of the artillary class. Shortly thereafter, in 1734, a school of military engineering (or geometricians, "Hendesehane") was instituted under his direction. After the death of Humbaracı Ahmed Paşa, his adopted son Süleyman Ağa became the director of the school. The school was not long-lived, or, at least, its activity subsided considerably after a

[17] H. Bowen, "Ahmad III", *Encyclopedia of Islam*, vol. 1, 1960, pp. 269-270.

[18] See, A. Adnan (Adıvar), *La Science Chez les Turcs Ottomans*, Paris 1939, pp. 132-133, 141-142; A. Adnan-Adıvar, *Osmanlı Türklerinde İlim*, Istanbul 1943, pp. 148, 160-161; Istanbul 1982, p. 170; Ahmet Hamdi Tanpınar, *XIX. Asır Türk Edebiyatı Tarihi*, Ankara 1967, pp. 12-13.

while. For the *yeniçeri* soldiery were opposed to military innovations and reforms.

Humbaracı Ahmed Paşa was apparently not the sole instructor of the school. For the name of its first teacher of geometry has come down to us on the occasion of an invention he made. He is Muhammed Said Müftüzade of Beyşehir. He invented an artillary instrument and wrote a book on geometry, and he was introduced by the learned Şeyhülislam Pirizade Muhammed to Mahmud I for these accomplishments of his.[19]

It is therefore seen that if, as pointed out before, the year 1773, the date of the opening of the Naval Engineering School in Istanbul, during the reign of Mustafa III (1757–1773), should be taken to represent the real beginning of the Turkish Westernization movement, then, the reign of Ahmed III and the vizieriate of Nevşehirli İbrahim Paşa would turn out to represent the period of preparation for that beginning. In fact, the Military Engineering School instituted by Selim III (1789–1807) may be looked upon as a revival and expansion of the one started under Humbaracı Ahmed Paşa's direction and leadership in 1734. Indeed, claims that the Turkish Westernization movement should be traced back into the eighteenth century have been made by several scholars.[20]

A Statement by Baron de Tott would seem to indicate that the school under Süleyman Ağa was not entirely disbanded, or, at least, had not long been interrupted when Baron de Tott started teaching in the Naval Engineering School. Koca Ragıp Paşa, poet and scholar grand vizier of Mustafa III, is said to have gathered the members of the Humbaracı School and to have had them secretly trained in mathematics.[21]

Now, it has been suggested that the phenomenon of "Westernization" should be subsumed under the broader category of major periods of transition in accordance with a previously conceived model or paragon and that it would be more in keeping with the examples

[19] Adnan-Adıvar, 1939, pp. 142-143; Adnan-Adıvar, 1943, pp. 161-162; 1982, pp. 182-184.

[20] See, Enver Ziya Karal, "Tanzimattan Evvel Garplılaşma Hareketleri", *Tanzimat I*, a Turkish Ministry of Education publication, 1940, pp. 13-30.

[21] Adnan-Adıvar, 1939, pp. 152-153; Adnan-Adıvar, 1943, pp. 181, 182-183.

of such trends in universal history to give prominence in cultural contacts of this type to science, technology, and the sectors of intellectual endeavor that come more directly under the sphere of influence of scientific work. We should therefore try to ascertain whether there was also a noteworthy awakening of interest in European science in Ottoman Turkey during the eighteenth century.

During the reign of Murad IV (1623–1640), Şemseddîn-i İtâkî wrote an illustrated book on anatomy.[22] In the field of medicine, some influences, usually fragmentary, are seen to have been received from certain European physicians, the most important among them being Paracelsus and Girolamo Fracastoro.[23] But the most substantial influence from European science and learning, in the seventeenth century, came from the field of geography, thanks to Kâtip Çelebi, and this would seem quite natural in view of European advances in the field of navigation and the spectacular activities of Western European nations in the domains of geographical exploration and colonization.

Kâtip Çelebi (Haji Khalifa) was helped in this work by a learned Frenchman who had embraced the Islamic religion. Interest in geography in Ottoman Turkey was apparently quite intense and it went back to the sixteenth century. Indeed, several books were written in this field and new European maps were eagerly sought in Turkey.[24]

Koçi Bey, in his memorandum presented to Murad IV, complains about an intellectual decline in the Ottoman Empire and about deterioration in the quality and efficiency of its schools of higher education, the madrasas. He refers more specifically to the instruction and cultivation of jurisprudence and the Islamic or revealed

[22] Aydın Sayılı, "Ortaçağ İslâm Dünyasındaki İlmî Çalışma Temposunun Ağırlaşmasının Bazı Temel Sebepleri", *Araştırma*, vol. 1, 1964, pp. 67-68; Esin Kâhya, "Şemseddin-i İtâkî'nin Resimli Anatomi Kitabı", *Araştırma*, vol. 8, 1970, pp. 173-186.

[23] Adnan-Adıvar, 1939, pp. 98-99; Adnan-Adıvar, 1943, pp. 110-114; 1982, pp. 131-135.

[24] Adnan-Adıvar, 1939, pp. 107-117; Adnan-Adıvar, 1943, pp. 120-129; 1982, pp. 141-149; A. Sayılı, "Üçüncü Murad'ın İstanbul Rasathanesindeki Mücessem Yer Küresi ve Avrupa ile Kültürel Temaslar", *Belleten* (T. H. S.), vol. 25, 1961, pp. 397-445.

sciences in general, while his contemporary Kâtip Çelebi was bitterly grieved over the neglect suffered by secular or rational sciences such as mathematics, astronomy, and natural philosophy.[25]

Kâtip Çelebi's appreciation of European accomplishments in science and learning and his reiterated admonitions against the neglect of the secular sciences were probably not altogether ineffectual. They may very well have contributed to the awakening of an interest, in the beginning of the eighteenth century, in science and learning in general and in European science and technology in particular, to which some reference has already been made.

During Ahmed III's reign a committee of twenty five persons was charged with the translation of certain important books into Turkish. These were mostly Arabic and Persian books, as mentioned some pages back, but there were European ones among them also. A commentary of Aristotle's physics by a Greek scholar who had apparently been professor at Padua University for a short time was among those translated but it was probably not completed. The physician Şifâî (d. 1742) translated one of Paracelsus' books. He also wrote a book on chemistry which is an adaptation from European works. He was well acquainted with Paracelsus' chemical medicaments, or more generally speaking, arcanas, and said they could be harmful unless prescribed judiciously by those fully competent to do so. European iatrochemistry probably showed signs of spreading rather fast in Turkey, and the need was felt to check this development and keep charlatans out of the medical profession. Ömer Şifâî gives a good description of syphilis which he accepts to be of American origin, and his knowledge of syphilis too reveals exposure to European influence. Some of the books printed in the İbrahim Müteferrika printing house also served as vehicles of cultural contact with Europe. In the first half of the eighteenth century there was a book on geography translated by an interpreter of the Embassy of Netherlands to be added to our list.

A book on trigonemetry of unknown authorship but based on two European books was presented to Mahmud I (1730–1754) and about this time a work on military art was translated. During the

[25] Adnan-Adıvar, 1939, pp. 92, 105-106; Adnan-Adıvar, 1943, pp. 105-106, 119, 130-131; 1982, pp. 126-127, 140, 150-151.

reign of Mustafa III, in medicine, Vesim Abbas was an important writer from the standpoint of introducing European medicine into Turkey, and a physician called Abdulaziz translated Boerhaave's aphorisms into Turkish with the help of a certain interpreter. The European commentary on Dioscorides mentioned previously in connection with seventeenth century infiltration of European ideas into Turkey was also translated into Turkish a few years later.

Mustafa III was interested in astrology, and he requested a good book on astronomy to be sent to him from France, whereupon the French Royal Academy of Sciences sent him a collection of works among which one was Lalande's book with astronomical tables. In Ahmed III's time Cassini's astronomical tables were brought to Turkey by Yirmisekiz Çelebi Mehmed. Mustafa III charged Ismail Kalfazade Çinarî to translate this work into Turkish. Çinarî added to this translation as appendix, the first Turkish table of logarithms (1771). He also translated Lalande's astronomical tables. According to Toderini, the grand vizier Koca Ragıp Paşa wished Voltaire's book on Newton's natural philosophy to be translated into Turkish, but it seems that this project was never materialized. Around these times, it may be noted, an increase in the number of European physicians in Istanbul is observed to have taken place.[26]

Concerning Abdülhamid I (1774–1789), M. Cavid Baysun writes, "Although Abdülhamid I, who succeeded to the throne at an advanced age after spending most of his life in the seclusion of the palace, cannot be considered an energetic and successful sovereign, he is noted for his zeal, humanity, and benevolence. He gave wide powers, for that time, to his grand viziers and left them free in their conduct of affairs. ...

"The most important of the grandviziers of Abdülhamid I was Khalil Hâmid Pasha, who was a supporter of reforms and who, in order to put them into effect, tried to dethrone the old Sultan and put the young prince Selim (afterwards Selim III) in his place. During the tenure of office of this enlightened grand vizier, who paid for his attempt with his life, the corps of Cannonneers, Bombardiers, and Mariners were reorganized.

[26] Adnan-Adıvar, 1939, pp. 127-130, 134-136, 143-144, 146-157; Adnan-Adıvar, 1943, pp. 139-145, 149-153, 162-163, 169-175, 179-183, 185; 1982, pp. 159-165, 170-174, 183-184, 189-195, 199-203, 204-205.

"The opening of the Imperial Naval Engineering School ... and the reopening of İbrahim Müteferrika's printing house, which had been allowed to fall into disuse, are among the achievements of Abdülhamid I. ..." [27]

Abdülhamid I reorganized and enlarged the Naval School started in 1773. Selim III (1789–1807) started, just after his accession to the throne, an engineering school for artillary officers and enlarged it first in 1793. This school was reorganized and perfected in 1795 and given the name of the Imperial Army Engineering School Turkish, Arabic, and French were among the courses given in this school in addition to those in the basic sciences and technical subjects. [28]

Thus, if the infiltration of European science into Ottoman Turkey is qualified as not much more than a trickle up to the time of Selim III, from this time on the scientific borrowings from Europe gained considerably in volume, and this quickening of pace and increase in momentum continued throughout the nineteenth century. But the gap between these two worlds was enormous, and to plan to reach Europe's level in science and learning meant to shoulder a formidable task. This was an undertaking of far greater magnitude and stature than those ventured by Islam in the eighth and ninth centuries and by Western Europe in the twelfth century. But the main difficulty was owing to the fact that Europe was increasingly modifying and improving itself. In science and technology especially the goal Turkey was striving for was not static. It was continuously in the process of surpassing and transcending itself.

In addition to the obvious difficulty of venturing a tremendous leap from a medieval level of knowledge to a nineteenth century European level or stage of accomplishment, there were the retarding forces of fanaticism and the inertia of established tradition. It is of interest, e.g., that the introduction of the printing press was officially specified to be for the purpose of printing books not pertaining

[27] M. Cavid Baysun, "Abd al-Hamid I", *Encyclopedia of Islam*, vol. 1, 1960, p. 63.

[28] Adnan-Adıvar, 1943, pp. 186-188; 1982, pp. 206-209; Hamdi Peynircioğlu, "Türkiye'de Mühendislik Öğretiminin Tarihçesi", *Istanbul Teknik Üniversitesi 1948–1949 Ders Yılı Açılış Töreni Konuşması*, Istanbul 1967, pp. 1-4; A. H. Peynircioğlu, "A Comparative Study of the Engineering Education in Turkey", *CENTO Conference on Engineering Education*, 1967, p. 91.

to religion and jurisprudence. For such was the opinion of the *ulemâ*, and the *grand muftî* issued a proclamation to this effect. And when in 1716 a grand vizier died in the battle with Austria he had left behind a sizeable collection of books. These books were to be but at the disposal of readers at a public library, but the grand mufti declared that books on philosophy and the science of the stars should not be admitted into public libraries.[29]

Toderini says that the Turkish intellectuals have respect for the philosophical and scientific attitude or mentality that posits a creating principle as distinct and separate from matter but that they frown upon those who admit no other principle than nature and matter, considering them impious and blameworthy.[30] There was in general a whole system of customs and prejudices to which outward conformity and lip service had to be given, and the mere pulling down of the wall of prejudice and ignorance constituted a major problem. It was necessary therefore to countermand and compensate first of all various sorts and shades of bigotry through more liberal and enlightened enterprises, and this usually required and necessitated the prerogatives of the sultans.

To compare Western Europe and Ottoman Turkey, or the World of Islam, with respect to scientific work, a small comparison of scientific publications may be instructive. The first book published by İbrahim Müteferrika was printed in 1728. This printing house had remained idle for a while, and, as we have seen, it had been revived by Abdülhamid I. Selim III, on the other hand, set up a second printing house in Üsküdar. Now, the number of books printed in these two printing houses up to the year 1830, i.e., in about one hundered years, has been estimated to be 97, 17 of these having been printed by İbrahim Müteferrika.[31] If we compare this with the scientific incunabula, i.e., books on science and philosophy printed in Europe up till the last day of the year 1500, i.e., in a period of about fifty years, their number is slightly bigger than one thousand, and if we count repeated editions or impressions of the same books

[29] See, Adnan-Adıvar, 1939, pp. 133, 125-126; Ahmet Refik, *Hicrî XII. Asırda Osmanlı Hayatı*, Istanbul 1930, p. 57.

[30] Toderini, *De la Littérature des Turcs*, 1788, French tr. by Cournand, vol. 1, pp. 108-109.

[31] Adnan-Adıvar, 1943, pp. 187, 152; 1982, p. 173, 207.

separately, then the number exceeds three thousand. And, chronologically, there is a difference of about three centuries between the two periods considered.[32] Moreover, in none of the previous examples of borrowings from another culture or civilization was there an involvement in a crucial and crying question of keeping abreast of a highly advanced and rapidly developing complex of science and technology.

All in all, Westernization in Turkey may most conveniently be started roughly with the reign of Selim III or, somewhat earlier, with the opening of the Naval Engineering School. The first three quarters of the eighteenth century may perhaps be regarded as a period of preparation for it. We should therefore try to ascertain what efforts were expended in the way of industrialization, and the adoption of the European activity of research in pure science, in Ottoman Turkey during the nineteenth century.

There is no doubt indeed, because of the stiff rivalry she was subjected to, that Ottoman Turkey was aware of the emergence of a superior European industry especially with the advent of the industrial revolution of the second half of the eighteenth century and that she exerted a creditable and rather persistent effort during the nineteenth century to adopt Europe's incipient revolutionary technology. And although, quite generally, these attempts largely failed in the long run, they clearly show that Turkey had a genuine appreciation of the fact that the opening of military engineering schools and close acquintance with new military techniques were not sufficient for coping with the formidable challenge emanating from the stupendous strides and the marvelous growth of the Western civilization. The continuation of the policy of emphasizing the basic importance of education is evidenced by the opening, throughout the nineteenth century, of mancy schools of higher education and the effort not only to develop and spread intermediate education but also to make primary education compulsory early in the second quarter of the nineteenth century.

Edward C. Clark points out that in the 1890s "Selim III took an intense personal interest in improving the manufacture of mili-

[32] See, Aydın Sayılı, "Ortaçağ Islâm Dünyasında İlmî Çalışma Temposundaki Ağırlaşmanın Temel Sebepleri", *Araştırma*, vol. 1, 1963, pp. 65-66.

tary goods. As early as 1793–1794 he introduced contemporary European processes and equipment for the production of cannon, rifles, mines, and gunpowder. Numerous difficulties prevented Selim from fully realizing his goals, but he persevered. As late as 1804, for example, he initiated the construction of elaborate buildings to house a woolen mill for uniforms and a paper factory near the Bosphorus at Hünkâr İskelesi. Following the overthrow of Selim III few if any industrial improvements seem to have been attempted in the first two decades of Sultan Mahmud II's reign, but this hiatus was followed by a burst of activity. A spinning mill was built near Eyyup in Istanbul in 1827, a leather tannery and boot works at Beykoz was improved early in the 1830s, a part of the paper factory at Hünkâr İskelesi was converted to cloth manufacturing in the same years, a *Feshane* was established in 1835 to supplement hand manufacture of the new headgear, a woolspinning and weaving mill began operating south of the Balkan Mountains in İslimiye about 1836, a new saw mill and copper sheet-rolling mill were built also about then near Tophane, and in the late 1830s both the Tophane cannon foundary and Dolmabahçe musket works were converted from animal to steam power.

"With the partial exception of the *Feshane*, these early attempts to introduce European industrial methods were devoted exclusively to the manufacture of goods intended for governmental and military use. . . .

". . . from 1841 or 1842 to the eve of the Crimean War (1854–1855) a great number of Ottoman state manufacturing facilities were built. In variety as well as in number, in planning, in investment, and in attention given to internal sources of raw materials these manufacturing enterprises far surpassed the scope of all previous efforts and mark this period as unique in Ottoman history. They constituted the main Ottoman hope for a true industrial revolution.

". . . Its manufacturing center on the shore near Zeytinburnu contained a foundary and machine works designed for the production of iron pipe, steel rails, plows, bits, stirrups, locks, lanceheads, cannons, swords, knives, razors, and other forgings and castings of any desired complexity or quantity. . . . A technical school was established nearby.

"Also in this Istanbul complex was a second manufacturing unit built west of Zeytinburnu. . . . This included a factory to spin, weave, and print calicoes, another iron works with a furnace and two forges, and a boatyard equipped for the contsruction of small steamships. . . .

"An ambitious model farm project was established farther west toward Yeşilköy (San Stefano), still within the same complex. Based on French prototypes, it was supplied with new strains of livestock, various experimental crops, and thousands of seedling trees. Students were recruited from a new school of advanced agricultural techniques that was located on the premises." [33]

A little further on we read, "Nearly all the machinery for these industries had to be imported from Europe. . . . Some was bought piecemeal whereas some, like the Hereke silk works, were bought bag and baggage, including the shop steward and all hands. Most if not all foremen, master craftsmen, and skilled workers of necessity came from abroad to assemble, operate, and repair factories and equipment. . . ." [34]

Thus, the nineteenth century industrialization program of the Ottoman Empire was extremely ambitious, but it was hampered by problems of raw materials, construction, transport, personnel, inefficient operation, maintenance, and distribution which required intricate planning and coordination. There were also problems of mismanagement, lack of experience, political complications, European rivalries, periods of international depressions, introduction of new developments and improved techniques in industrialized nations and the obsolescence of old equipment. Undoubtedly, a weighty and fundamental factor was simply the inertia towards innovation and the difficulty of adaptation to a new situation sharply divergent from prevailing old traditions. [35] The most crucial cause for this

[33] Edward C. Clark, "The Ottoman Industrial Revolution", *International Journal of Middle East Studies*, vol. 5, No. 1, January 1974, Cambridge University Press, pp. 66-68. See also, Ömer Celal Sarç, "Tanzimat ve Sanayiimiz", *Tanzimat I*, Millî Eğitim Bakanlığı publication, Istanbul 1940, pp. 423-440.

[34] *Ibid.*, (Clark) p. 69.

[35] E. C. Clark, *op. cit.*, pp. 74-75. See also, Rifat Önsoy, "19. Yüzyılda Osmanlı İmparatorluğunda Sanayileşme Teşebbüsleri", *Millî Kültür*, vol. 2, No. 3, 4, 5, August, September, and October 1980, Turkish Ministry of Culture publication, pp. 71-74.

failure was undoubtedly the inability of the nascent Ottoman industry to compete with European industrial innovations, and the non--existence in Turkey of a research activity in pure science anywhere near that of Europe lay at the heart of this problem and constituted its most crucial issue.

Consequently, these attempts towards industrialization turned out to be ineffectual and unsuccessful. The trend ended up in failure and bankruptcy, with the exception of a few centers and varieties of textile industry. Edward C. Clark writes, "Despite fire, earthquake, obsolescence and decay, four factories continued to produce wool, cotton, and silk goods during the remaining years of slow Ottoman decline. The İzmit wool mill finally was abandoned during World War I, but its looms were transferred at least in part to the *Feshane*, where wool cloth still is produced today by government agencies at the *Defterdar Fabrikası*. At Bakırköy, cotton spindles and looms also continued to manufacture for the military, and in so doing established the rather unenviable record of undergoing absolutely no improvement for more than a half-century. Under the name *Bakırköy Bez Fabrikası*, or more popularly the *Basmahane*, this factory too still operates for the Turkish government. The last of the four is the Hereke mill, whose more luxurious silk and wool products are currently sold to the public through Sümerbank.

"It is this minor industrial continuity into the present which was the most influential outcome of the original plans. The several Ottoman factories, their machines, and their employees formed a nucleus of experience and precedence that were inherited by the Turkish Republic." [36]

In Europe, during the age of industrial revolution purely empirical inventions generally loomed large in technological developments and innovations. Such was clearly the situation in the textile industry, e.g., which within the space of about two generations was transformed out of all recognition. Before the industrial revolution, i.e., before the last quarter of the eighteenth century, whatever machinery existed was run mostly by hand or foot and was operated in the houses of industrial workers. Then within a short span of time the factory system came with collective labor in newly

[36] E. C. Clark, *op. cit.*, pp. 75-76.

formed power plants and with machinery driven by water power or steam. This was the gist of the industrial revolution which increased the individual output and modified the very structure of human society.

In all branches of the textile industry in particular a large number of patents were issued for empirical innovations. Referring to such patents, President Lincoln of the United States said that they added the fuel of interest to the fire of genius'. Again, it was reported that 'in the metal industries of Birmingham and Sheffield, almost every master manufacturer hath a new invention of his own and is daily improving on those of others'. Josiah Wedgewood, one of the most outstanding figures of the glass and pottery industries in England in the second half of the eighteenth century, was a potter's son who began to work on the potter's wheel as an apprentice when still a child. He set up his own business later on, and up to his death in 1795 he used to mix experimental clays in secrecy, in the hope of improving on his own procedures and techniques in quality, usefulness, and efficiency.[37]

The following short passage can help us gain a good panoramic view of the situation:

"... the use of water power began before the introduction of steam, but the perfection of the steam engine by Watt ... was powerfully aided by the scientific studies of his fellow countryman Black, on heat, steam, evaropation, and calorimetry, which greatly hastened, and soon made almost universal, the mighty change. Henceforth machinery was to become the handmaid of toil, and to bring with it not only factory industry in place of home industry but before long improved means of transportation, effecting a virtual shrinkage of the world and a far closer contact of mankind. Almost coinciding with the introduction of water power and steam power, came a great burst of invention. The spinning "jenny" and "water frame" came almost hand in hand with the "mule" and the "power loom"; while, as if to meet these on the cotton field, the cotton "gin" (engine) was invented (by Eli Whitney of Connecticut) to replace the slow

[37] See, T. K. Derry and Trevor I. Williams, *A Short History of Technology*, Oxford 1960, pp. 557, 557-558, 279, 281, 586.

and tedious process of separating the cotton fibre or staple from its seed — hitherto laboriously done by hand. . . ." [38]

Derry and Williams write, "One other feature common to the industrial revolution of different countries is the increasingly significant part played by the growth of scientific and mathematical theory. Broadly speaking, we may say that throughout the nineteenth century the role of the scientist as a pioneer of industrial changes was becoming more evident in each of the major countries concerned, though even in 1900 his was rarely that all important role which we associate with the research scientist of today. In general, the period in which British industries led the world coincides with that in which the empirical was preferred to the purely scientific approach to industrial problems: certainly, that leadership was already waning before the doctrine that Ludwing Mond, a naturalized German, expounded to the Society of Chemical Industry in 1889, became a commonplace even in Britain: 'The slow methodical investigation of natural phenomena is the father of industrial progress.' [39]

Methods of production adopted by chemical industry are often the laboratory procedures of chemical research adapted to the practical requirements of large-scale production with the least possible costs. Wolf sums up the birth of modern chemical industry in the tfollowing words:

"The eighteenth century witnessed the beginning of industrial chemistry, i.e., the comparatively large-scale manufacture of chemicals for industrial use. In the main, this was not, at first, any real advance in chemical science, not did it immediately add anything to the practical knowledge of chemistry. The methods employed were the old traditional methods which had been discovered empirically by the method of trial and error. The improvements introduced related almost wholly to the greater convenience, rapidity, and cheapness of production. The chemicals in greatest demand for industrial use in the eighteenth century were sulfuric acid and alkali; and they were required chiefly for use in the metal, bleaching, and dyeing industries.

[38] W. T. Sedgwick and W. H. Tyler, *A Short History of Science*, 1935, pp. 320-321.
[39] Derry and Williams, *op. cit.*, p. 280.

"... During the Napoleonic wars France found herself cut off from her usual supplies of crude soda. The Paris Academy of Sciences tried to stimulate the inventiveness of French chemists by offering a prize for the best method of manufacturing soda. The prize was won, in 1790, by Nicolas Leblanc (1742–1806), who thus became the founder of the soda industry. ...

"The manufacture of soda on an industrial scale was begun in 1791, and it developed rapidly. In England the manufacture of soda was not taken up till 1823, when Musprat erected a plant in Liverpool. ..." [40]

The birth of the electrical industry and its development both were direct consequences of scientific research. The word "birth" in this context means unequivocally the creation, the passage virtually from non-existence into existence. In addition, the transition from stage of laboratory experiments to that of profitable practical application was not long to follow, whether we think of the electric cell, the battery, or the magneto-electric generators, or things like the telegraph and the telephone.

The technological field of optical instruments made certain specific demands on the glass industry. The most simple ones were the removal of all traces of cloudiness from glass and the elimination of bubbles and other flaws. The microscope objective, moreover, brought to the fore the question of chromatic abberration in particular. There were many technical as well as scientific difficulties to be surmounted.

Carl Zeiss who combined a wide university training with extensive practical experience set up an optical-instrument workshop in Jena in 1846. In 1866 he took Ernst Abbe, mathematician and physicist at Jena University, into partnership. In 1883 Abbe carried out elaborate calculations on lenses which would be corrected for chromatic aberration for three different wavelengths and, in addition, for spherical aberration. The materialization of these theoretical conditions made necessary, however, the manufacture of glasses with entirely novel characteristics, i.e., with special optical properties envisaged and stipulated by the calculated results. At this juncture,

[40] A. Wolf, *A History of Science Technology and Philosophy*, vol, 2, XVIIIth Century, London 1938, pp. 641, 647-648.

technical collaboration with Otto Schott, who had been experimenting with lithium glass proved extremely fruitful. He was persuaded to undertake new experiments which led to the development of borate and phosphate glasses, and thus the Zeiss Firm made great strides chiefly with the help of well-coordinated mathematical and experimental work.[41]

John W. Servas writes, "The creation of institutions for the direct application of scientific theory and methods to industrial problems has been a prominent aspect of the development of science during the past century. From the 1870s business firms in Germany began to use significant numbers of scientists for more than such limited purposes as quality control: science became assential to the product and process innovation upon which entire industries depended. By 1900 in Germany and by 1920 in America, businessmen might turn to several institutions where science could be harnessed to meet their needs. ...

"The university did not remain untouched by the expansion of science-based industry. Indeed, university laboratories came to join the ranks of those institutions that served as sites for the application of science. German firms were pioneers in forging links between industry and university laboratories during the late nineteenth century. ..."[42]

It would be appropriate undoubtedly to speak of an industry-based science by the side of a science-based industry as its correlative, or as its match or counterpart. The optical industry just referred to briefly .constitutes a fine example of this interdependence.

The technical difficulties of manufacturing achromatic lenses consisting of two or more tiny lenses with strongly curved surfaces and fit for use as microscope objectives remained unsolved up to the nineteenth century, at least if we disregard a few exceptional cases and patient experimenters. The opticians' method of work was one of trial and error. Out of about one thousand simple lenses,

[41] Maria Rooseboom, *Microscopium*, Leiden 1956; Trevor I. Williams (ed.), *A Biographical Dictionary of Scientists*, pp. 1, 573.

[42] John W. Servos, "The Industrial Relations of Science: Chemical Engineering at MIT, 1900–1939", *Isis*, vol. 71, 1980, p. 531.

e.g., they would succeed in composing one or two satisfactory objectives. [43]

Arthur Hughes says, "The invention of the microscope in the seventeenth century disclosed a new world, that of the hitherto invisibly small, and summoned the student of nature to explore it. Efforts to meet this challenge have continued ever since; though always the horizon of final comprehension steadily redeces with each new forward step. Robert Hooke, with his imperfect compound microscope, baffled in the search for nature's 'appropriated instruments and contrivances to bring her designs and ends to pass', stands here beside the contemporary electron microscopist still without sight of the physical gene." [44]

The same author says, "Thus by the early 188os cytologists were in command of a number of technical facilities which had been separately developed in the preceding years. Refined methods of staining, the new techniques of accurate section cutting, and the oil-immersion lens were all available much at the same time." And, later on he adds, "... It may be said that in few other branches of cytology has progress so closely followed on the heels of the ever-widening technical capabilities of the instruments. ...The history of citology, or of aynthing else, can by no means be deduced from the study of one single constituent factor; yet it is with the visual information presented to the eye of each investigator that our enquiries must begin." [45]

Just as the microscope disclosed a new world which had even at the most primitive stages of the development of that instrument baffled imagination, so the telescope and spectroscope have widened the field of human vision beyond all expectations. Thanks to Christian Huygens (1629–1695), Newton (1642–1727), and Thomas Young (1773–1829) the wavelike aspects of light were detected. The wave theory of light then became a subject of detailed scientific research. Color thus changed its status of a so-called secondary quality and came to partake of the characteristics of "primary qualities" amenable to quantitative treatment and investigation. The concept of

[43] Rooseboom, *op. cit.*, p. 17.
[44] Arthur Hughes, *A History of Cytology*, 1959, p. IX.
[45] *Ibid.*, pp. 16, 24.

color thus became susceptible of being envisaged within an incredibly wide perspective out of all proportion in scope to its ordinary common sense conceptual frame.

The spectacular advances achieved in the fields of astronomy and spectroscopy have been largely owing to the constant enrichment and improvement of the equipments and instruments used by researchers. But these very instruments have been essentially the outcome of that scientific work itself.

This is a good example of interdependence of science and technology. The relationship is one of give-and-take. This reciprocity of relations does in fact work on a much larger scale and in a much more general way. Sciences are both builders and products of growing and dynamic societies ever since the dawn of history.

There are undoubtedly many other examples of fields of scientific research which are highly dependent on advanced technology in general and on precision instruments in particular. But, in some very important cases, scientists do first class creative work with very modest equipment or tools and without necessarily having to spend much money.

Henry C. King writes, "When we think of the telescope we are at once reminded of its long and brilliant association with astronomy. But for this, our present knowledge of the heavens would be little in advance of that of the Renaissance astronomers, who thought that the solar system extended no further than Saturn's orbit and stars just visible to the naked eye marked the outer limits of the sidereal universe. Modern astronomy, in fact, dates from 1610, when Galilei directed one of his first telescopes skywards and at once extended the frontiers of the observable domain nearly a hundred fold. Since then the process has continued, owing to the use of larger and more powerful instruments and to the rise of photography and spectroscopy in the last century." [46]

Photography was of service in astronomical research by increasing sensitiveness and precision in observational work. Another great advantage presented by photography was that it could see where the human eye is totally blind. This is true for both the ultraviolet

[46] Henry C. King, *The History of the Telescope*, London 1955, p. IX.

and the infrared regions of the spectrum. The part of the infrared sector which lay outside the range of the photographic plate was investigated painstakingly by researchers and the range of the detectable infrared radiation was extended by the end of the last century to more than one third of a milimeter wavelength. Similar work was done for the ultraviolet region of the spectrum by the physicists. In the meantime X-rays and the phenomenon of radioactivity was discoverd at the end of the last century, and the gamma rays were shown to be of electromagnetic nature with wavelengths shorter than X-rays. It was thus clearly established by the end of the first quarter of our century that the visual range of electromagnetic waves cover only a veritably small portion of the radiation which is emitted from physical bodies and is packed with rich information concerning the sources from which it proceeds. [47]

All this was the direct outcome of pure scientific research and laboratory work. It depended nevertheless on the continual supply of a rich variety of specialized equipment and precision instruments which were highly dependent on advanced technology.

The fundamental supremacy of the contribution of science to technology lies in the systematic nature of scientific knowledge. Scientific progress, or the growth of scientific knowledge, has to take place along lines determined by its own nature or structure, by the logic inherent in the emerging systematic knowledge, while innovations made in technology unaided by science are prompted by the dictates of the needs and exigencies of the time and are consequently apt to present themselves in the form of isolated discoveries or inventions. Pure technology therefore naturally lacks the cumulative and progressive characteristics of scientific knowledge whose growth takes place usually in a gradual manner and at times in the form of sudden leaps based upon the reorganization or overhaul of accumulated factual data or partial and isolated conclusions.

Moreover, the very function of technology, its very aims and objective, is to meet, to gratify human needs. It is a type of behavior

[47] See, Aydın Sayılı, "Astronomy Yesterday and Today", *International Symposium on the Observatories in Islam*, 19-23 September, 1977, *Proceedings of the Symposium*, Istanbul 1980, pp. 11-13, and 9-17 passim.

whereby man acquires mastery over his environment and improves his efficiency in the conduct of his daily affairs. But human needs are generally not in a position to make apt suggestions as to the ways and means of meeting or fulfilling those needs. The urgent requirements or exigencies of the old Egyptians for moving heavy stones could not possibly have contained clues leading to the creation of the powerful cranes of different kinds of our day.

Indeed, the many and diverse fields of science form the veritable sinews of effective technological progress. Technological research can gain greatly in fruitfulness and efficiency if it can establish contact with a sector of scientific knowledge useful to it and acquire thereby the possibility of proceedings systematically and methodically to its goal.

A technological problem or complex of problems thus acquires or gains the chance or possibility of being treated or approached with the help of a certain scientific discipline, i.e., it gains the advantage of becoming absorbed into that field of science. As science has the tendency to develop along lines determined by its nature, social and economic concerns should therefore not be allowed to dictate or unduly inspire the topics and lines of scientific research lest technology defeat its own purpose by leading science into less productive paths.

No promptings of daily needs or social and economic considerations would have led to the discovery of current electricity and the invention of the electric cell by Galvani and Volta about the end of eighteenth century and nor to the discovery in 1820 of the action of a current on a magnet free to move. But these have touched off a formidable array of elaborate researches that lie at the bottom of the gigantic electrical industry of our day.

The repercussions of the discovery of the electron and the coming of the atomic age could not have been foreseen and neither could the discovery have been made except through work conducted in accordance with the requirements of pure disinterested scientific curiosity. Again, Roentgen's chance discovery of X-rays in 1895, inaugurating a new era in physics and medicine, could not possibly have been planned in advance. Likewise, Henry Becquerel's chance discovery, in 1896, of a mysterious new ray was seemingly not the

sort of accident to occupy front pages in newspapers, but it had world-shaking consequences. It brought to light the phenomenon of radio-activity, and this meant a new world awaiting to be explored, with all its industrial and technological repercussions. Indeed, momentous discoveries can rarely be planned in advance and truly creative research will inevitably transcend previously made plans and projects.

Scientific research should therefore not be diverted from the path of growth consistent with its internal structure and logic. It should not be forced to passively follow the dictates of practical needs, if technology is to enjoy fully from the advantages accruing from being based on or aided by the solid and reliable knowledge supplied and made available by pure science.

Disinterested research in pure science thus has a very important part or role in improving man's life and guiding him in all his decisions. Indeed, sound and systematized knowledge can serve as a reliable and indispensable guide not only in matters pertaining to the material aspects of civilization but also in all sorts of social, administrative, and moral questions.

All this leads us to asking ourselves the following questions: Did such ideas possibly gain any appreciable validity, recognition, or importance in the course of time in the Turkish movement of Westernization? Or to what extent was the dynamic aspect of pure science and its value in the growth of civilization grasped; and did it gradually come to be regarded as a constituent part of the policy of Westernization?

As we have seen, Russia in Peter's time tried to appropriate Western European science together with its industry and technology. Toynbee writes: "Peter launched Russia on a technological race with the West which Russia is still running. Russia has never yet been able to afford to rest, because the West has continually been making fresh spurts. . . ."[48] We also know that Russia did not quite fall behind Western Europe in scientific work. E. T. Bell says e.g., "...Mathematics owes an undischargeable debt to Frederick the Great of Prussia and Catherine the Great of Russia for their broadminded liberality. They made possible a full century of

[48] A. Toynbee, *The World and the West*, 1952, p. 9.

mathematical progress in one of the most active periods in scientific history. In Euler's case Berlin and St. Petersburg furnished the sinews of mathematical creation. ..." [49]

Moreover, it is undoubtedly reasonable to think that in the international technological race Russia has managed not to fall much behind the rest of Europe, because she has always had the scientists that could help her catch up with any new technological revolution. The following passage from Bernard Jaffe concerning Mendeleef whose mother was a Tartar, i.e., Russian Turk, may serve as a good example:

"In 1876, Mendeléeff was commissioned by the government of Alexander II to visit the oil fields of Pennsylvania. These were the early days of the petroleum industry. In 1859, Colonel Edwin L. Drake and his partner "Uncle Billy" Smith had gone to Titusville, Pennsylvania, to drive a well sixty-nine feet deep—the first to produce oil on a commercial scale. Mendeléeff had already been of invaluable service to Russia by investigating and throwing open her extensive oil fields of Baku in the Caucasus. ...

"On his return from America Mendeléeff was again sent to study the naphtha springs in the south of Russia. He did not confine his work to the gathering of statistics and the enunciation of theories. He developed in his own laboratory a new method for the commercial distillation of these products and saved Russia vast sums of money. He studied the coal region on the banks and basin of the Donetz River and opened it to the world. He was an active propagandist for Russia's industrial development and expansion, and was called upon to help frame a protective tariff for his country." [50]

It is clear, nevertheless, that Russia did experience certain difficulties in keeping abreast of Western Europe in science and technology, a situation which gave rise to a drive for self-sufficiency and independence of "Russian science". In as late as 1869 the following words were pronounced in an address before a crowded Russian scientific congress:

"The traditional absence of concentrated scientific work in Russia once drove our scholars to Western European centers where

[49] E. T. Bell, *Men of Mathematics*, New York 1937, p. 141.
[50] Bernard Jaffe, *Crucibles*, New York 1936, pp. 214-215.

science was highly developed; but the congresses have helped us mobilize our forces for a scientific study of Russia itself. The Western centers should not loose all significance for us; however, they should serve only to supplement Russian science. . . ." [51]

On this question Vucinich writes as follows:

"The nationalism of Russian scientific community was not nurtured by blind demands for a Russian science isolated from the broader world of science, but by a profound desire for more extensive Russian participation in the world of scholarship, which could best be achieved through a more rational and effective mobilization of native talent.

The popular pressure on scholars to write in the Russian language opened the gates of scientific scholarship to many young men from the middle and lower classes. However, the same pressure tended to reduce the value of science as a source of international prestige, since very few foreign scholars could read Russian. This was a serious problem, for Russian scientists were eager to reach the world of scholarship outside Russia as they were to ensure a wide circulation for their ideas at home. At the Fifth Congress of Russian Naturalists, Mendeleev . . . urged that summaries of the current works of Russian scientists be published in foreign languages. . . ." [52]

As we have seen, Western technology was highly appreciated in Ottoman Turkey. The adoption and establishment of European-type schools on military techniques and of western technology were also accorded precedence and priority in the Turkish movement of Westernization. It is of interest therefore to try to ascertain the nature and extent of the value accorded to basic science and scientific knowledge in general, but more particularly to the activity of research in pure science.

Turks were quite aware that the genius of the Ottoman Empire had somehow started to slumber. They had also shown interest in discovering the crucial factors responsible for the superiority of the Western World.

[51] Alexander Vucinich, *Science in Russian Culture, 1861–1917*, Stanford University Press 1970, pp. 94-95.

[52] *Ibid.*, p. 98.

As we have seen, Yirmisekiz Çelebi Mehmed Efendi was sent as special ambassador to France for such a purpose. This was in 1721, and his son Said Mehmed Efendi who accompanied him in France, as well as such men as De Rochefort, Comte de Bonneval, or, Humbaracı Ahmed Paşa, and Baron de Tott performed this same sort of function quite beneficially. The latter was the son-in-law of the French ambassador, Vergenne, to the Sublime Porte, and he belonged to the Hungarian nobility. He was active in the initial phases of the Naval Engineering School of 1773 during Mustafa III's reign. Mustafa III was a patron of science and learning, and Toderini, e.g., speaks of his interest in European science. [53]

Mustafa III had sent Ahmed Reşmi Efendi as ambassador to Prussia because he was much impressed especially by the successes the Prussian army had achieved during the Seven Years' War (1756-1763) under Frederick the Great. During his reign contact was established with the Vienna medical circles and certain students were sent there. [54]

Other references have already been made to Mustafa III and also to Abdülhamid I. More important than either one of them in the movement of Westernization is the latter's successor Selim III (1789–1807). Concerning him Creasy has the following words to say:

"Sultan Selim III, the successor of Abdülhamid, ascended the throne on the 7th of April 1789, being then twenty-seven years old. He was a young man of considerable abilities and high spirit; and his people gladly hailed the accession of a youthful prince, active in person, and energetic in manner, under whom they hoped to see an auspicious turn given to the long-declining fortunes of the empire. Selim had been treated by his uncle, the late Sultan, with far greater kindness, and had been allowed much more freedom, both bodily and mental, than the non-reigning princes of the blood-royal were usually permitted to enjoy. One, of his intimate associates was an Italian physician named Lorenzo; and from him and other Franks, Selim eagerly sought and obtained information respecting the nations of Western Europe, their civil and military in-

[53] Toderini, *De la Littérature des Turcs*, vol. 1, pp. 127, 161.

[54] Enver Ziya Karal, *Nizam-i Cedit ve Tanzimat Devirleri, Osmanlı Tarihi*, vol. 5, 1947, pp. 59-61; Tanpınar, *op. cit.*, pp. 14-15.

stitutions, and the causes of that superiority which they had now indisputedly acquired over the Ottomans. Selim even opened (through a confidential agent, Isaac Bey) a correspondence with the French king and his ministers Vergennes and Montmorin, in which he sought political instruction from the chiefs of what he was taught to regard as the foremost nation of the Franks." [55]

Selim III had reached the conviction that Westernization was the only remedy for stopping the deterioration of the institutions of the Ottoman Empire that had ceased to work properly. But he did not feel he knew the West and understood the real causes of its efficiency and success. For this reason he sent Ebubekir Efendi with secret mission to Austria and this gentleman submitted to him a report of five hundred pages. Selim III's successor Mahmud II was also imbued with the same feelings, and his advisers in these matters were, from 1832 on, the British ambassador Lord Stratford Canning and Mustafa Reşit Paşa. There was also Sadık Rifat Paşa who was an intimate friend of Mustafa Reşid Paşa. Sadık Rifat Paşa was Turkish ambassador in Vienna in the years 1837–1839. Mustafa Reşid Paşa himself had been sent to Paris as ambassador in 1833. [56]

But what was it that made Europe so prosperous and so successful? What was Europe's most potent source of success? The Gülhane Decree brought important reforms to which a short reference has already been made. Many schools were opened during the nineteenth century, and many books were translated. European teachers and professors were employed, and students were sent to Europe to be trained. As we have seen, considerable efforts were made to adopt Western industry and technology. But the result was never entirely satisfactory. For the West was continually renewing itself and making new spectacular advances especially in technology, and scientific progress was, as we have seen, at the bottom of all

[55] Edward S. Creasy, *History of the Ottoman Turks*, 1878, pp. 433-434. For Selim III's relations with Louis XVI, see, İsmail Hakkı Uzunçarşılı, "Selim III.'ün Veliaht İken Fransa Kıralı Lui XVI. ile Muhabereleri", *Belleten* (T. H. S.), vol. 2, 1938, pp. 191-246; Tanpmar, *op. cit.*, pp. 18-19.

[56] Enver Ziya Karal, "Gülhane Hatt-ı Hümâyununda Batının Etkisi", *Belleten* (Turkish Historical Society), vol. 28, 1964, pp. 581-601; Ercümend Kuran, "Osmanlı İmparatorluğunda İnsan Hakları ve Sadık Rifat Paşa", VIIIth Turkish Congress of History, *Proceedings*, vol. 2, Ankara 1981, pp. 1449-1453.

this. How close did the Turkish movement of Westernization come to realizing this point?

We see Mustafa Reşid Paşa's attention fixed on the concept of "civilization" for which there was not as yet a special word or term in Turkish. He believed Turkey should somehow manage to participate in the European way of life, should become a part of European civilization.[57] This is symbolic of the groping after this European key to success, but it does not supply an answer to our question. The most important schools of higher education started in the nineteenth century are the Medical School of Istanbul and the Istanbul University. We may therefore look into the objectives and aims in founding these institutions, and especially the latter, for this purpose, i.e., in our attempt to find an answer to the question as to whether the Turkish movement of Westernization was aware of the fact that science was the moving force behind the dynamism of the Western civilization, or as to when and to what extent such an awareness came into existence. We would likewise want to know whether the enormous importance of research in pure science in particular was understood and appreciated in this connection, and, if so, to what extent and at what or which stage in the progress of the movement of Westernization.

The comprehensive reform program of the Gülhane Decree and those that supplemented it brought to the fore an urgent need for civil servants trained so as to properly implement the newly established forms of institutions and to carry out the requirements of the administrative innovations. This meant a need for founding secular schools different from the existing madrasas. The High Council of Public Education was founded in 1845 by Mustafa Reşid Paşa for this purpose. The objective, in more concrete terms, was the creation a European type of university.[58] But did this decision to adopt the Western-type institution of higher education entail also a component touching more substantial training and instruction

[57] See, Reşat Kaynar, *Mustafa Reşit Paşa ve Tanzimat*, Ankara 1954, p. 69; Enver Ziya Karal, "Gülhane Hatt-i Hümâyununda Batının Etkisi", *Belleten* (Turkish Historical Society), vol. 28, 1964, pp. 592-593.

[58] Halil İnalcık, "The Nature of Traditional Society, Turkey", *Political Modernization in Japan and Turkey*, ed. Robert E. Ward and Dankwart A. Rustow, Princeton University Press, 1964, pp. 60 ff.

in the field of the so-called intellectual or secular sciences? We may now look into this particular question.

To sum up what we have ascertained so far, there was the decision of bringing the army up to date on the basis of European standards, of adopting European technology and industry, of embracing the ideas of human rights and the supremacy of law, and in particular, of accepting Western systems of education. All this, and especially the latter, meant closing the wide gap that existed with respect to knowledge, with respect to science and learning, between Ottoman Turkey and Europe. But Western Europe i.e., the model chosen, was not a static one. It kept outstripping itself, transcending and surpassing itself. It was dynamic, it kept making remarkable manifestations of new energy and vitality, and starting innovations. And the most potent source of this remarkable virtue of regeneration and renovation was, we have decided, a relentless pursuit of scientific research, especially disinterested research in pure science. Did this aspect of Western behavior enter the minds of Turkish Westernizers?

In 1838 Mahmud II spoke at the inauguration ceremony of the Royal Medical School. The school had in fact started some years previously, and even this earlier school had a prehistory of its own. But it was decided that the school needed improvement, and this was brought about by taking certain appropriate measures. A professor from Vienna was made director of the school, and an English physician also was on its new staff. Sultan Mahmud II opened the school with the following talk:

"Students,

"I have arranged and made available these exquisite buildings so that they may serve as medical school, and I have named this institution the Royal "Adlî" Medical School. As the sacred work of sustaining human health shall be carried on in it, I have given preference and precedence to it over other schools. Here you shall study the art of medicine in French, I know that at this point a question comes to your minds, and I also know that it consists of asking "can we not express, then, this art in our language and do we not possess our own books on medicine, since we chose to learn it by having recourse to a foreign tongue?" I agree with your concern,

and I shall touch upon the inconveniences and difficulties we are confronted with as an answer on your behalf to your question, hoping and trusting at the same time that in the near future they will all be overcome. It is true that we are in possession of many books on the healing art and that in bygone times the Europeans acquired and obtained the knowledge of medicine through the translation and study of these books. The great majority of these books are in Arabic, however, and for some time scholars of Islam have not shown much inclination for their study and have not deemed them very useful for teaching and learning. Moreover, the number of men duly acquainted with the technical terms of this art have gradually diminished and these books have fallen into disuse. Consequently their translation to our tongue will require going through much unnecessary labor as well as a long period of time. As to the Europeans, after having translated the books on medicine from Arabic into their language, because they have been expending effort to advance and perfect their knowledge in the field for over a century now, they have become better versed in its rules and in the ways of mastering it and have lately made certain discoveries with which they have enriched their medical literature. Now, consequently, in comparison with them, the Arabic books on medicine would seem deficient to some extent. And even if we envision the compensation of this deficiency with the help of the other works, their translation would not be possible in a short time. It would moreover, be necessary first to spend about ten years for learning Arabic and then at least five or six years for the study of medicine. For us, on the other hand, both for the imperial army and for our divinely protected dominion, it is imperative to train skilful physicians and employ them in the needed services, and it is likewise necessary to come into possession of a complete corpus of medical literature in our tongue and to forge ahead and to persevere in the task of composing the needed books in Turkish. It is not my desire in having you learn medicine in French to make you study the French language; it is my purpose to have proficiency gained in the art of medicine and to see that gradually that knowledge is carried over into Turkish and, after that has been accomplished, to have medicine taught in Turkish in all parts of my divinely guarded dominion.

I have had this gentleman (pointing to Dr. Bernard) brought here especially for you. He is a very competent person and one of the foremost among European physicians. Now then, try to learn the art of medicine from this gentleman, and from the rest of your teachers, and endeavor to commit this art into writing in Turkish and to bring about and actualize its dissemination in our own tongue. For I am not pleased and contented by witnessing the arrival from foreign countries of certain people of unknown disposition to stay with us as physicians to be employed in various capacities.

I feel certain that after the completion of your schooling and upon obtaining your diplomas, with God's permission, you shall attain to high positions, and I have provided for the full satisfaction of all your needs during your education here. Your food shall range from roasted meat as hot dish to strawberry as cold meal, other things too having been arranged accordingly. I shall send in, this week, the tokens I have had specially made ready to serve as insignia for your distinction. Come then and work assiduously in conformity with my imperial intent and aim. It is for you to ask and for me to give. May God Almighty grant bounteous blessing and success. Amen". [59]

This is a very interesting talk. It is reminiscent of Louis Philippe's attitude of condescention, of descending to an attitude less formal or stately than was usual for a king. Mahmud II was an energetic reformer, and he was at the same time a democratically-minded ruler. This was some years after the suppression and abolition of the Yeniçeri organization and on the eve of the promulgation of the epoch-making Gülhane Decree. But the outlook on the political and military scene was far from being heartening and encouraging.

Mahmud II seems to be in quite good spirits and, generally speaking, optimistic in his inauguration speech, in his hopes of catching up with Europe in the domain of medicine at any rate. He makes references also to the decline of traditional Islamic medicine and its teaching and transmission, indicating that this was partly the result of rivalry by the newly emerging modern European medicine.

[59] See, Galip Ata, *Tıp Fakültesi*, Istanbul 1341 H., pp. 88-91; A. Süheyl Ünver, "Osmanlı Tababeti ve Tanzimat Hakkında Yeni Notlar", *Tanzimat*, Millî Eğitim Bakanlığı publication, Istanbul 1940, pp. 935-966.

This constitutes a revealing disclosure in connection with the factors underlying the origins of Westernization in Turkey, although the speech has a marked air of understatement in this respect which must have stemmed from lack of adequate familiarity.

This talk also contains apt and lucid references to the question of the language of instruction and scientific terminology. It is seen that Mahmud II had an inkling of the achievements of scientific research in Europe, but, clearly, the topic of scientific research occupies no place of prominence in this speech of Mahmud II. He does not refer at all to scientific research as the key to the dynamic and progressive characteristics of the European civilization.

We may therefore pass on and look into the circumstances surrounding the birth of the Istanbul University. The so-called second enterprise is referred to as the official opening. The Sultan and the ministers were present at the inauguration ceremonies. The minister of education Safvet Paşa made a long talk on this occasion, and another one by Münif Efendi (later on, Paşa), head of the High Council of Public Education (Meclis-i Maarif-i Umumiye), followed. I shall give a partial translation of these talks now. This was in February 1870.

After dwelling on the value attached to knowledge in Islam, praising science and learning at some length, and speaking of the strides achieved in science and technology in contemporary Europe, the minister proceeds as follows:

"If the advancement of the sciences and arts continues as incessantly as it does at present and if such developments go on at the same rate as they do in our day, those inventions to which we look now with great bewilderment and astonishment will after a while turn into modiocrities and commonplace things, and many fanices of our mind, the realizations of which are deemed impossible, will turn into realities. And on the basis of these we can easily imagine the future achievements of the human intellect.

"It is also manifest that just as the sciences can embellish the natural constitutions of individual human beings with a variety of virtues, likewise, the civilization and prosperity of a country are also dependent upon the sciences. Had the esteem felt for the various sciences and arts for a span of two hundred years during the initial

periods of the foundation of the Ottoman Empire and the encouragement and veneration shown to talented persons and men of learning lasted for another two hundred years and had contact and intercourse also been established with the progressive nations of Europe and the high road of progress traversed in conjunction with them, in these days our Ottoman lands too would have been in a different situation and the scientific and industrial advancements seen now in these other countries would also have been realized in our dominions.

"But whatever the cause, with us, with the intervention of certain obstacles and difficulties, the course of the sciences and arts became confined within limited bounds and could not keep abreast of the requirements of the time and attain to the desired level. One of the causes, and probably the major one, that have brought about this circumstance, i.e., the thing that has given rise to our lagging behind in the knowledge of an efficient conduct of our affairs is that we could not find the possibility of making any headway in intellectual contact [with Europe] and that we thus remained as if in a state of isolation. For the development of the secular ("intellectual") sciences depends upon exchange of opinion and intercourse in investigation and discussion among those who occupy themselves with these subjects, and the nations of advanced civilizations of Europe have been successful in gaining ground in the advancement of the branches of science through just this avenue of approach. It is well known that we are exhorted [by our Prophet] to go in search of knowledge and to obtain it even in far away China. . . ."[60] The minister refers here to such "remarkable inventions" as the telegraph and the steamship and asserts that they have been made possible by progress achieved in pure science. Yet he also feels compelled to confess that human intellect will never prove equal to delving into the secrets of the universe. The achievements of science to which he specifically refers belong to thirty or more years before the year of the inauguration.[61]

As to Münif Efendi's address, I reproduce it here, again partly, from J. Lewis Farley's translation of it. Farley writes, "Münif Efendi

[60] *Takvim-i Vekayi*, No. 1192, 20 Zilkade 1286, p. 2, column 1.

[61] The full text of Safvet Paşa's speech is planned to be presented in the next issue of this journal.

also delivered the inaugural address, of which the following is a condensed translation:

"To conquer a country, to be avenged upon an enemy, to accomplish other similar deeds which tend to satisfy the ambitions of man, are considered by nations as great causes for congratulation. Yet, in the eyes of enlightened men, none of these triumphs equal that of erecting such a monument as this institution, which is destined to revive science and diffuse the benefits of education. How can it be otherwise? Material conquests are invariably achieved at the expense of others, and the advantages obtained are always limited. But the benefits derived from moral conquests, those conquests that injure no one, are immense, for all humanity is the gainer.

"The efforts of our glorious master and sovereign have been crowned with success in many enterprises destined to consolidate his empire and secure the happiness and prosperity of every class of his subjects. His Majesty has thus justly acquired a right to the thanks of every one; but, in my humble opinion, the reform of public instruction ought to be considered as the most important act of his reign. Those who are acquainted with the spirit and exigencies of our times know that education is today the basis of prosperity and strength. Without education, none of the measures adopted for the reform of the country would have the desired result, and even if a certain result were obtained it would be only ephemeral. The wealth of a country and the strength of its government are in direct ratio to the degree of capacity and knowledge which the people possess in their industrial and other pursuits. The better individuals perform their several duties, the more will the country be rich and its government powerful. But to arrive at this result we must have instruction, for it is evident that the difference existing at the present day in the wealth and power of nations is owing to no other cause.[62]

These authoritative pronouncements, and other statements not quoted here, indicate that the new university was conceived as an institution created for the purpose of training the personnel needed for the new burocracy that had come into existence as a result of far-reaching administrative reforms. They also indicate that the Istanbul university was founded with the aim, or hope, of raising

[62] J. Lewis Farley, *Modern Turkey*, London 1872, pp. 154-156.

the cultural level of the country so that it could serve to bolster all kinds of activities for people belonging to all walks of life. The Istanbul University thus is expected to serve, as is pointed out by both speakers, as a basis for the power and prosperity of the Empire.

The address delivered by Safvet Paşa, the minister of education, touches, as we have just seen, also the very important question of participation in the community of European nations, the question of becoming Europeanized, so to speak. This was, as we know, Reşid Paşa's formula for saving the Ottoman Empire from ruin, and it was apparently a suggestion coming from European circles sympathetic to the Ottoman cause. The initial tendencies in interpreting such a formula must perhaps have been especially in the line of political Westernization. But the word civilization occurring in the formula is thought-inspiring and helps add to the complexity of the measure. It is of interest that in that period it was fashionable in Europe to speak of civilization and to analyze its contents and connotations. The word *medeniyet* for "civilization" and *mütemeddin* or *medenî* for "civilized" or "highly civilized" are seen to have been coined by 1870. They are both freely used by Safvet Paşa in his address.

Safvet Paşa interprets the participation in the community of European nations, presumably, also as maintaining close cultural contacts with Europe in the fields of science and technology. It is possible to take this to mean, by extention at least, as actual participation and cooperation in the endeavors to advance that civilization. But this is far from being realistic. Safvet Paşa himself speaks of "consultation and discussion" only in this context, very generally, and it is hardly possible to construe this as an utterance referring to the intense research and laboratory work carried out individually by outstanding European scientists.

It is extremely interesting, nevertheless, that these words of Safvet Paşa represent a movement of thought in the right direction. We have seen that the Turkish statesmen had been anxious, since over one hundred and fifty years before, to find the correct answer to the question as to what constituted the most potent and vital factor or factors responsible for the power of the West, as to what was the key to its efficiency and success. Safvet Paşa's words mean

at least that one of the answers which had been found for this question by 1870 was that Europe had adopted the policy of determining its courses of action with the help of considerations, or learned debates, based on acquisitions in the field of science and learning. But it is quite likely that what he is referring to is Europe's power of achieving innovations in science and technology through cooperative research and investigation. The truth is probably that what he means to say involves both these senses, but the latter sense especially is only vaguely implied.

That such an assertion has been made by a minister of education and on the occasion of the foundation of the first European-type university in Turkey, that such a diagnosis has been espoused officially, is of added significance. But, as just pointed out, what is exactly meant by research or "investigation" is not sufficiently clear, and the intensity or rate of work of this kind is not referred to at all. And, moreover, a true appraisal of what constitutes scientific research was surely lacking in this assertion. This statement therefore sounds more like inauguration oratory or rhetorical manner of expression rather than a solemn and stout-limbed promise or forecast. At the most, the new Istanbul University could vaguely be hoped to serve as the beginning of a chain of developments that could lead in the future to the materialization of such goals.

It was, in the first place, far from easy to create a European type of University in Turkey at that time, and a number of years had still to pass before the Istanbul university could start to function on a scale comparable to those of its kind in the West. It was inevitable that it should have a modest beginning. It was about this time, moreover, that the universities of the West began to transform themselves gradually into veritable centers and strongholds of pure scientific research, especially by adding to their faculties special schools for graduate work. The Istanbul University was practically foredoomed to lag behind.

In the period of about half a century extending between the opening of the Istanbul University and the foundation of the Turkish Republic in 1923 various professional schools of higher education came into being in Turkey, the Istanbul University and the Engineering School whose origin went back to the naval and ground

forces military engineering schools of the last quarter of the eighteenth century were further developed and enriched, many students were sent abroad to receive their education in European universities, guest professors and specialists were employed to bolster the teaching staffs of Turkish schools of higher education and other institutions, and a considerable number of books were translated from European tongues into Turkish. All this represents a remarkable effort and a laudable deed. But the fact remains that in the matters of industrialization and scientific research Turkey lagged behind Europe and barely managed to follow new developments with some degree of success.

We thus come therefore to the new era ushered in by the declaration of republic in Turkey, and our story wends its way to Mustafa Kemal Atatürk, the Founder of the Turkish Republic. Concerning him Toynbee says:

"Kemal had the wit to see that half measures of Westernization, which had always been disastrous to Turkey, would be fatal for her now; and he also had the character to move his countrymen to follow his lead. Mustafa Kemal's policy was to aim at nothing short of an out-and-out conversion of Turkey to the Western way of life; and in the nineteen twenties he put through in Turkey what was perhaps as revolutionary a programme as has ever been carried out in any country deliberately and systematically in so short a span of time. It was as if, in our Western world, the Renaissance, the Reformation, the secularist scientific mental revolution at the end of the seventeenth century, the French Revolution, and the Industrial Revolution had all been telescoped into a single lifetime and been made compulsory by law. In Turkey the emancipation of women, the disestablishment of the Islamic religion, and the substitution of the Latin alphabet for the Arabic alphabet as the script for conveying the Turkish language were all enacted between 1922 and 1928." [63]

Atatürk himself, says "We are not appropriating the Western civilization in a spirit of imitation. We are espousing in the level of world civilization the things we deem to be good because we find them suitable to our characteristics and temperament." [64]

[63] Arnold Tonybee, *The World and the West*, 1952, pp. 27-28.
[64] Utkan Kocatürk, *Atatürk'ün Fikir ve Düşünceleri*, Ankara 1971, p. 85.

Atatürk had a deep interest in the university. He felt that the Istanbul University, the only non-technical university of Turkey in the early years of the Republic, was in need of reform. An occasion arose already in the year 1923 for him to make an allusion to this, although the reform came only in 1933, at a time when a large number of professors wished to leave Germany and central Europe.

The importance Atatürk attached to the university reform may be inferred also from his statement to the effect that he envied the minister of education, Dr. Reşit Galip, to whom this work was entrusted, because it befell his lot to perform such an important work. Professor Albert Malche of Switzerland was officially charged to act as consultant, and Dr. Philipp Schwartz, professor of pathological anatomy, who had come from Germany and settled down in Istanbul, also was active in a somewhat similar capacity. The main objective of the reform was to make scientific research an integral part of the activity of the university as well as to raise the scientific and academic level of work in the university and enrich it with new departments, chairs, personnel, laboratories, and libraries.

The Faculty of Language History and Geography (Faculty of Letters) of Ankara was founded in 1935 with the personal initiative of Atatürk and with his instructions and guidance. Here in particular scientific research was clearly in the foreground. A number of foreign professors were invited to this faculty too which included disciplines such as sumerology, hittitology, sinology, hindology, and hungarology which were not represented in Istanbul University.

Indeed, Ankara too was a scene of brisk activity in the growth and expansion of university life in Turkey. The Higher Institute of Agriculture set up in Ankara in 1933 was virtually a section of a university, consisting of faculties of agriculture, forestry, and veterinary science and a school of basic sciences, transplanted from Germany with its rector and deans and numerous instructors. The Turkish Historical Society and the Turkish Language Society too were founded by Atatürk expressly for carrying out scientific research.[65]

Atatürk's pithy words concerning the part played by science in human life has come to be widely known. In a speech delivered in the

[65] See, Aydın Sayılı, "Atatürk, Bilim, ve Üniversite", *Belleten* (Turkish Historical Society), vol. 45, 1981, pp. 27-42.

Independence School of Commerce of Samsun in September 22, 1924, Atatürk said, "Man's truest guide for everything for the material and moral aspects of the human life and for success in his undertakings is science, science and learning, and to search for other guides to the exclusion of science is a sign of shallow-mindedness, of ignorance, and perversion".

The Turkish expression rendered here as "is science, science and learning" is "ilimdir, fendir" in Atatürk's words. Here, *fen* should mean "basic sciences" and *ilim* "science" in a more general and wider sense. The two words *ilim* and *fen*, coming in succession, serve to complete one another's meanings, and this scheme also brings added emphasis to the statement as a whole, and, to the word *fen*, i.e., the basic sciences part of the more general term *science*, in particular. All in all, the translation of "ilimdir, fendir" as "is science, is science and learning", although it involves in external form a transposition of words, has seemed the most appropriate choice to me. For in this expression the basic or exact and natural sciences are emphasized by the word science, and the expression "science and learning" serves to broaden the denotation or extention, or connotation, of that word, i.e., of the term science.

It may be noted here that the question as to whether Atatürk may also have meant to refer to technology or industry by the word *fen* may come to the mind. For this word, by the extension of its connotation, may possibly refer also to the applied sciences, to the application of the basic sciences. But a perusal of Atatürk's various yearly or periodic opening speeches of the Grand National Assembly clearly shows that he never used the word *fen* in referring to technology and industry. Moreover, the context of this passage in which Atatürk speaks of "the truest guide for man" pretty well excludes the connotation of technology and industry any way. It is amply clear therefore that Atatürk has in mind pure science and research in pure science when he speaks of science and extols its value to man and the conduct of his affairs, although by implication he refers of course also to all sorts of application of scientific knowledge.

In an address delivered in Dumlupınar on August 30, 1924, Atatürk spoke as follows:

The indispensable condition, the *sine qua non*, of keeping alive, of survival in this world, is to follow the course of civilization and to

achieve success. Those who espouse the feeling of attachment to the past and do not tread the path of civilization, those who display such inadvertence and shallowmindedness, are bound to get drowned some day in the onrushing torrent of universal civilization. ... The existence and value of every community in the world and its right to lead a free and independent life is concordant with the products of advanced social culture it possesses and commands and with the contributions it makes to civilization."

In his speech on the occasion of the tenth anniversary of the declaration of the Turkish Republic, Atatürk said:

"It is our national goal to continually reinforce and develop through all kinds of means and measures the high character, the unremitting industriousness, the innate intelligence, the devotion to science, the love for the fine arts, and the national solidarity of our people. This ideal which befits and accords very well with the Turkish nation will enable her to do her share in securing freedom from anxiety to the whole of mankind."

And, again in the same speech Atatürk asserts:

"We shall raise our country to the level of those of the most well-to-do and the most civilized nations of the world. We shall equip our country with the most extensive means and sources of prosperity. We shall raise our national culture above the level of contemporary civilization."

So, Atatürk wants to see the Turkish nation become a partner in the most advanced civilization of the day, the Western civilization, and he deems it necessary that Turkey should contribute to the future developments of this civilization and in this way "do her share in securing freedom from anxiety to the whole of mankind". And in fulfilling this noble task she should undoubtedly be aided and supported especially by pure science, and by partaking in the activity of scientific research in the endeavor to expand the foremost boundary of scientific knowledge. Indeed, there is ample justification for thinking so. We may now mention some typical examples.

In October 27, 1922, in a talk he made to Bursa school teachers, Atatürk spoke as follows:

"Ladies and gentlemen; do you know what lies at the bottom of the victory we have won over the enemy who trampled with its filthy

feet for three and a half years the most prosperous, the loveliest, the most beautiful parts of our country? It is the adoption of the precepts and mandates of science and systematized knowledge (*ilim* ve *fen*) as guide in the conduct of military affairs. . . . In the political and social life of the country and in the mental and intellectual culture (bringing up) of our nation too our guide is going to be science and systematized knowledge. . . ."

In January 26, 1923, addressing the crowd that had filled the Salihli railway station in order to welcome him, after saying that the dark days of enemy occupation had become a thing of the past, Atatürk spoke thus:

"We must take very energetic and fundamental measures in order to secure for our country its full liberation. The most important among these measures, and those of utmost priority, pertain to science and sagacity (*ilim* ve *irfan*).

In the initial parts of his famed lengthy speech at the Grand National Assembly in 1927, Atatürk refers to the West as the World of veritable civilization which has been flooded by the light of science and learning (and technology) (*ilim* ve *fen*).

In the last week of January 1923 Atatürk visited Alaşehir and delivered a public speech there, in which, after dwelling on the Greek occupation which had been relegated to the past, he makes the following assertion:

"We shall gain very important new victories also. But these shall not be bayonet victories. They shall be victories in the field of economics, in science and sagaciousness (*ilim* ve *irfan*). The victories which our armies have achieved thus far cannot be deemed to have brought our country to veritable liberation. These triumphs have merely served to lay the groundwork for future achievements. Let us therefore not be arrogant because of our military exploits. Let us get prepared for new victories of scientific and economic purport."

In 1933, on the occasion of the tenth anniversary of the declaration of the Republic, Atatürk said, "The torch that the Turkish nation bears in her hand and in her head in pursuing the road of progress and advancement of civilization is that of science, of positive knowledge."

Such examples of assertions by Atatürk bearing directly or indirectly on the question of the place of science in the building up of civilization may be multiplied. But the ones already cited amply testify to the fact that Atatürk expended a truly valiant effort to place science at the foundation of the endeavors to transform Turkey into a land of veritably happy and prosperous people. We also know that he tried to make the Turkish university a center of scientific reserach as well as instruction just like its sister universities of the Western World. And he likewise gave examples of founding special institutions or societies specifically for carrying out scientific research. For he was convinced that it was through such work that a nation could manage to stay in the advancing front of world civilization and that this circumstance in turn was necessary for guaranteeing one's survival as a nation in this world.

Atatürk had a clear vision of civilization as a dynamic process and was convinced that the prosperity and the well-being of a nation depend on its keeping abreast of the advancements of civilization, on its not losing ground in international rivalry. He also clearly formulated the rate of activity and achievement that would guarantee such a circumstance or desideratum. According to Atatürk, in order not to lag behind the onrushing innovations of civilization, a nation should not only be in a position of learning and profiting from other nations, it should actively collaborate in and contribute to the advancement and growth of civilization, it should actually be active in the expanding boundary of science and technology, and, as he puts it in his own pithy and trenchant way, should surge ahead of the contemporaneous civilization, it should rise above the civilization, or intellectual culture, of his day.

In this way Turkey would permanently secure for itself a place of honor and distinction among the torchbearers of civilization, whoever they may be, and this, it would seem, was the true meaning of Westernization in Atatürk's mind. This should be the most correct interpretation of the course of "unlimited Westernization under the leadership of Mustafa Kemal Atatürk" as Toynbee puts it.[66]

It is noteworthy that although Atatürk is realistic enough to duly emphasize the factor of self-perservation as a paramount reason

[66] Toynbee, *The World and the West*, p. 27.

for not lagging behind the advancing and onrushing civilization, he is equally emphatic in considering it the duty of every community to contribute to the well-being of the rest of humanity. And he seems to emphasize peace of mind and freedom from anxiety as the most important constituent of human happiness, and he apparently deems it the major justification and goal of all this unremitting activity of forging ahead with the creation of better and better civilizations.