By insisting on keeping Turkish as the language for teaching, plenty of scripts of the foreign guests had been used as textbook.

The French-German war of 1870 created also a splitting on science political level. In the ace of the western nations the basic research and applied big-research played a growing role. In it the institutes far from universities as the Kaiser Wilhelm Institute had by no way been a German invention. Meanwhile we know about the influence of the American models since 1903, first of all the Carnegie-Institution, beside other institutes far from university.

The indecision of the Ottoman education system for the choice of models lead of course to frictional loss and spoiled human potentials. On the other hand Turkey kept itself out of the trouble of not always fruitful bindings to one country resp. cultural region. The change from Italian to German over French had never been completely realised. Soon Turkish became the only teaching language at all important institutions, let alone mention Galatasemester and Mülkiye. The extension of the Ottoman literature language to a modern science language could succeed, because in the Tanzimat decades a secular elite believed in Turkish as science language.

The same distance to the victorious powers and the former allied stayed the characteristics of the foreign politics of Austria, which means until the years of İnönü the condition for free scientific and artistic movement. With the example of the young Ismail Hakki Balatçoğlu, the later rector of the University of Istanbul, could have been shown, how strong the need for "Aquidistance" for the formulation of a new pedagogic has been already in the early-Turkish years.

The aim for my historical few was to show, which conditions existed at the eve of the Republic, in order to understand the outstanding cultural revolution of Mustafa Kemal Atatürk better.

THE METRIC SYSTEM IN TURKEY

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Starting from the 14th century, the Ottoman Empire (1299-1923) ruled over a large territory for more than six centuries. Its long reign may be divided into two main periods: the classical age and the modernisation period. From the viewpoint of the history of science and culture, we can say that the classical age, highly influenced by Turkish and Islamic traditions, continued until the last decades of the 18th century. The modernisation period, which followed, witnessed the co-existence of both the old tradition and European novelties, the latter being introduced and adopted with great enthusiasm during the 19th century.

However, from the 19th century onwards, the Ottomans began to pursue the technical innovations developed in Europe, especially in such fields as war technology, mining, and cartography. Contacts with Europe accelerated in the 17th century and the Ottomans learned more about Europe, as well as its science and technology, through travel notes of Ottoman ambassadors, books translated from European languages, and other means. Towards the end of the 19th century, Ottoman officials started to recruit engineers and officers from France to help to recognise the Ottoman military corps and train engineers for the army. The goal was to reverse the relative decline of the Ottoman army by injecting them with Western science and technology. These reforms constituted the beginning of the modernisation period, which would last until the end of the Ottoman Empire. Thus, by the 19th century, especially after the 1839 Reform Movement called the Tanzimat, Ottoman administrators took Europe as "the model", and a multidimensional transformation occurred in almost every field, from the state organisation to architecture, from education to social life.

The attempts to transfer and adopt European science and technology unavoidably brought along the need to compare the Ottoman and European measuring systems at the end of the eighteenth century. The first comparisons were made in the Mühendislik (Engineering School), a leader in the introduction of European techniques into the Ottoman Empire. Political conditions of the late eighteenth century led to the recruitment of French and English experts in the Mühendislik where texts translated from these languages were used for teaching. Collaboration between the Ottoman and foreign technicians, and the teaching of new engineering techniques to Ottoman students, hindered it necessary to establish the Ottoman equivalents of French and English measures. The results of the comparisons were published by Hüsrev Rifki Tanrılar, the chief instructor of the school, in the textbooks used in the fortification establishments, the driving of mine galleries etc., he had compiled from European sources (1. şubat-i amani = 1.166 şubat-i france = 1.242 şubat-i rige i ran). Starting from the first half of the nineteenth century, metric weights and measures became included in the European books of science and technology. Ottoman engineers mentioned more in the books they translated or compiled from European sources and calculated the metric equivalents of Ottoman weights and measures (1. metr = 1.319 şubat or 1. izzo = 0.758 metre). An early example is Hüsrev Rifki's book on fortification (Uşul-i istihbar, Istanbul 1834). In the calculations, they used the results of the comparisons made by H. Rifki between the Ottoman measures and the pre-metric French measures.
A few years later, due to difficulties encountered in the manufacturing of guns and cannon, work was undertaken for the standardisation of the zira, the Ottoman measure of length. As zira was used by different founders with different lengths, the calculated ratio between the diameters of the cannon balls and the cannonballs could not be practically attained by the Imperial Arsenal of Ordnance and Artillery (Tophane-i Amiri). In 1841, a few samples of zira were sent to France upon the initiatives of Mehmed Emin Paşa, and were compared with the meter. This standard zira (0.757 738 m.) was later accepted as the official unit of length of the Ottoman State by an imperial decree. Originally, the aim of the State was not to transfer and adopt the metric system as a new system for measures; the basic aim was to establish the equivalence between the new system and the Ottoman weights and measures, in order to facilitate the transfer and application of European science and technology. The use of the metric system had initiated a process of standardisation and standardisation in Europe. The aim was to achieve a similar standardisation in Ottoman Turkey. The value of 0.757 738 m. was accepted as the official metric equivalent of the zira after the adoption of the new system by the Ottoman government in 1869. The metric equivalent of akba (1,282,945 kg.), the Ottoman measure of weight, was calculated in 1862 by Mehmed Emin Paşa.

In 1850, metric weights and measures were also used by European physicians, pharmacists, and chemists practicing in Istanbul, and by non-Muslim Ottomans who had studied medical sciences in Europe. The use of grams and kilogram became increasingly widespread in these regions engaged in overseas trade. Kilograms were already in use in the ports, especially in purchases from abroad and in the wholesale trade. The unit was used in commercial centers that contained large business houses or mines. Thus, it may be argued that the metric system infiltrated into Ottoman Turkey prior to its official adoption by engineers, physicians and merchants, and was in use, although narrowly, mainly amongst those who had close contact with Europe.

The official adoption of the metric weights and measures constitutes an important step towards the standardisation of Ottoman metrology. Several factors influenced Ottoman administrators to take this decision. One of these was the desire to transfer the technical knowledge from Europe, and the need to solve the problems resulting from the use of weights and measures having different values in different regions. Moreover, the steadily increasing trade with European countries rendered the use of the metric system essential. These preconditions, together with the encouraging atmosphere of the modernisation movement, led to the official adoption of the metric system in 1869.

With the Law Concerning the New Weights and Measures issued on 27 September 1869, the Ottoman state adopted metre, gram and litre as the official units of length, weight and volume. The law laid down that, as of March 1871, the new weights and measures were to be used in all business and transactions carried out in government offices and local administration. From March 1874, the metric system was to be applied throughout the Ottoman Empire. Thus, the conversion to the new system was planned to be completed in five years after the promulgation of the law.

Following the promulgation of the law, various measures were taken to facilitate the acceptance and use of the new system. The most important of these measures was the publication in 1869 of the Regulations Regarding the Use and Control of the New Measures. The regulations specified the duties of the officials responsible for the application and control of the new units, rules to follow in the production of metric weights and measures, the application of the official stamp on them and so on.

Work was also undertaken to teach the new system in schools. A booklet introducing the metric system was made compulsory reading in all schools by the Ministry of Education. The Commission on New Weights and Measures (Eyalet-i Cedide Kimyâname), responsible for the preparatory work for the introduction of the metric system, ordered posters illustrating the new weights and measures from Paris, and which were probably sent to secondary schools.

Conversion tables were printed and distributed. The conversion tables annexed to the 1869 Regulations display the meticulous approach to the introduction of the metric system. New terms were coined in Ottoman Turkish for the new units (e.g., litre-i akba for metre, metre-i akba for millimetre, gram-i akba for milligramme). However, as the general public found the comprehension and pronunciation of the new terminology difficult, these tables were printed that were simpler to use.

The adoption of the new system involved the production and supply of metric weights and measures. The first sets were imported from France. The Imperial Arsenal (Tophane-i Amiri) stamp found on metric weights indicated that the weights and measures were produced in Istanbul. An imperial decree issued in September 1872 requested the preparation of new weights, in view of the complete abandonment of the old weights and measures planned for March 1874.

Despite the work undertaken since 1869, it was observed that the new weights and measures were not being widely used in government offices and among the general public as had been hoped. In 1873, the difficulties encountered in the introduction of the new system were discussed in the Council of Ministers, where it was decided that although substantial benefits would undoubtedly accrue from the standardisation of weights and measures, the public had not yet become accustomed to the new system, that there was considerable discontent and dissatisfaction, and that it was neither possible nor fitting to insist on the use of the new weights and measures by tradesmen and the general public at a time when they were still not in general use in government offices. It was concluded that in order to allow "general consent and satisfaction", the use of the new system should remain voluntary for the time being and that the preparation period (up to March 1874) proposed in the law of 1869, should be extended for a further five years.

At the end of this additional five-year period, in 1880, it was obvious that the metric system was still not generally accepted throughout the country. A decree was issued in 1881 to facilitate the dissemination of the metric system. Compared to the law of 1869, the decree of 1881 introduced radical changes in terminology and in the presentation of the conversion tables. It abolished the use of traditional weights and measures as of 1882, with the stipulation that they should be completely destroyed. In spite of the 1881 decree, the transition to the metric system was postponed at regular intervals by new regulations and official announcements during the last twenty years of the 19th century. There were several reasons for these postponements, such as the long-standing familiarity of the general public with the traditional system, and the mispraise of shopkeepers. As explained below, popular opposition was mainly based on the fact that tradesmen were taking advantage of this changeover to charge the same amounts of money for a kilo as had formerly been charged for an akba. To prevent such abuses, a memorandum was issued on January 1898, temporarily prohibiting the use of the new weights and measures in the market.

From this date onwards, the new system was employed in all government offices, while the general public preferred the old. In the first two decades of the 20th century, steps were not taken by the Ottoman officials to enforce the use of the metric system. In an empire experiencing difficult times after long periods of war, this issue was perforce neglected and postponed. Metrification in Turkey was reconsidered in the years following the proclamation of the Turkish Republic in 1923. A project proposed in 1925 was modified in the following years and was accepted by the General Assembly in March 1931 as the Law on Weights and Measures. The new law rendered the use of metric weights and measures compulsory from 1 January 1933 onwards. However, the actual implementation was postponed for a year, and the new measures were put into practice all around Turkey, from 1 January 1934.

The metrification in Turkey took about 60 years - from the promulgation of the law in 1869 to the final adoption of the system in 1934. The major difficulties encountered in the acceptance of the metric system by the Ottoman society were as follows: 1) the general public's long-standing familiarity with the old weights and measures; 2) the fraudulent exploitation of people's unfamiliarity with the new system by a number of readymen and shopkeepers, out to secure unfair and excessive profits.
This made the general public feel that they were certain to be cheated in any business conducted in the new weights and measures. They believed that they would not be exposed to fraudulence and deceit, as long as they kept to the old units. The very serious dimensions of the problem were demonstrated by the publication of books aimed at making shopping easier. These taught the trader, by means of tables, how to calculate the price of any particular commodity in the new system given its price in the old; 3) The decimal character of the new system was not easily understood by the geocentric public accustomed to using the decimal (Ottoman) system of weights and measures; 4) The new terms, especially prefixes such as deci-, centi-, milli- coincided for naming the new weights and measures gave rise to a great deal of confusion. 5) The astronomical basis of the metric system (1 metre was determined as 1/4,000,000 of the meridian) and the lack of any social, functional or human dimension also proved an obstacle in the way of its acceptance. Although it was not welcomed by the general public and shopkeepers, it seems that the metric system was used regularly in government offices from 1873 onwards. The conversion tables prepared for use in the land registry during the second decade of the 19th century are an example. In this period, the metric system was also used in modern educational institutions (Engineering Schools, Military School, School of Medicine etc.) since the textbooks on science and technology were translated from European works. It is likely that the metric system was also taught in secondary schools, for textbooks on mathematics included chapters introducing the new weights and measures. On the other hand, some professional groups contributed to the establishment and use of the metric system. In the chemical and pharmaceutical analyses carried in hospitals of Istanbul, metric weights and measures were used even before their official adoption. Similarly, European physicians and pharmacists, practising in the Ottoman state used this new system, beginning from the middle of the 19th century.

The use of the metric system in government offices and by certain professional groups, led to the coexistence of two different systems within the Ottoman Empire. It is true that this coexistence delayed the full adoption of the metric system in the Ottoman period. On the other hand, it facilitated its adoption in the Republican period since this coexistence familiarised the general public with the new weights and measures.

Another important factor that allowed for the full adoption of the system in 1934 was the change in the geographical borders of the country. It was easier to apply the metric system within the borders of today's Turkish Republic than it had been in the Ottoman Empire, with its lands stretching from the Middle East to the Balkans. It must also be taken into consideration that the first attempts to go metric occurred during the last century of the six hundred year old Ottoman Empire, that had witnessed long periods of war and a host of economic and political problems; the reinvention of this new system, by contrast, was realised during the first decade of the young Turkish Republic, founded in 1923, which was a more homogeneous nation-state with a strong central government.

CONCLUSION

The most important 19th century development in standardisation was in the field of metricology; the initiatory stage was first within the military institutions and related to engineering issues. Metric measures were used in the early 19th century in the Imperial School of Military Engineering with the practice of European techniques. The zira was first compared to the meter on the initiatives of Emin Paşa, an Ottoman military engineer. However, the official adoption, which took place in 1869, aimed to resolve the confusion caused by the multiplicity of weights and measures in Ottoman lands. It is interesting to note also that the official use of the universal time started in the army, prior to 1912, when the Ottoman government decided to adopt it in government offices as well.

In Ottoman history, the 19th century is usually considered a century of transformation. As the century progressed, Ottoman standards were slowly and inevitably replaced by European ones. The Ottomans gradually gave up their centuries-old measuring systems and started their integration with the European metrology. As in various other areas, this century was without doubt the period of reform for Ottoman meteorology. However, the widespread use of European metric units in Turkey did not occur before 1930s.

When the reception of the metric system by the Ottoman society is compared to the French experience, common points might easily be spotted. On the other hand, the main dissimilarity is that in France the desire for unification sprang from among the general public, complaining about fraudulent practices, whereas the Ottoman work on this project was initiated in response to a need felt for standardisation and also to the

Appendix I

19th Century Ottoman weights and measures

<table>
<thead>
<tr>
<th>Name</th>
<th>Abbreviation</th>
<th>Equivalent in SI units</th>
</tr>
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<tbody>
<tr>
<td>kibit</td>
<td>k</td>
<td>2 kg</td>
</tr>
<tr>
<td>rastix (0.735 m)</td>
<td>2 kibit</td>
<td></td>
</tr>
<tr>
<td>sobr</td>
<td>s</td>
<td>12 m</td>
</tr>
<tr>
<td>ket</td>
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<td>12 km</td>
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<td>bit</td>
<td>b</td>
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<tr>
<td>mekhi</td>
<td>m</td>
<td>2 kg</td>
</tr>
<tr>
<td>bozuk</td>
<td>b</td>
<td>4 kg</td>
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<td>demik</td>
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The Great
Ottoman - Turkish
Civilisation
The Great
Ottoman-Turkish Civilization

3

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ISBN 975-6782-12-X (TKNO)
975-6782-20-X (VOL 3)

ANKARA 2000
The incredible fact that the Ottoman frontier beylik became an Empire over such a short period of time has attracted many Western researchers and scholars to delve into the history of the Ottoman State. It could be argued that there are miscellaneous determinants and dimensions that actually created the possibility for such an incredible feat to be accomplished. This volume has been edited with the aim of focussing on the main factors that gave rise to such a great civilisation. In the first place, the institutional character of the Ottoman State is of utmost importance. In order to understand the basis of Ottoman civilisation, the different patterns of its institutions should be studied, as the comprehensive analysis of the institutional structure of the Ottoman Empire might enable us to conceive how a small beylik was able to turn into one of the greatest Empires in the world. In this volume, the administrative, judiciary and military institutions of the Empire are set out as the main subject titles. In addition, there are various subjects which have been analysed, under such subrubes as bureaucracy, religion and law, shedding light on the main characteristics of Ottoman institutions.

In appreciation of the highly developed institutional structure of the Ottoman Empire, the ideational and philosophical sources cannot be underrated. Unless these sources are taken into consideration, it is impossible to grasp the various dynamics of Ottoman institutions. Therefore, this volume is entitled “Philosophy, Science and Institutions”, due to the close correlation and importance of these subjects to one another.

Contrary to conventional Euro-centric and Orientalist assumptions, which hold “science” as the peculiar praxis of the Renaissance and Enlightenment in
the West, in this volume it is generally argued that the Ottomans had a number of successes in scientific activities (ilm ü fen). The Ottoman State not only promoted the development of science within the borders of the Empire, but also facilitated several interactions with scientific activities outside of its territories. During this interaction, it both benefited from and contributed to the scientific improvements made in Europe.

Additionally, this volume dedicates an important place to the development of philosophy and thought in the Ottoman Empire; although in the Ottoman Empire such major philosophical schools as developed in Europe were not formed, rather the Ottomans focused mainly on Islamic philosophy. Yet this situation does not arise from the fact that the Ottomans lagged behind in speculative matters. On the contrary, they were not interested in philosophical issues that were outside the realm of Islamic tradition. From their point of view, Islam encompassed all ontological and epistemological matters, making any other philosophical concern dysfunctional.

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