Workplaces: The Transformation of Places of Production

Industrialization and the Built Environment in the Islamic World

Edited by Mohammad al-Asad

Aga Khan Award for Architecture

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Preface

FARROKH DERAKHSHANI

A large part of the world's population, including increasing numbers of people in the Muslim world, spend a majority of their time in places of production, such as factories, workshops, and industrial facilities. In most cases, industrial facilities are built with only economic performance in mind; the welfare of those who work in these buildings has not been a major a concern.

The human aspects of the built environment, in parallel to innovative intelligent solutions for the functional and aesthetic aspects of projects, were a principal concern for His Highness the Aga Khan when he first established the Aga Khan Award for Architecture in the late 1970s. In the past thirty years, the Award has strived to find exemplary works of architecture and to share their unique qualities with those who are responsible for shaping our built environment. The Award's mandate is not only to recognize outstanding projects by permeating them, but it also plays a broader role in the dissemination of ideas and information of concern to architects and clients through its regular program of seminars, meetings, and exhibitions.

Addressing the issue of industrial facilities and places of production has been on the Award's agenda for many years. The fact that there was not a single industrial facility among the more than 100 projects that had received the Award since 1980 was an issue that, it was felt, deserved further investigation. An international seminar to explore this subject was therefore organized during the eleventh Award cycle. Turkey was chosen for the seminar venue since it is the Islamic world's most industrialized country, and Istanbul Bilgi University, which itself is located on an old industrial site, was a natural partner for this venture. At the seminar, architects, engineers, and academics from around the world joined their Turkish counterparts to explore subjects such as the relatively little-known history of industrial buildings in Muslim societies, the contemporary design of industrial buildings, agro-industrial projects, and the adaptive re-use of industrial facilities.

One of the numerous themes that the seminar, which was entitled "Workplaces: The Transformation of Places of Production," explored, was the rapidly-changing nature of many industries and their modes of production. The old sheds that contained traditional production lines are becoming obsolete, and at the same time, the overwhelming growth of cities in many Muslim countries has meant that what were peripheral industrial sites are now located within dense urban areas. The transformation of these sites to accommodate new urban realities has become a major challenge for authorities. Many old industrial spaces were considered liabilities for their surroundings, but, with imaginative programming, some of them have been transformed into assets that support a healthy urban life. Also, while older industrial facilities are being reconfigured to accommodate new functions, new construction techniques and materials have given architects additional tools to design industrial facilities at scales that some decades ago where not possible.

The seminar helped focus attention on the importance of industrial facilities in the Muslim world. In fact, for the 2010 cycle of the Aga Khan Award, the Master Jury selected the Ipekyol Textile Factory in Edirne, Turkey, designed by Istanbul-based Emre Arolat Architects, as one of the five Award recipients. The message that the jury wanted to convey in selecting the Ipekyol Factory was that a visionary client who allows an architect to design a space of quality not only serves the well-being of his employees, but also ultimately helps increase productivity.

The basis for the seminar was set by the Award Steering Committee, and Mohammad al-Asad developed the concept on their behalf. Suha Özkan, former Secretary General of the Award, Han Tümertekin, member of the Award Steering Committee, and İhsan Bilgin, Director of the Graduate Program in Architectural Design at Istanbul Bilgi University were instrumental in the organization of the event since its inception. Sefik Onat and Tolga Turgal, along with their team, coordinated the logistics for the seminar with assistance from Francesca Cantien at the Award.

Mohammad al-Asad undertook the task of editing the publication of the seminar proceedings. The proceedings include a selection of papers presented at the seminar or prepared afterwards. The texts were copyedited by Cyrus Samii. Sibel Bozdogan, one of the contributors to the proceedings, oversaw its publication in coordination with Belgin Cinar at Bilgi University Press. The main photographic essay of this volume is by Cemal Emden, who was commissioned to photograph contemporary industrial sites in Turkey for the seminar.

It is hoped that this first publication on the topic of industrial facilities in the Muslim World will trigger discussions and draw the attention of both industrialists and designers to consider the quality of space and the welfare of users as prime objectives in creating the workplaces of the future.

Introduction: Exploring industrial architecture in the Islamic world

Mohammad al-Asad

In spite of their ubiquity, factories, workshops, warehousing facilities and other building types intimately connected to the industrial process have yet to be the subject of any intense investigation in the diverse countries that make up the Islamic world. This book, which comes out of the "Transformation of Places of Production" seminar organized by the Aga Khan Award for Architecture in cooperation with Bilgi University in Istanbul in January 2009, aims at initiating a discourse that may remedy this oversight and begin to shed light on this important topic.

A brief overview of the industrialization process in the Islamic world

As the chapters on the development of industrial architecture in Egypt, Turkey, and Iran illustrate, the earliest examples of modern steam-powered industrial production in the Islamic world date to the first half of the 19^{th} century. These initiatives were implemented primarily as state enterprises serving military purposes, producing weaponry as well as such items as clothing for soldiers, but eventually extended to products intended for civilian consumption, primarily textiles and foodstuffs. Ralph Bodenstein, Farayar Javaherian, and Sibel Bozdogan independently note this phenomenon, in Egypt under its autonomous Ottoman governor, Muhammad 'Ali; in Iran, under the newly-established Qajar dynasty; and in Turkey, under the Ottoman Sultan Selim III.

Attempts at industrialization emerged as an integral component of the process of modern state-building in countries throughout the Islamic world. The narratives for industrialization differ considerably from one country to the other and follow diverging chronologies, but a number of common themes may be identified. In spite of the intensity of industrialization efforts in the Islamic world during the 19^{th} century, their geographic spread remained rather limited. However, as a large number of independent states came into being throughout the Islamic world in the post-Second World War, post-colonial period, establishing an industrial base emerged as an important and central component in the making of the modern state, along with other undertakings such as setting up a military force, putting in place a state-run media apparatus, and developing a unified national educational system.

The vast majority of early industrial establishments were state-owned. This is largely due to the underdevelopment of the private sector, especially in comparison to the overwhelming power and domination of the state, which often went as far as establishing and enforcing industrial monopolies. This phenomenon is particularly evident in 19th-century Egypt, Iran, and Turkey, but later was given new meaning in the mid-20^{th} century, with the rise of socialist ideologies that advocated significant—and often complete—state ownership of the means of production.

Egypt provides an excellent example of this trajectory. As

Ralph Bodenstein illustrates, Muhammad 'Ali established a state monopoly system that covered a wide range of industrial products. Following the failure of most of Muhammad 'Ali's industrial enterprises and the ensuing abolition of that monopoly system during the second half of the 19^{th} century, considerable private capital—initially foreign, but then both foreign and local—began to flow into industrial projects. This active private-sector participation in industrialization in Egypt continued until the 1950s and early 1960s, at which point the country's new republican regime took full control of its industrial sector by establishing new large-scale industries and nationalizing existing ones. This control was maintained until the mid-1970s, when private capital was gradually allowed to participate again in the industrialization process.

In fact, whenever and wherever regulations allowed for a market economy to emerge, a private-sector industrial base eventually came into being. In many cases, it has been associated with individuals or families, but these have incrementally given way to public share-holding companies. This transformation took on a particularly accelerated pace, in the 1990s, when numerous governments initiated processes for the privatization of state-owned industries—which were widely viewed as highly inefficient—by converting them into public companies and selling them partially or completely to both local and foreign investors.

In spite of the significance of the industrialization process in the Islamic world as a primary force of modernization and nation building, it has neither been consistent, complete, nor entirely successful. And it has yet to be as extensive as what took place in the West beginning in the mid-18th century, or in the emerging industrial nations of East Asia or even South America beginning in the second half of the 20th century. One explanation is that many countries with sizable Muslim populations, even those with established industrial infrastructures, remain significantly agrarian, with pre-mechanical agricultural production systems continuing to play a significant role in their economies.[1] There also is the lack of the intense history of engineering and mechanical innovation found in industrialized nations. Moreover, as the process of economic modernization has progressed over the past few decades, considerable resources in the Islamic world have been directed towards the service sector, as with banking, real-estate development, tourism, and, more recently, telecommunications, rather than towards industrial production. In many instances, the industrialization process has yet to reach its logical conclusion. In other instances it has been entirely bypassed.

Other hurdles have hindered this industrialization process. The extensive level of state ownership mentioned above has often allowed highly-inefficient production, marketing and distribution, as well as management practices to prevail unchecked. Similarly, the excessive protectionist policies put in place in many countries often directed industrial production exclusively towards a local, often small, captive market instead of pursuing export-oriented policies that would result in internationally-competitive industrial products. South Korea, in contrast, embarked upon the latter course in the 1960s, with extraordinary results. In addition, intensely-competitive and highly-crowded market conditions for many items, with established industrial as well as emerging nations vying for effective presence and increased market share, make it very difficult for newcomers to make any significant inroads.

Important changes, however, have begun to take place over the past two decades that are providing new opportunities for the evolution of a more active industrial sector in emerging economies. This has been most evident in China, which has quickly expanded its industrial output to become the world's fourth largest industrial producer (after the United States, Japan, and Germany). These changes are closely connected to policies of global economic liberalization and openness, as well as the cross-border synchronization of national investment-related policies and regulations. Such developments have ushered an era of economic globalization that has facilitated the movement of goods and capital (though not necessarily people) across borders. Also of extreme importance are the tremendous advances in telecommunication technologies that have greatly facilitated the exchange of data across the globe, and that should make the current phase of globalization more enduring than the preceding one from the second half of the 19^{th} century. It still remains unclear to what extent this globalization process will continue, particularly considering ongoing international economic and financial downturns that are constraining economic activity everywhere, as well as the ensuing protectionist reflexes. Nevertheless, what has transpired already has linked markets in many—though not all— Muslim countries to the outside world in a manner not seen before. This new global interconnectedness, as illustrated by Sibel Bozdogan

1 For example, according to statistics for 2005 provided by the United Nations Department of Social and Economic Affairs, although only about 33% of the population in Turkey and Iran is agrarian, the percentage increases to about 52% in Indonesia, 57% in Egypt, 65% in Pakistan, 71% in India, and 74% in Bangladesh. See, *http://esa.un.org/unup/*, accessed June 2010.

and Casey Tan Kok Chaon, has allowed industrialization in Turkey and Malaysia to evolve at an incredibly rapid and effective rate.

One manifestation of this globalization of industrial production has been multinationals establishing production facilities throughout the developing world to serve local, regional, and international markets. This move is attributed to a number of factors, one of which is lower labor costs as well as the weakness or even absence of effective organized labor organizations. These conglomerates also may benefit from relatively weak environmental protection policies that would provide safeguards against potential air, water, or soil pollution and contamination caused by industrial facilities. Another motivation is to reduce shipping costs, an issue that is becoming increasingly significant with the long-term trend of rising oil prices. By establishing permanent production facilities in these targeted markets, rather than transporting finished products to them, it is possible to create more sustainable production and distribution networks as well as a more permanent consumer base. Finally, such production facilities can take advantage of regional economic cooperation agreements (as with the Gulf Cooperation Council in the Arabian Peninsula) that allow their products not only to readily access the country where their production facilities are located, but also regional markets. As for the investments in these new local production facilities, they have been provided by the industrial multinationals themselves, by local investors, or through joint ventures.

Criticisms have been made of such arrangements, particularly that they take advantage of lax labor or environmental protection regulations in host countries. These industrial facilities in many cases are also relatively labor-intensive, relying on conventional assembly-line industrial production methods, and most often do not involve cutting-edge industrial technologies, as with semiconductor chips or advanced biotechnology and pharmaceutical products. Still, they do involve a level of industrial-technology transfer, as well as a transfer of their associated management, marketing, and distribution structures. It also may be argued that the labor and environmental practices that a number of industrial multinationals bring with them already adhere to higher standards than what exists locally. Whatever the arguments may be, it is definite that because of these new developments, many countries of the Islamic world today are undergoing a renewed and rather extensive phase of industrialization.

Another very interesting, though yet limited, related development is that a number of industrial companies in Muslim countries are beginning to establish industrial facilities in the West and elsewhere, and are purchasing existing companies internationally. One example is the recent 850-million-dollar purchase of Godiva Chocolatier, the Belgian manufacturer of high-end chocolate and related products by the giant Turkish food producer Ülker. Another is the acquisition by the Jordanian Hikma Pharmaceuticals of a number of pharmaceutical companies in Italy and Germany during the past five years as part of its expansion strategy. In India (whose 150 million Muslims make up less than 15% of the country's total population, but comprise the third largest Muslim population in the world), Tata Group, founded by Jamsetji Tata of the Empress Mills textile factory in 1877, has emerged as a truly global conglomerate. Its numerous international industrial acquisitions most recently included the universally-recognized British automobile brands Jaguar and Land Rover. It remains early to tell regarding the extent and consequences of such a phenomenon, but it is an indication of the maturity and success of a number of established industrial ventures in the Islamic world and in emerging economies in general.

Industrial production and the built environment: Narratives in the West

These various developments have found expression in the built environment. And yet, the architectural as well as urban ramifications of places of industrial production in the countries of the Islamic world have not received the focus they deserve. They definitely have received far less attention than in the West, and even there, the interest in industrial architecture remains relatively limited in comparison to the interest provided to other building types. The West provides a natural frame of reference since it is where the Industrial Revolution took place and the modern industrialization process came into being.

Numerous narratives presenting the evolution of industrial architecture in the West have been put forward. Many share what has become a common and well-known storyline that finds its beginnings in projects such as Claude-Nicolas Ledoux's 1775 Royal Salt Works complex at Arc-et-Senans in France, which although belonging to the pre-mechanical age of industrial production, provides an important example of a place of production that also is consciously and deliberately presented as an architectural statement. These narratives move on to feature utilitarian structures from the second half of the 18th century that were made possible by technical advances brought about by the Industrial Revolution, as with iron bridges, the earliest of which is the 1779 cast-iron bridge at Coalbrookdale. These are followed by a variety of large-scale steel structures that were proudly exhibited as examples of industrial advancements in the Western world and symbols of national pride. Among the best known is the cast-iron and glass Crystal Palace in London by Joseph Paxton. The Crystal Palace housed the Great Exhibition of 1851, which featured the latest and most advanced industrial products available in the world. A later world-renowned example is the 1889 Eiffel Tower in Paris, the iron structure that functioned as the entry arch for the Exposition Universelle and remained the world's tallest structure for decades. The Exposition also included the Galerie des Machines, which had the longest single-span interior in the world—extending along a length of 111 meters. As with the Crystal Palace of a few decades earlier, it featured the latest industrial machinery of the time.

These narratives usually reach their apogee with the industrial buildings designed by German Modernists to give "architectural dignity to the workplace." Many of these architects were affiliated with the Deutscher Werkbund (German Work Federation), the association of artists, architects, designers, and industrialists that aimed at integrating traditional crafts and mass industrial techniques. The most celebrated of these buildings are the AEG Turbine Factory in Berlin by Peter Behrens, completed in 1910, and the Fagus Shoe Factory in Alfeld on the Leine by Walter Gropius and Adolf Meyer, begun in 1911. This group of architects also paid considerable attention to the extensive social ramifications of the industrialization process, and accordingly was concerned with developing housing prototypes for the newly-emerging and sizable class of industrial laborers. A memorable expression of such design efforts is the 1927 Weissenhof estate exhibition, carried out by the Deutsche Werkbund, with Mies van der Rohe as lead architect. The exhibition featured over twenty constructed projects, including Le Corbusier's Citrohan House, which remains one of the better-known explorations by a prominent architect of standardized, prefabricated low-cost housing units.

These narratives may veer away from architectural production to touch upon the emergence of an industrially-inspired aesthetic that affected the visual arts of the West. Examples include the paintings of the French Fernand Léger (d. 1955), which featured machine-like, streamlined forms and colors, and those of the American Charles Sheeler (d. 1965), which provided highly-developed visual explorations of the formal qualities of machines and industrial facilities.

The chronological coverage of these narratives usually begins to fizzle out with the advent of the second quarter of the 20th century. Possibly, the industrialization process in the Western world had almost run its full economic and social course by then, and with that, the architectural community's interest in industrial architecture began to wane. Moreover, as Western economies entered the post-industrial era, with its emphasis on the service sector and on information technologies, architects followed suit by shifting their attention to other relevant building types such as office buildings, showrooms, or even research facilities, while maintaining pre-existing interests in other buildings types, whether residential, commercial, institutional, or cultural. Although industrial buildings of high quality continue to be designed and built, industrial buildings unfortunately remain to many architects (and also to clients and members of the general public) not much more than utilitarian structures of generally predetermined form that house machinery and warehousing facilities. In this context, however, it is interesting to note how what has come to be known as High-Tech architecture has increasingly taken on a prominent role in defining the formal qualities of overall architectural production in the industrialized world and elsewhere since the 1970s. By incorporating conspicuous technical elements, combinations of materials such as plastic and metal, as well as suspension building systems and structural devices, High-Tech architecture expresses what may be best termed an "industrial aesthetic."

Industrial production and the built environment: Industrial architecture in the Islamic world

A corresponding narrative (or narratives) to the evolution of industrial architecture in the West has yet to be put together for the countries of the Islamic world. This is understandable considering that the industrialization process—and by extension, the evolution of industrial architecture—has not taken on the same level of intensity as in the West.

Still, the countries of the Islamic world contain enough relevant works to allow for putting together a preliminary narrative addressing industrial architecture. A natural point of departure for such a narrative would be the industrial facilities erected under Muhammad 'Ali in Egypt, the Qajars in Iran, and the Ottomans in Turkey during the first half of the 19^{th} century. Ottoman activities relating to the industrialization process even included an industrial exhibition, the 1863

Ottoman General Exposition in Istanbul. These would be followed by the industrial facilities constructed in South Asia during British rule as with those by the Tata family in the 1870s. The construction of industrial facilities continued during the first quarter of the 20th century, primarily in countries that escaped direct colonial rule as with Turkey (under the Ottomans and then the republican regime) and Iran (under the Qajars and then the Pahlavis). The industrialization process during the first half of the 20th century also began to feature increased participation by local private-sector industrialists. In addition to the Tata family in India, these include figures such as Tal'at Harb of Egypt, who has achieved the status of a national hero in that country.

A major proliferation of industrial facilities across the Islamic world, however, does not take place until around the middle of the 20th century, with each country following its own path of industrialization, often initiated by the exit of colonial powers. During this phase, large-scale manufacturing facilities emphasizing heavy industries related to iron, steel, and cement, as well as oil and petrochemical production feature prominently, for they were considered clear and strong signs of progress and modernization. These heavy industries continued to dominate the industrial landscape for some time, often until the 1990s, when new policies of economic liberalization resulted in an increased emphasis on the wide-scale production of consumer goods for both local consumption and export markets. With that came a reconfiguration of the industrial scene to include far more diversity in the type and size of facilities.

Closer to the present, such a narrative for industrialization also may touch upon the newly-emerging phenomenon of converting pre-existing industrial buildings, some of which date back to the 19th and early-20th centuries, to accommodate new uses, primarily cultural centers, as with art exhibition spaces or performance centers. This growing adaptive reuse of industrial facilities is one indication that the industrialization process in the Islamic world has finally achieved considerable chronological depth. Such projects include the recent conversion of the 1910 Silahtarağa Santral, Turkey's first electric power station, into a multi-use center that now is part of Istanbul Bilgi University, or the recent conversion of two warehouse buildings, also in Istanbul, dating from the late 1950s, to serve administrative and academic functions at Bahçeşehir University. These undertakings are the subject of the chapters in this book by Ihsan Bilgin and Ahmet Eyüce. In Iran, the 1993 Komeil Cultural Center in Tehran is a converted beer factory originally built during the 1940s, and the 1938 Gheysarieh Spinning Factory in Qom was converted into the city's television and radio station in 1995.

One may also address the works of individual architects. Although the corpus of many prominent architects in the Islamic world still does not include industrial architecture, an increasing number are giving attention to this building type and are transcending the conception of the place of industrial production as a utilitarian shed covering machinery and storage space. Not surprisingly, the highest concentration of such architects is found in Turkey, the Islamic world's largest industrial producer. These include Seyfi Arkan, Haluk Baysal, Melih Birsel, and Aydin Boysan, who were active during the 1950s and 1960s. They in turn have been followed by younger architects such as Cenkis Bektaş, Mehmet Konuralp, Nervat Sayin, Murat Tabanlıoğlu, Dogan Tekelli, and Han Tümertekin. The work of a number of these architects is featured in Cemal Emden's photo essay and in "My Workplace," the film on industrial architecture in Turkey included with this book. Pioneering work is also being developed by architects from other countries, as with Sinan Hassan of Syria, who has devoted considerable energies to designing industrial buildings and has contributed a chapter on his industrial projects to this book.

Any study of industrial architecture needs to address the urban level. The effects of industrialization on large-scale land-use patterns are always significant. They include the destruction of agricultural land, the development of sizable new settlements, both planned and unplanned, and the establishment of new and complex transportation networks, all issues addressed by Suha Özkan in his chapter on Istanbul. There also are complete industrial districts that have been developed throughout the Islamic world. The chapters on Egypt, Iran, Malaysia, and Turkey all make references to such districts, in varying degrees of detail. The most ambitious examples, however, may be found in the oil-rich countries of the Gulf. These include the massive industrial districts of new cities such as the King Abdullah Economic City along the Red Sea in Saudi Arabia, currently under construction, the City of Silk in Kuwait, which is still under design development, and the zero-carbon, zero-waste Masdar City, on which construction has been initiated, and which will feature new industries concentrating on alternative energy technologies. Masdar City is being designed by Foster + Partners, and is featured in the chapter on their high-technology industrial projects written by David Nelson, their Head of Design. In addition, complete cities focusing on industrial production are being developed. An early example is the Jubayl Industrial City in Saudi Arabia, dating back to the late 1970s. A contemporary example is the upcoming Jazan Economic City, along the Red Sea in Saudi Arabia, which focuses on refining and on industries relating to the extraction of the area's rich mineral deposits.

Even rural areas may be significantly impacted by industrialization, without being overtaken by urban sprawl. This is particularly achieved through the installation of agro-industries, often in proximity to areas of agricultural production. These industries also require various infrastructure services including transportation networks that facilitate transporting agricultural products and packaging materials to them, as well as transporting the processed outputs to distributers. Moreover, these facilities create manufacturing jobs in communities where most employment opportunities traditionally are in agriculture, and therefore may bring about new habitation densities and transportation requirements for those attracted to or pulled into these jobs. They may also create new demands for supporting services, such as eating facilities, garages, and retail shops, thus introducing significant non-agricultural land-uses into predominantly agricultural zones. This book gives considerable attention to agro-industries, particularly within the context of socio-economic development. This is evident in the chapter by Jim Garnett on the agro-industrial projects carried out by the Aga Khan Fund for Economic Development (AKFED) in the coastal regions of Kenya, and the chapter by Hashim Sarkis on his work for AKFED in Kenya as well as other agro-industrial facilities being developed in Lebanon.

Parallel to the Western world's early interest in worker housing during the early-20th century, a concern is emerging in countries of the Islamic world regarding worker housing projects that aim at improving their living conditions. In some countries, as the chapters on Egypt and Turkey show, the practice of developing industrial labor housing is relatively well established, and examples have existed for decades. In other instances, these have only recently been a subject of concern. They usually are developed to adhere to standards set by foreign manufacturers or investors, or to avert growing negative international media coverage regarding the treatment of guest factory workers, as is the case in the Gulf.

While the general narrative on industrial architecture and urbanism proposed above primarily addresses the engagement of architects and planners in creating industrial buildings or urban complexes, a very important issue that needs to be addressed is the emergence of informal industrial districts. In many ways, these correspond to the low-income, low-quality urban districts that came into being in various cities in Europe and the United States with the spread of the Industrial Revolution from the late-18th up to the early-20th centuries. The built environment in the countries of the Islamic world is littered with expansive areas containing small-scale, low-tech industrial facilities that include blacksmith workshops, automobile garages and spare-parts fabrication shops, as well as construction materials yards. These areas are visual and environmental blights on the urban (and often the rural) landscape. They need to be addressed when investigating the effects of industrial production on the built environment. While it has not been possible to discuss this issue, it remains one that requires in-depth study. This book hopefully will provide a catalyst for its exploration, among others.

Interestingly enough, it is worth mentioning that a new generation of creative architects in a number of countries of the Islamic World are searching for positive visual stimuli in the ubiquitous "vernacular" low-tech industrial landscapes mentioned above. They are incorporating in their work the products and visual patterns produced by those workshops, sublimating them into highly-developed architectural statements. Examples include Sahel Al Hiyari in Jordan, who has prominently featured in his work galvanized water pipes, stone objects produced by street-side stone-cutting workshops, and leftover iron powder from blacksmith shops. Bernard Khoury of Lebanon has incorporated into his buildings powerful visual elements consisting of expansive metal-sheet surfaces produced by local welders working out of simple workshops and involved in low-tech processes of fabricating compartments for elevators and trucks. Such budding examples provide the beginnings for the development and integration of a locally-based industrial aesthetic into contemporary architectural production. Moreover, they present very interesting visual and conceptual alternatives to the internationally-prevalent vocabularies of High-Tech architecture.

The Transformation of Places of Production

Even though the industrial landscapes that have emerged in the Islamic world since the 19th century have had a considerable effect on the evolution of its built environment, the attention provided to their documentation and analysis remains both limited and fragmentary. This book (as well as the symposium from which it has emerged) aims at providing a point of departure and frame of reference for developing new activities and explorations that may rigorously and comprehensively examine industrial architecture in the Islamic world. [2]

This book emphasizes both the textual and the visual. Most of its chapters are generously illustrated. It also features the extensive photographic essay "Impressions" by Turkish photographer Cemal Emden, which provides a visual overview and examination of contemporary industrial architecture in Turkey. In addition, the book includes a DVD of the film "My Workplace," which presents the industrial work of a number of contemporary Turkish architects through their own words.

As text, this book addresses diverse developments affecting industrial architecture both chronologically and geographically, and examines them within their technological, socio-economic, as well as urban contexts. It features early examples of industrial architecture dating back to the 19th century as well as contemporary examples of the adaptive reuse of early factories. It also traces the evolution of industrial architecture in a number of countries, each of which has been defined by its own socio-economic, political, as well as cultural specificities. It identifies both common themes of development as well as differentiating ones.

The book examines the various challenges as well as opportunities that the new wave of industrialization currently taking place in the Islamic world presents. In exploring current developments, it features architects presenting their own projects, historians and critics reflecting on various projects, as well as others, including clients and urbanists, addressing the various ramifications of industrialization. In doing so, it combines academic, professional, and even client-based perspectives.

Finally, while the book's chapters generally examine past practices and present conditions, Hanif Kara's chapter peers into the future. He explores how developments in digital technologies will enable us to develop architectural and engineering solutions for places of production that are more cost effective, environmentally sustainable, customized to specific functional requirements or predominant building technologies, and responsive to local conditions, thus engaging in what he identifies as "smart localism." With this diversity of perspectives and insights that the contributors to this book present, we have much to consider regarding a very important subject.

2 It is worth noting that both the seminar and the making of this book already have generated momentum on both the professional and scholarly levels. The seminar brought together clients and architects of industrial facilities. More specifically, representatives of Industrial Promotion Services, which is AKFED's industrial activity arm, met Hashim Sarkis and Turkish architect Han Tümertekin at the seminar. In addition to his experience in designing industrial facilities, Tümertekin participated in organizing the seminar. They consequently asked both architects to work on developing the design of the passion fruit factory they are planning near Malindi in Kenya in order to better address a number of important social and climatic needs. The factory is presented in this book from both the point of view of the client (in Jim Garnett's chapter) and that of the architect (in Hashim Sarkis' chapter).

This book also provided Ralph Bodenstein with the opportunity to initiate an exploration of the evolution of industrial architecture in Egypt since the early-19th century. His chapter provides a pioneering and valuable account of that development. It also has created opportunities for further study. The chapter already has evolved into a full-fledged research project at the German Archaeological Institute in Cairo with which he is affiliated.

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An afterword: Places of work within Islamic communities

Mohsen Mostafavi

The origins of this book are rooted in His Highness the Aga Khan's interest in the circumstances and conditions of contemporary places of work within Islamic communities. In the context of the Aga Khan Award for Architecture, there is also an ongoing concern about the architectural characteristics of the types of buildings that accommodate our daily labor, whether intellectual or physical. Namely, how can an office building, a workshop, or a factory best represent the values and aspirations of a society today?

This issue is particularly pertinent within Muslim communities, many of which are grappling with the impacts of various forms of modernization. Historically, industrialization has involved some degree of Westernization, yet the introduction of industrial production has hardly resulted in the establishment of identical spatial practices in different countries. What can we learn from the history of industrialization within Islamic communities that would help guide us in our task of designing buildings today? Are there any conditions related to the program, environment, and habits of a specific locality that make it necessary for an office building in Morocco to be thought of differently from one in Abu Dhabi or, for that matter, London?

To help address these and related questions, the Aga Khan Award for Architecture organized a conference in cooperation with İstanbul Bilgi University at their Santral campus, which is housed in a series of old and new buildings. The older structures are predominantly industrial, and some have been renovated to accommodate the functions of a dynamic university. Others have been supplanted by contemporary buildings within a landscape that provides a new surface to the whole and, therefore, a new setting for the entire complex.

During the conference, we spent much of our time in a massive new exhibition building adjacent to a gigantic turbine hall, now a museum, that once provided electricity for İstanbul. The interplay between the machinery of the past and the monumental space that housed it made a powerful impression. The museum was a gleaming embodiment of progress. The pristine machinery—old, but in seemingly perfect working condition—helped emphasize the heroic character of the building and its original function. Perhaps this would not have been the case had the building and its equipment been neglected and left to deteriorate. However, the status of the place as a museum helped us—perhaps even forced us—to be more cognizant of the historical significance of the building as part of a much larger architectural and cultural project at a specific moment in time, when the relationship between technological progress and architectural advancement was closely tied.

Many of the essays in this volume address that period of 20th-century optimism during which countries such as Turkey, Iran, and Egypt embraced the new possibilities of technology. During this era of modernization, numerous factories were built in these countries, often combining the pragmatic and routinized needs of technical organization with an architecture that relied on available local resources and vernacular traditions of construction. In essence, many of the industrial buildings discussed are hybrids that invariably incorporate both Western design planning and local motifs and ornaments. But there is no denying the fact that like the defunct turbine hall at Bilgi University, the majority of these buildings are proud exemplars of a bygone time.

But what are we to do today when—with the passing of time—it is debatable that there is any contemporary version of a vernacular that can be easily referenced in the design and construction of new places of work? Shouldn't we simply consider adopting the best of what is available in the West? This seems to be the position taken by a number of countries of the Gulf region, such as Dubai, Abu Dhabi, and Qatar. But, with a few exceptions, these countries have had a hard time realizing truly innovative versions of Western architecture. It is, for example, difficult to single out office buildings in the area that have challenged the status quo of patterns of use, or the very typology of the office building.

Industrial buildings and workshops, on the other hand—lacking the symbolic significance of office buildings located at the core of most urban areas—are now too frequently reduced to pure utilitarian artifacts positioned along the fringes of the city. Most are buildings that do little for those who spend working days and sometimes nights within their confines, or for those who wish to partake of their meager visual and architectural benefits and pleasures.

We need to challenge this state of affairs by questioning the very circumstances and conditions of our places of work. The arrangement of these spaces must be sensitive to the needs of those who work in them while supporting efficient methods of production. The handling of the interior of these buildings needs to be more carefully considered for their long-term sustainability and productivity. Optimization of production is not ultimately achieved via mechanization alone, but can be fostered by enhancing the environmental qualities of industrial buildings.

Some of the pioneers of industrial architecture in the West made influential contributions not only through the quality and appearance of their buildings, but also through the attention they paid to working conditions. The use of daylight, for example, in the well-known 1929 Van Nelle Factory in Rotterdam was in part a response to the dehumanizing environments prevalent in American industry. Perhaps ironically, this situation is just as ripe for reconsideration in the West today as it is in the context of emergent and transforming Islamic communities.

In the late 1960s and 1970s, a number of European firms—especially those in Britain—developed an approach to architecture that incorporated the aesthetics and, to some extent, the methods of industrial production. These architects, including Norman Foster, Richard Rogers, and Nicholas Grimshaw, were responsible for the evolution of a new industrial sensibility that was not limited to industrial buildings. One contribution of this approach has been a reconsideration of materials and methods of construction, in particular the use of lightweight elements fabricated off site. The buildings designed by these so-called High-Tech architects are more akin to assemblages from a kit of parts than to structures built using traditional methods of construction such as bricks and mortar. Adapting this type of building to the context of Islamic communities, however, presents a number of challenges, for this method requires a degree of sophistication that would make its use for industrial purposes both technically and financially prohibitive. But this kind of building, which still merits further exploration, has evolved to serve a variety of other functions in ways that respond to climate variations in diverse locations.

It is important to remember that despite their many problems, Le Corbusier's buildings in India were developed with the specific goal of responding to the local possibilities and knowledge of construction. This approach would also extend to the recovery of local traditions as the platform for innovation. For example, the use of geometry in Iranian architecture might be a rich source of new spatial exploration rather than a merely symbolic restatement of traditional motifs. The primary challenge of industrial buildings, and places of work more generally in Islamic communities, is for architects and clients to investigate ways in which local circumstances and contingencies can produce the basis for new forms of design imagination that transcend naïve representations of progress as well as tradition. By embracing the best of what is on offer both globally and locally, as a form of material research, we will be able to construct new places and spaces of work in the years to come. Surely this is the only way we can produce buildings that will not only be inviting workplaces, but also significant contributions to architecture and worthy of the Aga Khan Award.

Places of production: An engineer's perspective

Hanİf Kara

Introduction

Engineering is deeply implicated in the subject of this monograph—it is intimately connected to industrialization and the transformation of the physical landscape as well as to the social and economic relations that come with them. Both the places and modes of production are inextricably linked. For the purpose of this paper, it is also important to distinguish between the "architect" and "engineer" as each represents and indeed requires a different facet of human personality. The best engineers today, in my opinion, are those who regularly re-shape their methods and approaches to respond to the agendas and obsessions of a particular architect, to the increasing variety of building typologies, and to constantly-shifting client-types, all without compromising their own technical integrity or imposing their own technical obsessions.

A few preliminary statements should be made at the outset regarding the assumptions that this paper makes and the positions it takes. This paper makes sweeping generalizations to provoke discussion; it is based on European and Western developments that have shaped the discipline of structural engineering over the relatively short period since it came into being in the late 18th century; and it is mostly viewed from the position of practice. It also argues that "engineering," of which structural and civil engineering is an important component, could have something to offer in terms of helping us address the socio-economic inequities and other challenges that have accompanied the process of industrialization, as identified in the introductory chapter by Mohammed al-Asad. This is only possible, however, if it can engage in a process of redirecting its aims and methods.

Some observations

Opportunities do exist for engineering to further orientate itself and to offer its skills in beneficial ways. This paper outlines some possible paths for this to happen, driven partly by technology, especially Information Technologies (IT) and smart materials, and partly by recognizing human needs in specific contexts, which vary according to factors such as climate or a given state of economic development. However, these paths are mostly driven by encouraging a renewed and closer collaboration, recognition, and partnering between those who commission the work (private / public-sector patrons), those who design it (architects and engineers), and those who make it (contractors and construction workers).

Engineering emerged in the West in the late-18th / early-19th centuries precisely to mediate between pure science and human need. Engineering today needs to rediscover this role even though it now emerges from a very different background in comparison to 200 years ago. Both the discipline's possibilities and responsibilities have changed enormously since then.

As professional divisions hardened in the 19th century, architects became responsible for image, and engineers for form and function (at least for large projects). The inherent unity of craft-based building production was broken, but the division between architect and engineer provided a far more significant division of labor than that between "hand-based" and "brain-based" work, which John Ruskin and William Morris, as well as others connected to the Arts and Crafts movement abhorred so intensely. It was a division between two types of brain-based work: imaginative and analytical. An example of this is the 1868 St. Pancras Railway Station in London. Its train shed, the largest single-span structure of its time, is the work of the engineer William Henry Barlow (fig. 1a). This shed, however, was concealed by the Victorian Gothic Midland Grand Hotel (currently St. Pancras Chambers), designed by the architect George Gilbert Scott (fig. 1b).

But even in the 19th century, this dichotomy was never complete. Witness the combining of the expansive warehouse along with columns paying homage to Classical details—even if made of cast iron, thus giving an architectural sensibility to the visual expressions created by engineers.

Attempts during the early-20th century to reconcile this division between architecture and engineering include Peter Behrens' AEG turbine factory in Berlin and Albert Kahn's work for the Ford Motor Company in Dearborn, Michigan (figs. 2a & 2b). Both architects tried to create a new visual language that expresses and articulates the production process and the technology inside their buildings.

In some cases, engineering creates its own imagery without the interventions of architects, as with the 1967 Ostankino Tower in Moscow, designed by the structural engineer Nikolai Nikitin, and, before that, the 1932 Sydney Harbor Bridge, designed by Dorman Long and Co.—although it was visually greatly enhanced with the construction of Jorn Utzon's Opera House alongside it (begun 1959 and completed in 1973)—forming one of a series of episodes in the evolution of a tense relationship between architecture and engineering. Although the 1937 Golden Gate Bridge in San Francisco was designed by a team of structural engineers led by Joseph Strauss, it did include input from the architect Irving Morrow, who was responsible for designing elements including the bridge towers, streetlights, railings, and walkways (fig. 3).

In most cases, however, when there is no relationship between the engineer and architect, the results are most disappointing. One just needs to look at any British Rail bridge or motorway flyover from after the Second World War. In these, engineering dominates; but there is little aesthetic quality or consideration.

Fast forward

Let us leap forward to our own day and look at what engineering can offer in a world where ever-advancing technology exists in parallel with increasingly-divergent levels of development, where modern communications raise awareness

Fig. 1a: **London, St. Pancras Station, William Henry Barlow, 1868; train shed.**

Fig. 1b: **St. Pancras Station Midland Grand Hotel, George Gilbert Scott, 1868.**

Fig. 2a: **Dearborn, Michigan, Ford Motor Company Engineering Shops, Albert Kahn, 1917–1928; the external articulation of windows provides an example of an economically-produced architectural effect.**

of these discrepancies without suggesting solutions, and where ideology, technology, and economics merge to address issues such as sustainability.

What are the key areas where engineers can impact the architecture of industrial buildings? To begin answering this question, let us consider a few issues. The bulk of industrial buildings throughout the world are dominated by the single-story / long-span typology. Some of the design issues relating to structure for such typologies include massing, structural form, expression, and materiality. Transformations affecting the concept of places of production also are taking place, particularly the emergence of new building types used to 'produce knowledge,' as with research laboratories, universities, and design facilities. A good example is the Queen Mary University School of Medicine and Dentistry by AMEC Alsop Design, which incorporates an open-plan research laboratory, creating an interactive space for researchers and academics from seven departments (figs. 4a & 4b).

Fig. 2b: **Ford Motor Company Engineering Shops, the windows of the Engineering Shops provide natural light and ventilation.**

Engineering: Its potentials and its limitations

If we are to simplify the discussion about the potentials and limitations of engineering, a good starting point would be to agree that both the post and beam—the ancient static structural principle, and the buttress and vault—the medieval dynamic structural principle, are being superseded in our time by the elastic principle of continuity, which is dictated by forms from nature (fig. 5a). This has particular-

Fig. 3: **San Francisco, Golden Gate Bridge, conceived by a team of structural engineers led by Joseph Strauss with input from architect Irving Morrow, 1937.**

ly taken place over the past twenty years and the emergence of the 'digital age,' which has opened up new possibilities, at least on the design level, for incorporating this new principle.

Engineering is about the physical world; it is about channeling and modifying physical conditions to suit human needs, using scientific method to understand physical conditions, and incorporating technology to achieve their channeling and modification. In some cases, engineering is carried out at such a scale that it spectacularly transforms the physical world, as with the Three Gorges Dam in China, the world's largest.

This provides an alternative to the platonic forms that dominated architectural composition in the last century (figs. 5b & 6). Taking geometry as an example, we no longer base these forms on proportions and algebraic relations, but on approximations achieved through calculus. Nurbs, for example, are geometries determined by an infinite number of specific conditions mediated by an exact function rather than geometrical relations. Informal geometries, differentiated structures, and non-linear organizations are now controllable.[1]

As we understand it, engineering came out of political, technological, and economic developments that largely took place in the Western world in the late-18th and through the 19th centuries. This is the historical moment where scientific and technological progress made large-scale physical interventions in the natural and physical environments possible, and where social and political change demanded it.

Although engineering has shown considerable potential for improving the lives of millions throughout the world, and not just for the rich (railways and airplanes have made long-distance travel cheap; sewage systems have extensively reduced disease, etc.), many of its operating methods have reflected the need for new forms of social control for a changing world.

Very crudely put, the social potential of engineering was circumscribed by its political context, and from there, it is only a short step for a work of engineering to acquire sym-

1 For a more detailed discussion of such geometries, see, Hanif Kara (ed.), *Design Engineering: AKT* (Barcelona: Actar, 2008).

Fig. 4a: London, Queen Mary University, School of Medicine and Dentistry, laboratory and public spaces, AMEC Alsop Design (structural engineers: Adams Kara Taylor), 2005.

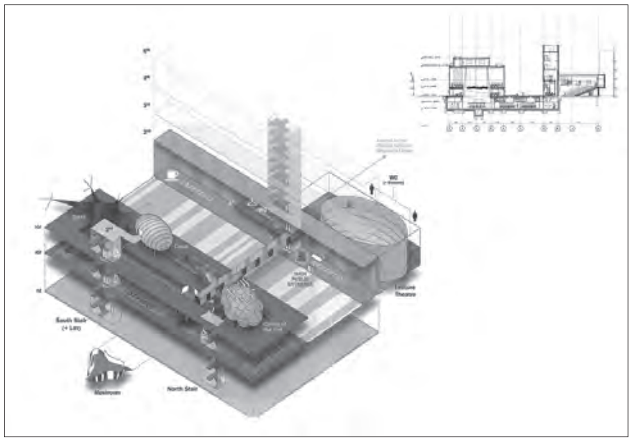


Fig. 4b: Queen Mary University, School of Medicine and Dentistry; diagram showing a new hybrid arrangement of open forms and spaces.

bolic resonance. Certainly, by the end of the 19th century, the 1851 Crystal Palace and the 1889 Eiffel Tower were examples of engineering producing symbols of technological triumph, political power, and an economic positioning of nations on a monumental scale that rivals those produced by architects. This continued into the 20th century with works such as the 1936 Hoover Dam and the 1930s Russian mining and industrial city of Magnitogorsk—and these are only examples of construction engineering, as I have not ventured into the intriguing world of space programs. In fact, a minor academic discipline has come into being that concentrates on decoding the relationship between politics and aesthetics during the Cold War, when neither side—the United States and Soviet Union—could ignore the symbolic value of their seemingly utilitarian undertakings.

What distinguishes the challenges of today is that technology has become even more powerful than before, but our world also has become morally more complex – and will become more so as it becomes increasingly interlinked. This makes it both possible and responsible to develop more sophisticated solutions that address today's complex conditions; easy and conventional solutions are becoming increasingly irresponsible.

All this brings about possibilities for developing a new aesthetic and also a new relationship between form, function, and production, which will bring about new forms of symbolism that accompany new and more efficient places of production.

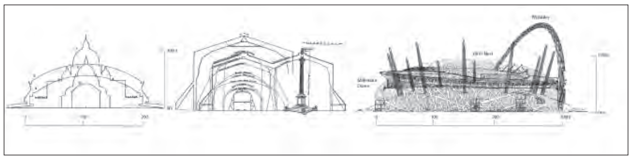


Fig. 5a: The ancient structural engineering principle of the post and beam, the medieval principle of the buttress and vault, and the contemporary principle of elastic continuity.

Fig 5b: Wolfsburg, Germany, Phaeno Science Centre, Zaha Hadid Architects (structural engineers: Adams Kara Taylor), 2005; this project provides a form where conventional walls, floors, and columns merge to produce a single surface with 'morphed fluid geometries' that are difficult to define as conventional platonic shapes.

The impacts of technology

Digital technology is at the heart of how engineering is evolving, and it is also driving several, not wholly compatible trends in transforming environments. It purports to merge the virtual and real worlds.

The implications of merging the real and virtual worlds are beyond the scope of this paper, but other impacts of dig-

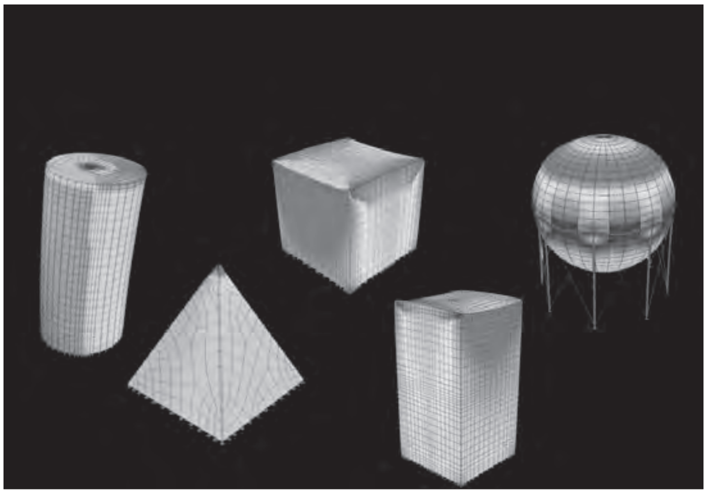


Fig. 6: **Platonic forms can now be morphed to create more complex, but also structurally optimal forms.**

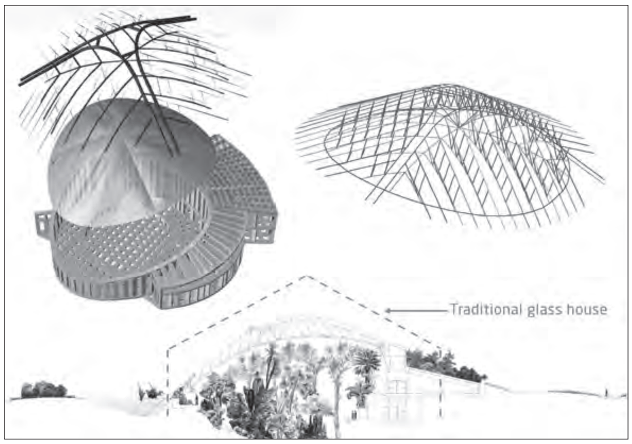
ital technology, which I will mention below, and the relationships between them are absolutely vital. They set the context in which the new aesthetic and balance between form, function, and production will emerge. Taken together, they transform the relationship between place and production, challenging the whole concept of "place of production."

New technology also allows for the exploration of hybrid forms and programs. Take for example the glasshouse as a typology. In the case of the Volkswagen Rainforest Pavilion at the Hanover Expo 2000, a conventional glass house typology was transformed by the use of ETFE foil in lieu of traditional glass. The use of this new material transformed the idea of a 'glass shed' into a more natural plastic form supported by only three leaning arches rather than conventional pitched frames (figs. 7a & b). The conceptualization and delineation of the structure's more complex curving forms would not have been possible without the aid of digital technology.

Digital technology hugely increases the range of possible design options, allowing solutions to be more closely aligned with their physical context, calculating optimal structural and environmental solutions, and therefore creating a more effective balance between human need and technology (figs. 8a, 8b & 9). In addition, it allows for a complete detachment of design from production in ways not possible before. This division of labor between thinking and making is part of what gave rise to engineering as a profession in the first place and made it a distinct endeavor from craft, where thinking and making are indivisible.

What is a "place of production" today? Narrowly described, it is a factory or workshop, a building, albeit a potentially very large one. But in social and economic terms, it brings together a network of suppliers, workers, managers, and consultants, who provide the labor, material, and ideas that together make up production. Traditionally, they tend to be in close proximity, creating an environment or even a "landscape" of production (see figs. 8a & b). But now that it is easier to detach design and production, that network can be extended across the globe to a greater and more efficient extent, covering a wider range of industries than ever before. Clearly, no single or easy physical definition exists today for "places of production."

Traditional industrial environments or landscapes, however, are often very specific to single industries (consider coal mining, power generation, or steel making, for instance), and are notoriously hard to adapt if and when that industry becomes economically or technologically obsolete, or is unable to compete with similar industrial facilities emerging elsewhere. One can see this in whole parts of any country belonging to the first wave of industrialization, whether the



Figs. 7a & b: **Hanover, Volkswagen Rainforest Pavilion at the Hanover Expo 2000, Bertram Bünemann (structural engineers: Adams Kara Taylor), 2000.**

Fig. 8a: **London, "Yellow Building," Allford Hall Monaghan Morris (AHMM) (structural engineers: Adams Kara Taylor), 2008; this building is part of a master plan for the development of a brown-field site. The 'Yellow Building' is coined as a 'white collar' factory for the fashion company Monsoon Accessorize that houses a gallery, garment prototyping space, and offices within one building. What is conceived here is mass-produced in factories in many other parts of the world.**

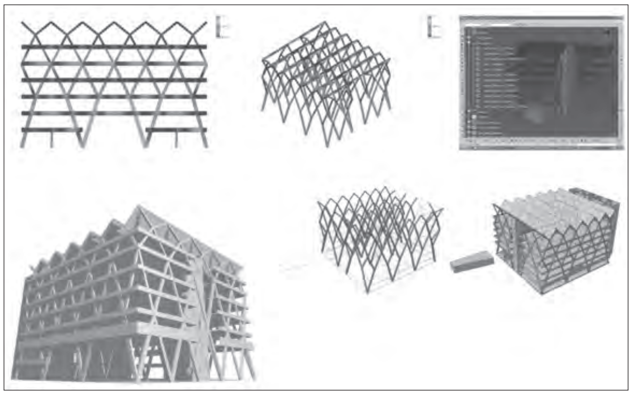


Fig. 8b: **"Yellow Building," stress diagrams showing the building's diagrid structure, where numerous options were explored to identify a system that optimizes the structure, but, more importantly, permits a new mixed-use slab building that is not constrained by the inflexibility of conventional column arrangements.**

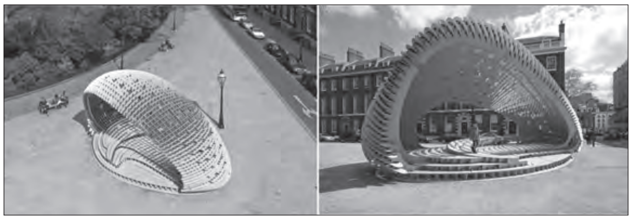


Fig. 9: **London, DRL 10 Pavilion (project received first prize in an international competition for the design of a public pavilion at the Architectural Association), Alan Dempsey, 2007 (structural engineers: Adams Kara Taylor); this pavilion is designed to be constructed out of sheets of FibreC (fibre reinforced concrete sheet) by Rieder. It is an experimental project that researches contemporary design and manufacturing processes that explore 'thought to production' through the use of automated digital manufacturing.**

United Kingdom (East London and most northern towns and cities), the United States (Detroit and other industrial cities in the Northeast and the Midwest), or Germany (the Ruhr Valley and whole swathes of the former East Germany). In these cities and regions one comes across the most pressing social and economic challenges facing their respective countries as a whole.

This "de-lamination" of places of production, where various components of the production process may be physically detached from each other, may well be an advantage for those countries that have not yet wholly industrialized: rather than "landscapes" of production, they might develop "mindscapes" of production. Here, the precise role of any given group, the techniques of production, and the products themselves are more flexible and responsive, less environmentally damaging, and provide for greater social mobility.

This presents all sorts of implications for the buildings that house production. Should they be flexible to prolong their lives, or should they be designed as short-term, economical structures that are so easy to take down and re-erect that they can be readily moved from one location to the other as the need arises?

In this context, the power of the "digital" is very important. The capability of modern computational analysis means that structures can be fabricated with just the right amount of material. It also makes it possible to customize or optimize a material to use no more than is absolutely necessary, and in just the right position for a particular task (see fig. 9). Ironically, the processes that lead to the "de-lamination" of building design and construction also allow buildings to be better aligned with their intended purposes.

Even more ironically, buildings now can also be better aligned with their local contexts. Again, modern computational analysis means that specific local conditions can be better understood, their drawbacks avoided, and their advantages exploited. In certain ways, this has been going on for some time. The problems of building in seismic zones, for example, have long been understood and techniques have been developed to offset them. Also, local climatic conditions increasingly can be effectively addressed in building design. But there also are other implications. In regions where basic construction techniques are prevalent, modern analytical tools can help identify their true potential much more effectively than traditional rules-of-thumb. This means that without having to go through the expense of importing advanced technologies or waiting for them to develop locally, higher standards of design and construction can be achieved using local building standards, materials, and practices. They might even provide the basis for a new aesthetic that speaks of a locally-derived modernity, not an imported one. This may be referred to as "smart localism."

Generic engineering solutions to places of production

Traditionally, industrial buildings have had some combination of the following characteristics:

* Large clear spans (to give flexibility and / or to accommodate large machines);

* Repetition of standard components (which brings costs down, especially in large buildings);

* Very simple exteriors.

These make the essence of industrial building types the world over, and they clearly often lack visual definition or character.

Industrial buildings of any significance will most probably continue to have new visual interest. But in light of the point mentioned above about smart localism, it should not be assumed—as has often happened in the past—that only advanced economies can make suitably-repetitive, cheap, or strong components. Instead, there are ways of adapting and co-opting local skills, products, or practices to achieve similar results.

Possible new challenges

Engineering can offer new possibilities as well. As the world's population increases, more and more areas will have to be inhabited or made productive in some way. Challenges will therefore emerge in making the desert habitable, developing new irrigation technologies, and making river floodplains or low-lying land near coasts safe from flooding. These challenges will provide the new landscapes of production—and may include agriculture, water-harvesting, as well as using sea-tides, the wind, and the sun to generate power. In this context, let us consider three areas:

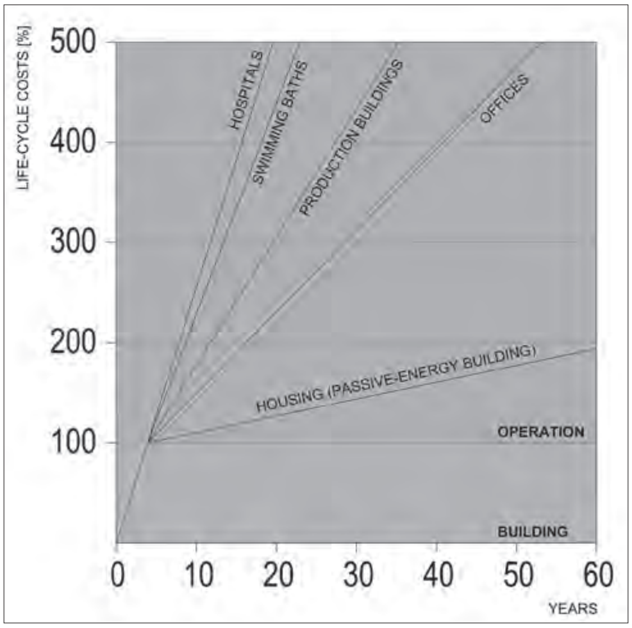


Fig. 10: **Energy consumption of 'production buildings' compared to other building uses. Only swimming pools and hospitals consume more energy in their first thirty years than factories.**

(a) Sustainable design

No seminar about the built environment would be complete without at least touching on this subject. Engineers play a vital role in enabling clients to procure buildings that are environmentally sustainable. The commitment to reduce CO2 emissions by the developing and developed worlds clearly demands all design disciplines to play their role. It is essential that a "holistic building approach" be taken as this is far more effective than putting together the sum of different individual parts. For industrial building types (which consume more energy than most other types of uses (fig.10)), this requires developing a new 'green aesthetic,' which through orientation and form creates low-energy spaces (figs. 11a & b). It requires engineers to 'unlearn' much of their recent practices and to return, for instance, to the use of natural materials. It also requires engineers to research the way materials are made, transported, and used so that embodied carbon can be evaluated. In the past, engineers have tended to use what manufacturers of building materials gave them. What is now needed is more work by engineers in the design and development of these materials.

(b) Natural disasters

Despite the contribution of engineers over the past century to mankind's management of natural disasters through an improved understanding of the nature of these disasters and an improved modeling of the manner in which they function, there is evidence that over the past twenty years, the nature of disasters reported globally has risen progressively (fig. 12). This includes hydro-meteorological (weather-related) and geological (earthquakes) disasters. Poverty, urbanization, climate change, and deforestation contribute to this trend, making large populations more vulnerable to floods, storms, landslides, and earthquakes. Engineering can make a significant contribution to mitigating their risks. The challenge lies in effectively using our tools and inventing new ones.

(c) Conservation, refurbishment, and reuse

Spatial standards in all building types have been undergoing a process of reduction for new buildings over the past fifty years. Whether it is room size, class size, or factory size, all are getting smaller and tighter. Accordingly, one of the greatest advantages of refurbishment and adaption is better quality of space, not to mention the benefits of sustainability and cost. In other words, refurbishment allows us to create large spaces and also to address the wider issue of sustainability by avoiding demolition. The protection of existing buildings for heritage reasons is also a growing trend.

Engineers are better able to engage with the practical di-

Fig. 11a: **Swindon, National Trust Headquarters – Heelis Building, Feilden Clegg Bradley (structural engineers: Adams Kara Taylor), 2005.**

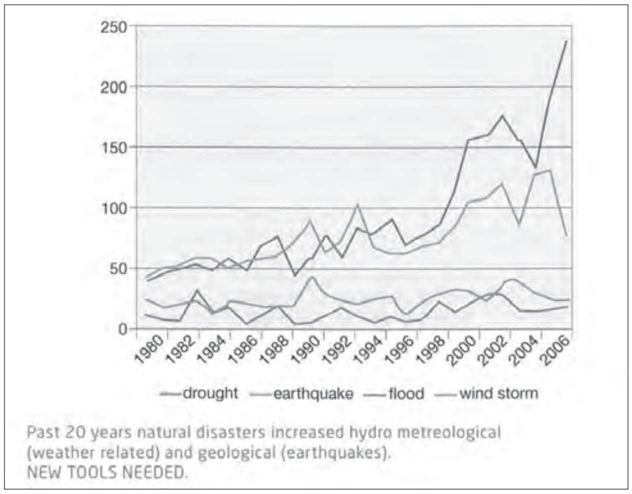


Fig. 12: **Diagram showing the increased occurrence of some types of natural disasters over the past twenty years.**

Fig. 11b: **National Trust Headquarters, the modern "saw tooth" design for the building demonstrates sustainability whilst fitting into the historical environment of Brunel's railway yards in Swindon. The form and orientation bring natural ventilation and daylight into a deep plan. In combining this with other features such as a large surface of solar panels, the National Trust Headquarters presents a unique green aesthetic.**

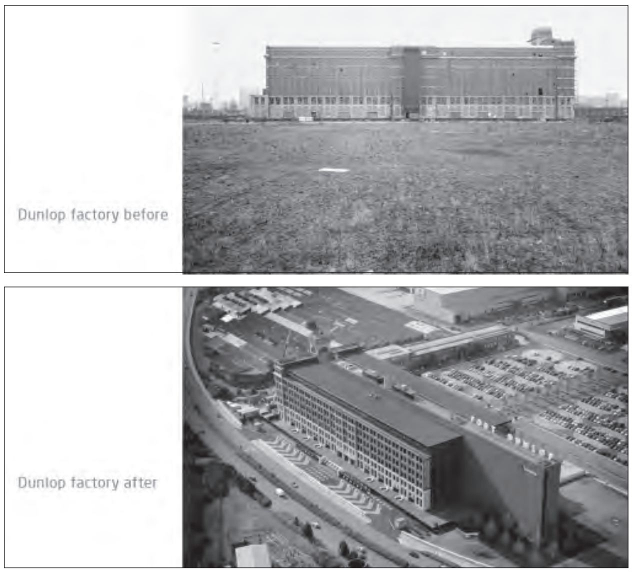


Fig. 13: **Birmingham, rehabilitated Dunlop Factory (Fort Dunlop), Hazel Rounding – shedkm, 2006.**

mensions of conservation, refurbishment, and reuse of existing buildings, and can help strengthen the debate on philosophical arguments put forward by conservationists through their understanding of materials. Interesting recent examples of adopting industrial buildings for new uses include the Tate Modern, a power station built between 1947 and 1963, and converted into a museum by the Swiss architectural practice Herzog & de Meuron in 2000. Another example is the 1920s Dunlop factory in Birmingham, which at one point was the largest factory in the world, but was closed down in the 1970s. The complex was recently redeveloped as an office and retail space with an adjacent hotel, with work completed in 2006 (fig. 13). Increasing the life of existing buildings requires a new 'skill set' and new experiences from the engineer that are not easily learnt. Educational institutions need to tackle this challenge.

Conclusion

Whilst industrial buildings of the past were often the result of a manufacturer instructing a local builder to construct a roof with four walls, the matter today is addressed through a different spirit, in both the developing and developed worlds.

The clients of today are familiarizing themselves more frequently with the best and best-known buildings to create benchmarks. More importantly, they appreciate the architect's importance in creating buildings that fit their contexts, and that also are adaptable, sustainable, and representative of the images they wish to project of their own organizations and products. A building that becomes a 'place' increases productivity. What is difficult to measure is the value of such buildings. They may well cost a bit more at the beginning, but, in my view, interesting buildings commissioned by 'visionary' clients more often than not have a positive impact on many levels that counters those initial increased costs. New challenges are emerging from a vast variety of issues such as concern for the environment, conflicts between building for industrial purposes and housing purposes in emerging countries, and the collapse of financial institutions. The role of the architect (and by implication the engineers who support him or her) is critical to bringing together and resolving the tensions that emerge between the multitude of challenges that affect what is finally built. All professionals will need to operate within the borders and margins of their own fields to deliver the factories of the future.

V. Contexts and future visions

Transformation of workplaces in İstanbul: Some macro urban form suggestions

Süha Özkan

Fig. 1: İstanbul, view from Kartal showing industrial production areas within their urban context.

Places of industrial production have long been regarded as the primary "workplaces." We are finding, however, that as societies progress, more people are being employed in the service sector than in industry. The capacity of the service sector for employment is enormous. For instance, in a five-star hotel in Turkey, there are one to one-and-a-half persons working for each bed. These statistics mean that one bed supports an average five-member family. By extension, a 500-bed hotel generates economic support for almost 2,500 people.

What we see as accommodations or leisure facilities are at the same time employment centers for workers. They are almost equal in number to the hotel guests, and are, perhaps, its primary beneficiaries. This simple example informs us that workplaces are no longer limited to places of industrial production, but also include facilities that provide services.

Work environments have always been divided into three sectors.

The first sector is the rural environment, where agricultural production is the primary economic activity. However, in time, through automation and the use of machines, it is absorbing less and less of the working population. In many cases, its seasonal nature also does not require the presence of a year-round working population.

The second sector is the industrial environment, where materials are transformed through technology into products. This sector has many different aspects and scales. It spans a large gamut of settings, starting from artisanal production in small workshops and proceeding to mega-buildings for production at a massive scale. Increased levels of industrialization usually result in small-scale, labor-intensive production being gradually taken over by larger establishments. While artisans, whether craftsmen or designers, will remain to address issues relating to tradition, quality, and innovation, large-scale industries are supplying more and more of the products we consume. Industrial production also has transformed modes of production in the rural sector since much of it is becoming increasingly mechanized and more extensively processed.

The third sector is the services environment, which addresses issues such as management, leisure, culture, and generally any activity that falls outside the fields of agriculture and physical production. With the development and spread of automation and robotics, manual labor has decreased at a great pace, and industrial settings have been empowered to produce more with less manual labor. In fact, the expectations in the late 1960s were that this trend would grow exponentially, and, as a result, this third sector would expand in leaps and bounds. Moreover, it was anticipated that the growth curve in production and the lessening demand for manual labor would result in worldwide prosperity. Expectations even emerged that three or four-day work-weeks would be sufficient to sustain our total industrial production needs. This shortened work-week would translate into further developments in art, entertainment, and leisure. In this context, the emergence of counterculture youth movements during the late 1960s such as the hippies and the Flower Children, who committed themselves to various types of artistic expressions and lifestyles that were in line with such a view, was not accidental.

These aspirations unfortunately did not fully materialize. Rural production often could not provide as much economic value as industrial production. Moreover, the discrepancy between industrially-developed nations and agrarian societies continued to increase. Less-privileged societies accordingly came to view industrial development as their only route for significant and sustained economic growth.

Industrialization in Turkey beyond agricultural processing

This approach is evident in Turkey, where it was realized by the 1960s that the country would not be able to achieve significant economic development by remaining a producer and exporter of agrarian products. The development plans introduced at that time instead emphasized industrial production. In previous decades, industries had been primarily concerned with the processing of agricultural products. Leadership in shifting industrial development away from agricultural processing was assumed by a new generation of industrial families, who funded their enterprises through their pre-existing business activities. The source of capital for the Koç family, for example, was import; for the Sabanci family, it was the processing of rural products, particularly cotton. The Koç family assumed leadership in manufacturing durable household goods, then electronics. The Sabancı family concentrated on textiles as a natural evolution of their involvement in cotton production. Later, both became involved in producing cars under license from Western and Japanese manufacturers. Other industrial families joined in developing new, specialized areas of industrial production, thus diversifying the country's industrial production landscape. The Kale Group pioneered in ceramics and building materials; the Eczacıbaşı family took leadership in pharmaceuticals, and then vitrified building materials. Turkey's industrial sector consequently emerged both as a major employer and an influential political lobby.

Both primary and auxiliary industries needed to be spatially close to each other and to transportation facilities. Proximity to railroad lines, highways, and ports became essential. Since they had a ready population supply for industrial labor, İstanbul and Izmit became Turkey's main industrial hubs. The industrial sector's large appetite for cheaper land meant that the non-urban areas between İstanbul and Izmit—and even beyond—evolved into one continuous conurbation. The workforce needed for these industrial facilities also grabbed land, and more than seventy percent of the population fulfilled their housing needs through de-facto self-help building methods or by buying cheaply-built flats from greedy speculators. These self-help building methods in fact have found their place in the international literature on low-income housing—along with bidon-villes, prosphigika, basti, and kampungs—as gecekondus, literally meaning "built overnight." For this uncontrolled and unregulated development, Turkey paid an unforgivable price in August of 1999, when a severe earthquake hit the area and killed tens of thousands of people.

This new phase of industrialization unfortunately did not bring new energies into the architectural scene. Though designed by architects, simple frame structures covered by corrugated steel and asbestos sheets became sore elements along the shores of the Marmara Sea. Moreover, the vast use of asbestos without any cognizance of its severe health effects resulted in environmental and health disasters in the following decades.

Not everything was devoid of quality, however. The architectural partnership founded by Doğan Tekeli and Sami Sisa emerged as a leader in large-scale building for industry, and designed factories as well as industrial complexes for many industrial holdings. Koç, Sabancı, and Eczacıbaşı were among those who cared for the quality of industrial environments as well as the efficiency of the workplace. The leadership they provided in emphasizing factories not only as places of production, but also as places where workers and other personnel spent at least one third of their time, created positive echoes in the architectural profession.

It is not possible to assert that these echoes were widespread enough to dominate the landscape and heal the scars of the preceding decades. They, however, were significant enough to eventually change the mentality of other industrialists. I will never forget the textile industrialist Atilla Türkmen telling me: "I am producing textiles for top designers who will transform them into garments of artistic value. Why should I not have a factory that is good enough for them to use for conducting their fashion shows?" He added, "Whether it is straight and neat or shabby, I pay the same price for every feature of the factory; why should I not have every component at its best?" This vision yielded a wonderful industrialist-architect partnership with Mehmet Konuralp. The result is the 1996 ATK Textile Factory in Tekirdağ, to the west of İstanbul, which perfectly manipulates daylight, creates a comfortable work environment, and presents an elegant architecture that addresses all types of work conditions with appropriate spaces. Along with Konuralp, Nevzat Sayın as well as Murat and Melkan Tabanlıoğlu joined the professional scene by designing workspaces of remarkable quality, which even occasionally became settings for feature films because of their unique architectural quality.

The ramifications of industrialization and post-industrialization on İstanbul's urban development

As we enter the second decade of the 21st century, İstanbul, with its population of fourteen million people, remains a suffocated city. The responsibility of planning for it is bewildering, and the challenges are enormous. Strategic decisions need to be made and new land-use master plans need to be developed in order to make better use of the city's urban spaces. It is very common in İstanbul to complain about traffic. Traffic problems, however, cannot be solved or alleviated by building additional roads, junctions, and flyovers. Permanent solutions lie in achieving better use of urban land and in removing industries that require long commutes. Also, issues relating to İstanbul's industrial development need to be incorporated in the strategic master plan being developed for the city, known as the 1/100'000 Scale İstanbul Land Use Plan (*1/100'000 Ölçekli İstanbul Cevre Duzeni Plani*; fig. 2). Although the following ideas seem simple to suggest, their implementation will take decades to realize.

The first aspect that needs to be realized in planning İstanbul's evolution relates to the fact that the Bosporus divides it into two cities: an Anatolian and a European one. After the first bridge across the Bosporus was built in 1973 (a second one was built in 1988) and as car ownership rates increased, the relatively plentiful job opportunities available on the European side and the less expensive housing available on the Anatolian side transformed pre-existing functional divisions between the two. The bridge made it very convenient to move between the two sides by car. Not surprisingly, traffic increased drastically and gridlock resulted. In order to address this situation, projects currently are being developed to provide the city's residents with opportunities to both live and work on each side of the city. The most significant of these includes the large-scale multi-use urban project being designed by the Iraqi-born British architect Zaha Hadid of Zaha Hadid Architects. Located in the Kartal district of Asian İstanbul, it is conceived as the Asian side's new urban center. I have directed the Kartal Urban Sub-Center Competition and the post-competition project development, where Zaha Hadid designed 555 hectares of new development as part of the İstanbul Land Use Plan (figs. 3-7). The project will serve a population of 2.5 million people and is expected to create 170,000 new jobs. On the European side, in Küçükçekmece, an equivalent project is being designed by the Malaysian architect Ken Yeang of T. R. Hamza & Yeang (figs. 8 & 9). When these two sub-centers are realized, they will generate inwardly-oriented urban traffic patterns and will consequently relieve current pressures on areas along the Bosporus.

The second aspect that needs to be addressed in planning the city's evolution relates to the fact that İstanbul is among the very few large cities of the world where import facilities are located in its center. Even though a growing capacity for such facilities is emerging in Avcılar at the western edge of the city, the centrally-located Haydarpaşa in its Asian Üsküdar district, along the Marmara Sea, remains the city's main harbour with container facilities (fig. 10). This harbour is an eyesore among the spectacular complexes that mark one's entry into the city from the Marmara Sea. In addition, bringing in goods by large containers into the heart of the city and then distributing them in smaller quantities seems inefficient and illogical. İstanbul needs two major logistics centers, one on each side, that are accessible by sea, rail, and highways. The logical locations seem to be Avcılar or Silivri in the west, and Pendik in the east. As for Haydarpaşa, because of its central and historical location, it should not continue to be used as a port area. Instead, it should be developed as a vibrant and engaging urban district.

A third aspect to be addressed regarding İstanbul's urban evolution is that it must change its function and identity. İstanbul has performed for over half a century the role of a center for industrial production. Many of its old and old-fashioned industries are moving to its outer areas and also to the provinces. The availability of a suitable workforce in these other areas is no longer a problem. Indeed, Turkey's popula-

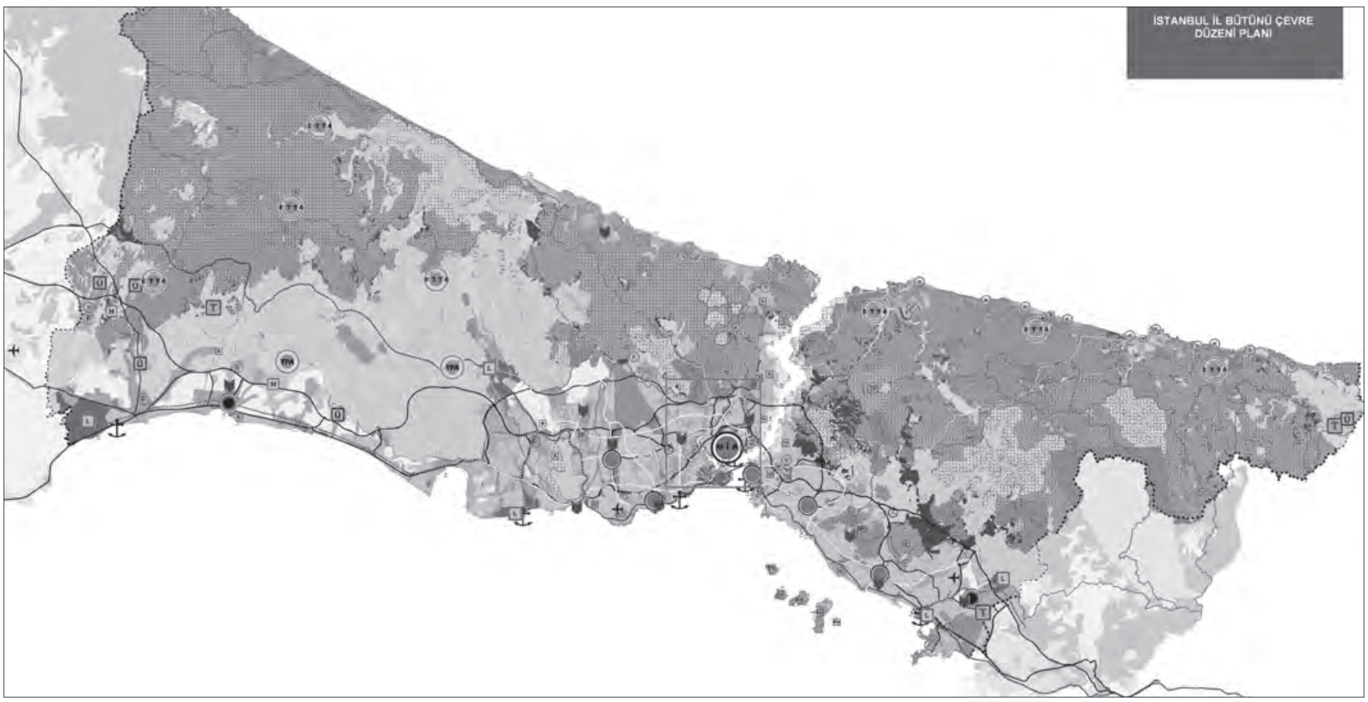


Fig. 2: **1/100,000-scale İstanbul Land Use Plan. The plan was approved in 2006 and altered in 2009.**

Fig. 3: **The Kartal Urban Sub-Centre competition site.**

Fig. 4: **The Kartal Urban Sub-Centre, site plan, first prize competition entry by Zaha Hadid Architects.**

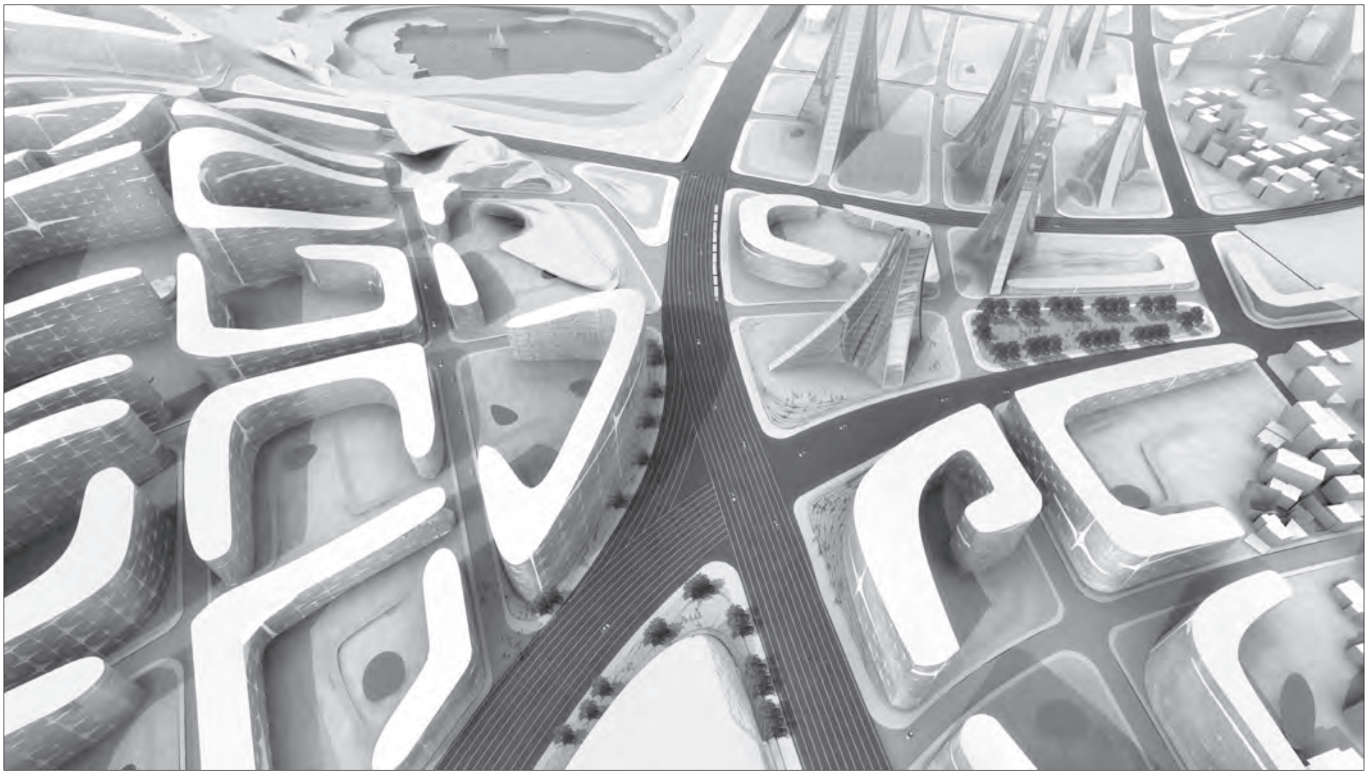


Fig. 5: The Kartal Urban Sub-Centre, proposed building layout/urban texture, Zaha Hadid Architects.

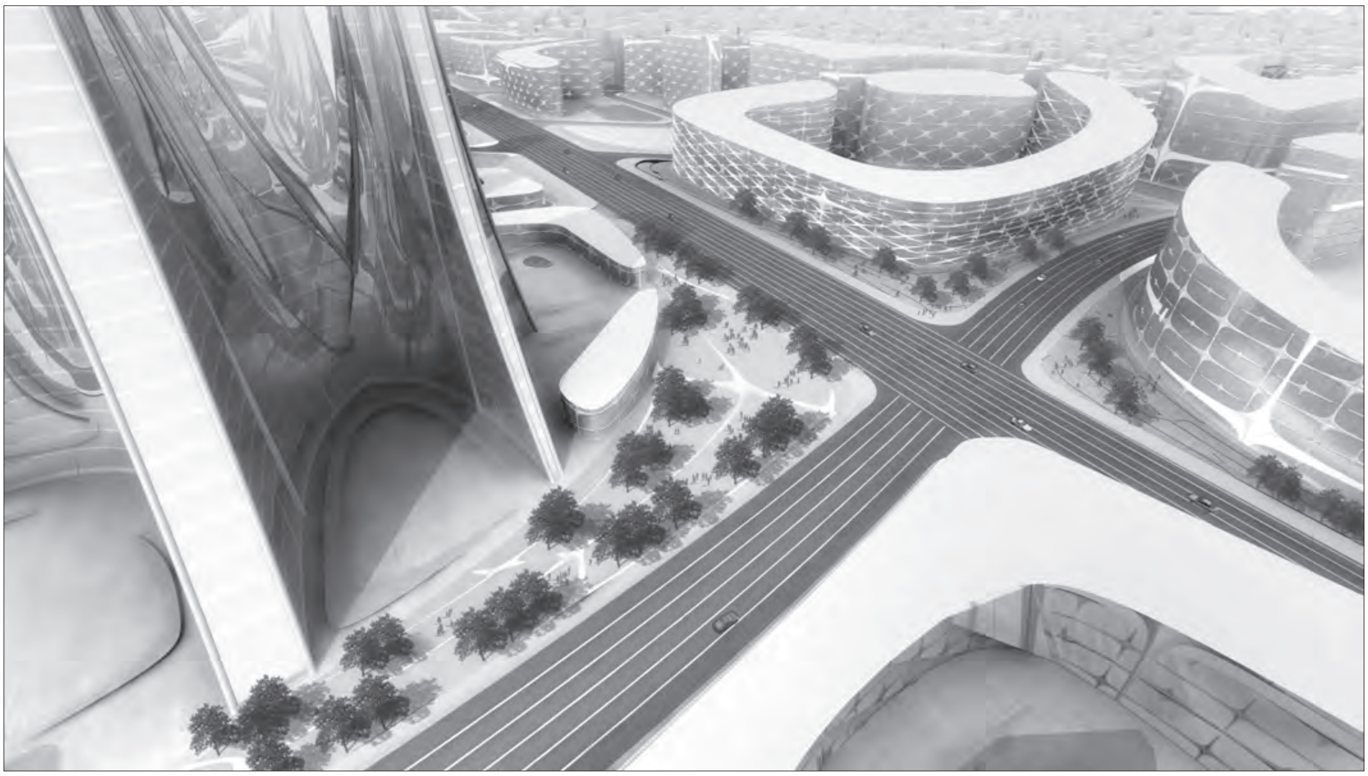


Fig. 6: The Kartal Urban Sub-Centre, detail of proposed building layout/urban texture, Zaha Hadid Architects.

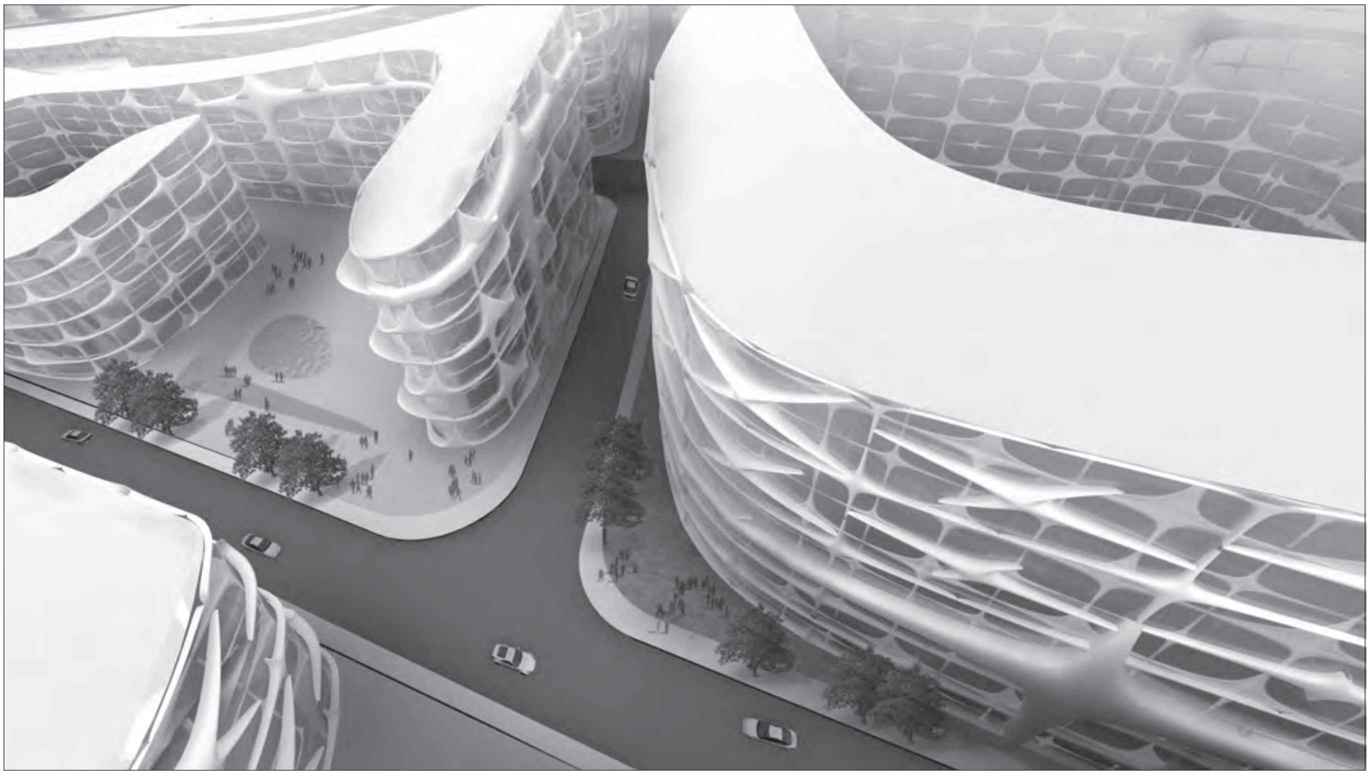


Fig. 7: **The Kartal Urban Sub-Centre, sample street-building-open space interrelationship, Zaha Hadid Architects.**

Fig. 8: **İstanbul, the Küçükçekmece Ecological Revitalization and Urban Regeneration competition site.**

tion dynamics provide one of its greatest potentials for development, and a skilled workforce exists wherever it may be needed. The land currently occupied by industries is precious and is getting more valuable as time passes. New functions therefore need to be given to these areas. In time, İstanbul must become a city for culture, tourism, conferences, business, and banking, along with all the other services necessary to sustain this metropolis. The problem here is with bulky, heavy industries. These are the ones that need to be relocated (fig. 11). Artisanal types of production, in contrast, can and should remain in the city, and must be integrated within its urban fabric to provide economic opportunities to urban populations.

İstanbul in fact already enjoys the status of a preferred city worldwide for congresses and conferences. Moreover, Atatürk Airport has emerged as a hub connecting international travel along east-west as well as north-south routes. In this geographic context, İstanbul is benefiting from the current shifts in the centers of international economic gravity from the West to East Asia.

However, having only one functioning congress center (The Lutfi Kirdar Conference and Exhibition Center)—with another one about to be completed along the Golden Horn—is not enough to satisfy existing demand, and conference facilities in the city often need to be booked more than a year in advance. In this context, it is interesting to note that İstanbul's music and art festivals and biennales now enjoy a worldwide reputation and have made İstanbul an interna-

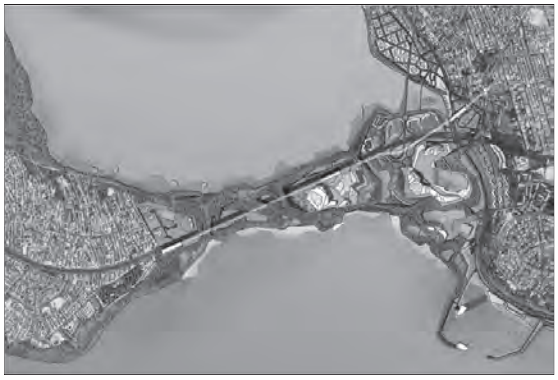


Fig. 9: **The Küçükçekmece Ecological Revitalization and Urban Regeneration project, site plan, first prize Entry by T. R. Hamza & Yeang.**

Fig. 10: **İstanbul, view of Haydarpaşa Port within its urban context.**

Fig. 11: **İstanbul, view of a typical urban development pattern near production sites.**

tional summer destination. In addition, the rental value of office space in the city has tripled over the last three years. The demand for making İstanbul an international business hub clearly is already there. What remains is to transform the types of work opportunities available in the city and to provide the necessary architectural and urban design solutions that would welcome and accommodate this new demand. This involves introducing talent and handicrafts into the city by establishing art centers and crafts enhancement studios, as well as non-intrusive, non-polluting means of artistic production and services, as with small repair and maintenance workshops.

Environmental and ecological issues cannot be ignored. İstanbul is surrounded by prime forests that so far have resisted the pressures of encroachment. But for how long will this be possible? The Land Use Plan, in addressing environmental issues, must reduce developmental pressures on these areas. Reducing these pressures can only be achieved by encouraging development along the Marmara Sea in the south in a manner that accommodates efficient mixed-use zoning.

There also is the encroachment of building on water reservoirs. İstanbul has enjoyed a tremendous capacity for collecting fresh water from surrounding areas. The city has celebrated this capacity through various architectural and urban projects such as the aqueducts that the Romans, Byzantines, and Ottomans built. Water is a setting for calm, pleasant environments. Therefore, the speculation and building taking place in the city's drinking water collection areas should be unthinkable, and must be stopped. Satisfying the pleasures of a privileged few at the cost of contaminating the city's daily water supply is criminal and must be treated as such (fig. 12).

Clearly, a major strategic policy shift is necessary to address the challenges facing İstanbul's urban evolution. The local authorities are aware of the challenges facing the city, and are directing their full resources towards achieving meaningful solutions. They cannot carry this out on their own. There accordingly is a need to devise an integrated policy that would bring together all relevant parties to develop what might be termed the "Commandments of Urban Development." This would positively affect the quality of life in İstanbul, including the quality of its work environments.

Fig. 12: **Urban sprawl is threatening İstanbul's water reservoirs.**

Santralistanbul: Architectural problematics

İhsan Bilgin

Spatial context

The Silahtarağa Power Plant was built at the turn of the 20th century at the tip of the Golden Horn, which formed İstanbul's central axis at the time, and has acted throughout history as the city's "stage." Beginning in the 19th century, it saw modern industrial facilities spring up alongside the shipyards it harbored since earlier times. The choice of this site for the power plant was probably influenced as much by the need for proximity to other industrial facilities as by its strategic location within the city walls at the heart of the busy economic life of the Galata district. The Golden Horn attracted large industrial facilities until the 1960s, and continued to attract medium and small-scale industries until the 1980s. From the 1960s onward, new large-scale industrial plants began to emerge at the urban fringes of a city growing linearly along its east-west axis. Large, campus-type industries in particular chose to settle along the eastern side of the Golden Horn, partly to be closer to the Anatolian hinterland that they served. The decentralization of the industrial landscape that took place late in the 20th century along the shores of the Golden Horn and in the valley beyond did not come about spontaneously. Beginning in the 1980s, industrial facilities were forced to abandon the Golden Horn and relocate to the periphery of the city following new planning decisions emanating from İstanbul's municipal authorities.

Completed in the mid-1990s, this process created a climate that favored adopting new functions along the Golden Horn, which continued to be the central axis of İstanbul, now a large metropolis growing rapidly along both east-west and northward axes. By assuming new functions not seen in the area during the 150-year history of Ottoman / Turkish industrialization, this "back-end alley" of İstanbul seized the opportunity to emerge as the city's forward-looking face. Since the local government did not possess adequate funds to plan and implement the Golden Horn's overall transformation, the change took place over time through fragmentary initiatives. And because it was spread over time, the change had the effect of decelerating speculative gains in the area, thereby also slowing gentrification. Emptied of its industrial component, the area's landscape began to attract not so much speculative projects, but social, cultural, and recreational programs that had been conspicuously missing in İstanbul's fifty-year history of modernization—a modernization that has been as traumatic as it has been energetic. Beginning in the 1990s, initiatives such as Kadir Has University, the Rahmi Koç Museum, Feshane, the Sütlüce Congress Center, and the Minyatürk Architectural Theme Park began to put their stamp on the Golden Horn's landscape as culturally-oriented public projects resulting from the conversion of industrial facilities. Although undertaken by different patrons, these projects collectively began

Fig. 1: **Names and locations of new public/cultural projects that have emerged along İstanbul's Golden Horn since the 1990s.**

to remake the Golden Horn into İstanbul's new cultural and recreational center (fig. 1).

The latest of these initiatives is the conversion of the Silahtarağa Power Plant by İstanbul Bilgi University into a center for art, culture, education, and recreation, with a stated mission of social responsibility to the city and the surrounding neighborhood. The electric power plant complex had ceased to function in 1984. In the early 1990s, the Board for the Preservation of Cultural and Natural Heritage registered it as a landmark of industrial archeology. The conversion project was carried out, under my coordination, by the architectural firms of Emre Arolat, Nevzat Sayın, and Han Tümertekin between 2004 and 2007.

The Santralistanbul project took shape in response to three complex problem sets, which may be listed as follows:

Limitations and boundaries

1. The plot on which the project is situated presented features that were unsuitable for construction, especially its muddy, alluvial, and unstable soil (fig. 2).

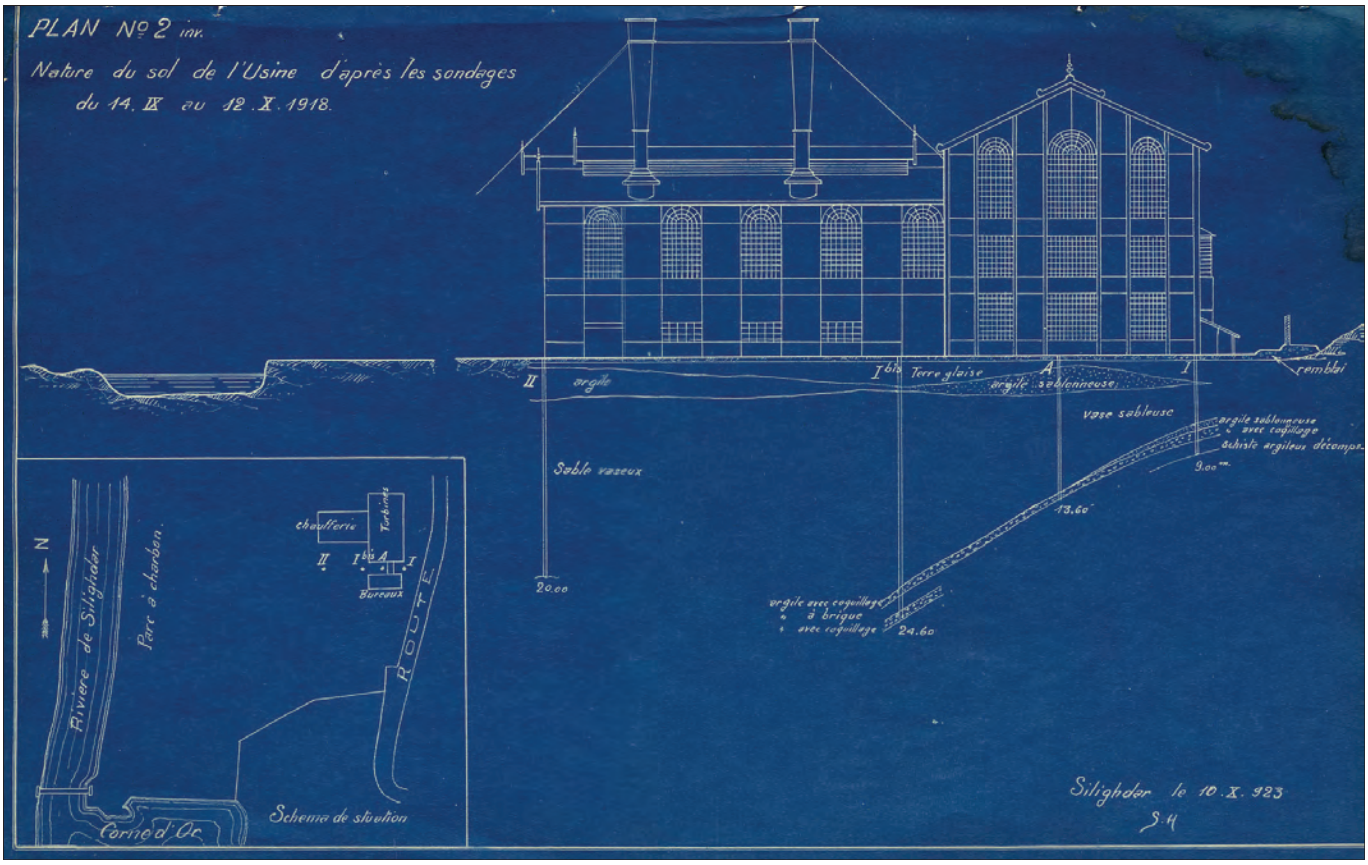


Fig. 2: **İstanbul, Silahtarağa Power Plant, site cross-section from the 1910s showing the structural weakness of the site's soil.**

Fig. 3: **Silahtarağa Power Plant, the main machine hall, which was the first structure to be constructed on the site.**

2. In addition to a number of buildings registered as individual cultural landmarks, the site as a whole was designated a preservation zone. The former mandated the preservation of these specific buildings, while the latter required that the site's overall character (density, layout, etc) remain unaltered.

3. The project's adaptive-reuse program was completely different from, and indeed ran counter to, the site's previous industrial purpose. We faced two layers of contradiction: First, we were expected to convert a single-function complex into an integrated one accommodating several functions. Secondly, the project mandated that the initial program, established according to technical functions invariable over time, should give way to projected cultural and social functions that would acquire their character with time. Furthermore, unlike Kadir Has University, which is a converted tobacco plant, the Silahtarağa's monumental machinery halls and boiler rooms had been designed to hold bulky machinery and boilers rather than workers engaged in production (fig. 3). In other words, our task was one of creating a space of social and cultural interaction out of a monumental industrial space practically devoid of human beings.

Accordingly, we were to preserve; but in preserving, we also had to undertake extensive change. In this context, two precedents that had addressed such a problem—albeit in opposite ways—are worth mentioning. In the Tate Modern (2000), Herzog & de Meuron had taken a monolithic building, the London power station, and completely transformed the interior, leaving only the exterior shell, thereby offering a rather easy solution to a difficult problem (fig. 4). In contrast, the Zeche Zollverein in Essen, Germany involved taking an old industrial / mining complex whose time was past (it was established in 1847 and closed down in 1993) and leaving it practically untouched, turning it into a gigantic performance and experience center in the middle of the Ruhr basin's loose, scattered, but continuous settlement pattern (fig. 5). Occupying two opposite ends of the spectrum of intervention, the former project completely transformed the interior space within a preserved shell, while the latter converted the old plant into a "found object," creating an art object out of something originally not intended to function as such. In our own case, various factors, including the program, the character of the site, its situation in the city, and the boundaries drawn by the preservation bureaucracy, forced us to seek more complex answers by exploring the "twilight zone" between preserving the old and proposing something entirely new.

How could change coexist along with resistance to it? How could change imply resistance, and vice-versa? Architectural strategies based on formal resemblances and formal contrariety give shortcut answers that short-circuit the dialectical possibilities that might arise when change and resistance imply one another. While formal resemblances seek to conceal change, formal contrariety loudly re-states the obvious fact of change. The first strategy tends to hide what is already a fact (that it is no longer an industrial building), while the second strategy merely affirms what is already known. We believed that in-between strategies that seek to preserve the aura of the old in the new are pregnant with dialectical possibilities, opening up more evocative, uncanny zones between concealment and the proclamation of common knowledge.

Fig. 4: **London, Tate Modern, Herzog & de Meuron, 2000, interior view.**

Fig. 5: **Essen, Germany, Zeche Zollverein, established in 1847 and closed down in 1993, and converted into a performance and experience site since then.**

Site analysis / Findings

The "found object" we had to work with can be seen in the 1984 site plan showing three different categories of buildings: registered landmark structures we had to preserve (red), unregistered buildings that could be demolished (blue), and industrial buildings that were already demolished but whose footprints we wished to preserve (green) (see fig. 7). The following findings, which we reached as a result of focusing on our "found object," encouraged us to explore the "twilight zone" mentioned above:

1. Established in four major stages (1910, with extensions in the 1920s, 1940s, and 1950s), the site had been essentially shaped by some basic decisions made at the very outset (fig. 6). At the same time, there were significant distortions and deviations with respect to these initial decisions (fig. 7). Rules coexisted along with their own violations. A cursory glance showed a certain order and repetition in the concentration and dispersal of buildings, only to be countered by other aspects of the site plan that may only be explained by arbitrariness. These are clarified in the following points.

2. The first example of rules and their violations relates to the site's functional zoning: raw material (coal) storage areas, the production units consisting of machine and boiler rooms, and the living quarters were separated from each other according to a clear zoning system that is further reinforced by thick bands of foliage between the zones (see fig. 7). In contrast, the relatively-small sheds and repair shops serving the production units as well as a number of administrative buildings were dispersed throughout the site, seeping

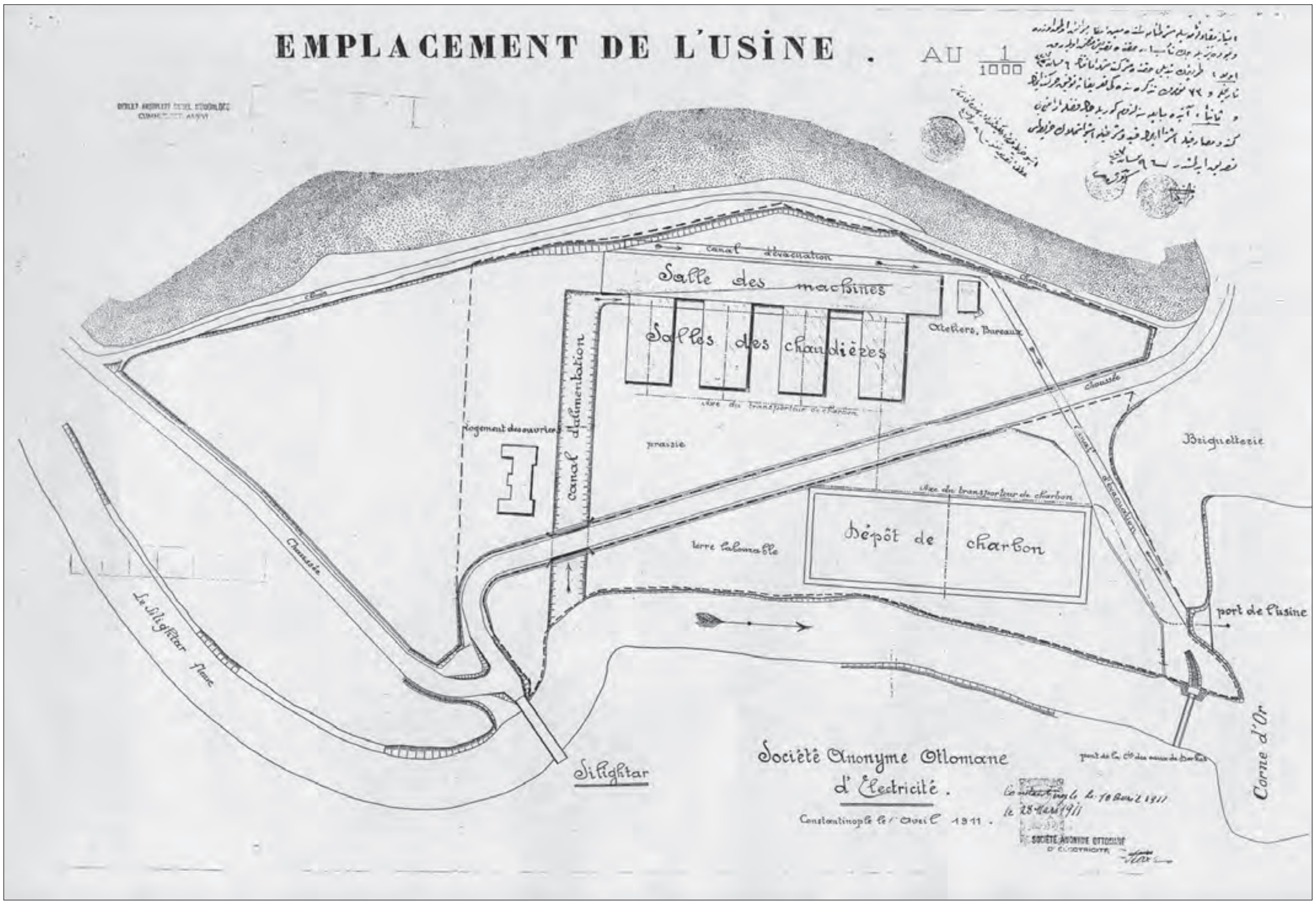


Fig. 6: **Silahtarağa Power Plant, site plan drawn in 1910.**

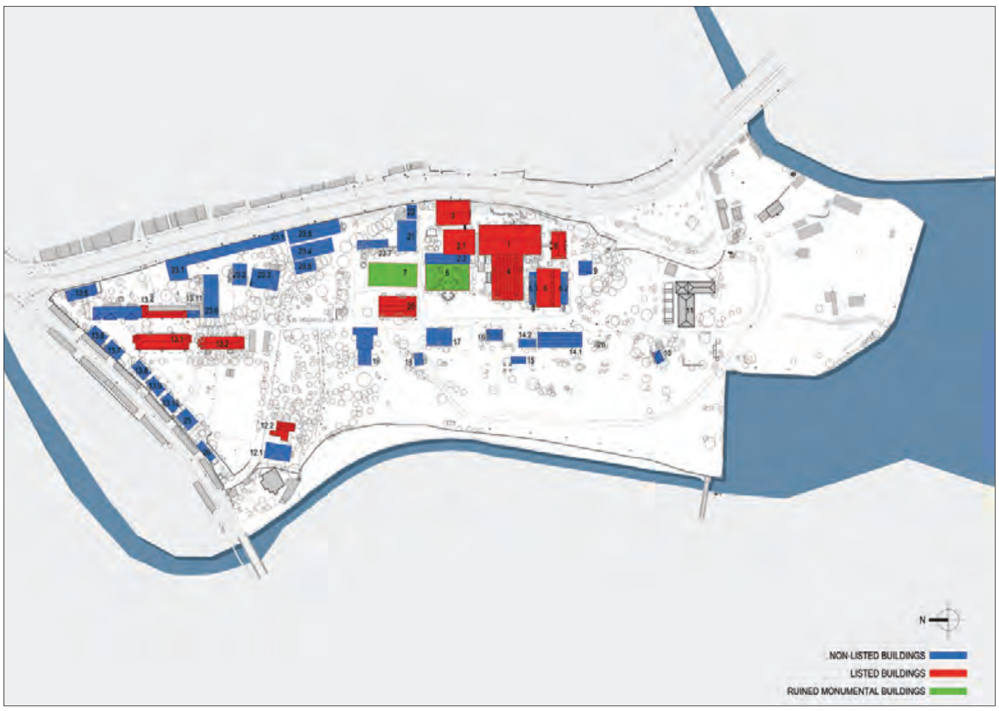


Fig. 7: **Silahtarağa Power Plant, site plan as it had evolved by 1984, three quarters of a century after its founding.**

into all three zones in such a way as to muddy the original clarity of functional zoning.

3. The groups of machine and boiler rooms comprising the production units were clustered around a distinct east-west horizontal axis. Yet, the proximity of these large buildings to each other, coupled with their varying sizes, shapes, and layout relative to each other—sometimes in a series and at other times as separate entities—give the impression of an orderless cluster that contrasts with the clearly-ordered "comb-shaped" layout of the original 1910 plan (see fig. 6)

4. As for the formal language of the buildings, certain grammars were pursued rigorously and decisively. Apart from a later machine hall (a reinforced concrete design by the architect Seyfi Arkan, dating from the 1940s), all the complex's industrial buildings were of cast-iron construction with thin exterior shells and large openings (in this case, arched on the upper levels; fig. 8). As such, they repeated, with small adjustments and re-interpretations, what was essentially the standard, anonymous, and monumental industrial shed grammar ubiquitous everywhere until the 1920s. This grammar owed its elegance to the ability of the exterior shell to exist independently of the crude internal construction that bore the weight of the gigantic machinery housed within (see fig. 3). It also should be mentioned that the shop buildings dating from the earlier stages of construction were small-scale examples of this same cast-iron interior structure with a thin exterior shell language.

5. In the meantime, the complex's administrative and residential buildings adopted a stylization that is totally different from this anonymous cast-iron language mentioned above: namely, an Ottoman version (designated as "First National Architecture") of the Central European architectural movement known as Heimatstil (figs. 8 & 9). This group of

Fig. 8: **Silahtarağa Power Plant, view of the first machine room and administrative headquarters adjacent to it showing the difference in the formal language between the production units and the prestige buildings.**

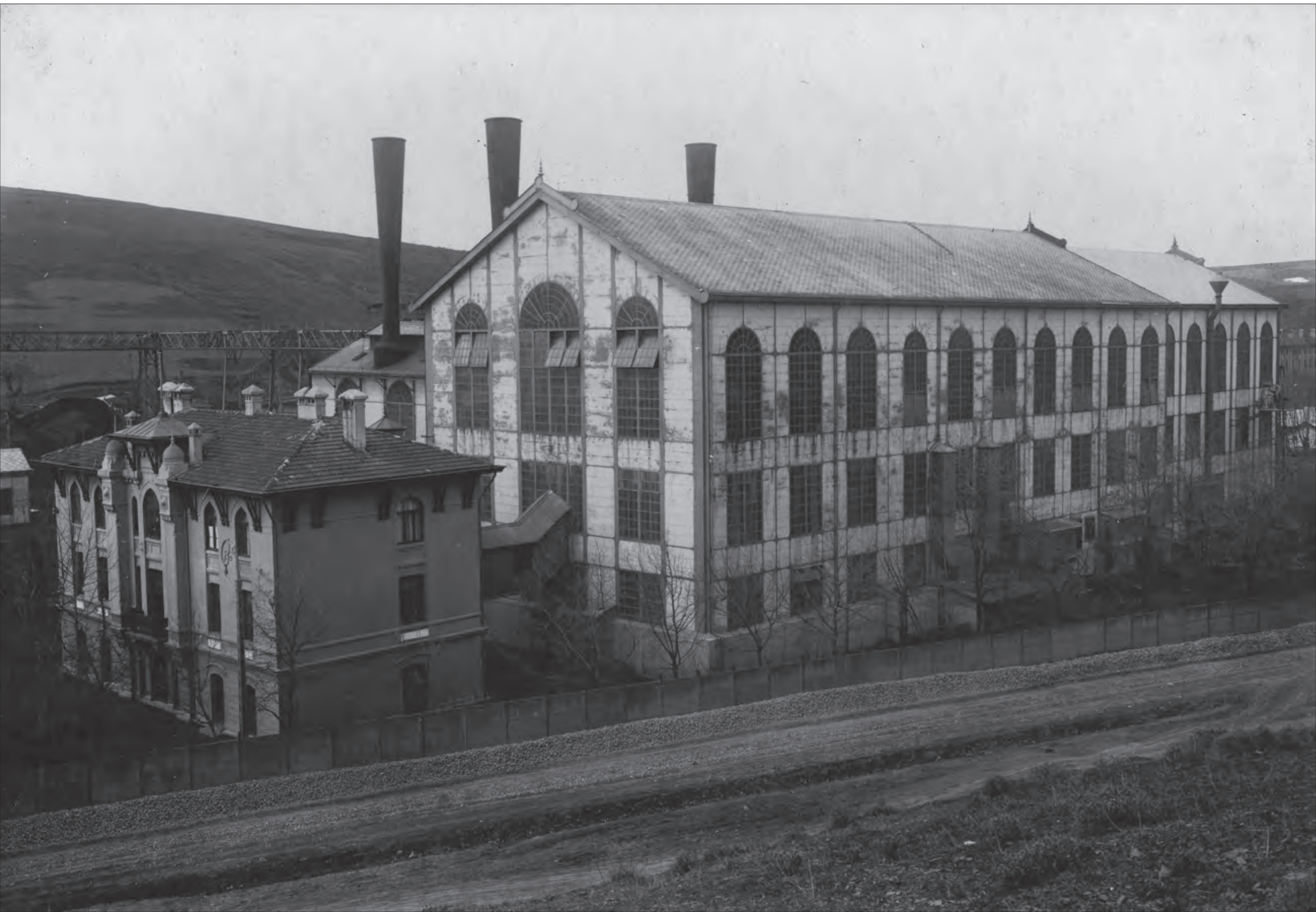


Fig. 9: **Silahtarağa Power Plant, view of a housing building in the site.**

buildings can be further divided into two categories: the "prestige buildings" (administrative headquarters, directors' housing, guest housing, etc) and the "ordinary buildings" (housing for workers and engineers). Whereas a local emphasis on Ottoman elements is more pronounced in the prestige buildings, the latter display the anonymous vernacular language of 19th-century workers' row housing in Germany and Central Europe.

6. External to the groupings above are a few shops, storage units, and housing facilities built after the 1950s (figs. 10 & 11). These are an outgrowth of the anonymous contractor-built production that spread in Turkey during the second half of the 20th century, and are without any architectural merit that would qualify them as cultural landmarks.

Reactions / Responses

Explorations, impressions, and determinations relative to the "found object" led to the strategic decisions explained below, which we felt would enable an infiltration into the zones of tension between change and resistance to change. A comparison of the new site plan (fig. 12) with the 1984 site plan (see fig. 7) provides a clear idea of the interventions that the conversion project introduced. Most significantly, these included the preservation / adaptive reuse of the registered structures (red), the construction of a new museum building on the footprints of demolished industrial buildings (green), and the construction of new educational buildings following the traces of unregistered buildings located at the edges of the site (orange).

Figs. 10 & 11: **Silahtarağa Power Plant, small shop and warehouse buildings from the post-1950 period. These were torn down during the renovation.**

1. The distribution of existing buildings on the site had already conformed to the peculiarities of the site section (see fig. 2): the unstable soil covering much of the site had prompted the building clusters to pull away from the water towards the more stable edges of the site that are favorable to construction. Continuing this pattern of concentrating construction in these zones was therefore important to us, not only for the sake of constructional rationality, but also for the sake of continuity with a familiar landscape that had become a major center of attraction over time. Hence, in making the specific site decisions for the conversion project, existing traces of the complex were followed, sometimes more closely (for example, the Center for Contemporary Art (CCA), built on the footprints of demolished boiler rooms), and sometimes in a looser fashion (for example, the educational buildings that replaced the unregistered housing and small shops along the site's northern and western edges).

2. The machine halls and housing units, which needed structural reinforcement for overall stability and earthquake resistance, were converted into an energy museum and housing for the scholars / artists-in-residence program, respectively. With a "single touch" intervention, the two machine halls became the energy museum, the essence of which is observation and absorbing impressions (fig. 13), while the old housing units were converted into new residential units, with upgraded service components. However, the boiler rooms, which revealed hazardous materials like asbestos as well as structural problems, could not be incorporated into the project's museum programs. Rather, their shells were preserved through additional structural reinforcement, while fragments of the interior were retained (such as one boiler encased in glass to preserve the memory of the original function), and the entire structure was transformed into the new university library. The main idea that inspired the shaping of this library was the powerful autonomous existence of the boilers in the central space, together with the service platforms and stairways flanking them, independent of the thin exterior shells protecting them from the elements.

3. The footprints of the no-longer-existing boiler rooms (shown in green in fig. 7) offered a good potential site for the CCA, which was the sole item in the program that required a large, single building with a highly-specialized function demanding high performance as exhibition space (fig. 14). Indeed, formally speaking, the only elements that the new building took over from the old boiler rooms were their footprints and scale (and hence, their distant memory). In shaping the CCA, the adopted strategy sought to channel constructive grammar and phenomenological experience into a single equation, thereby demonstrating that the inspiration to be drawn from old buildings need not be trapped into a dichotomy of either formal analogy (imitation) or formal contrast.

4. Meanwhile, the most important element in devising the new educational buildings along the outer edges of the complex was to avoid a "third language" (the first and the second being the cast-iron shell language of the industrial buildings and the Ottoman-style administrative buildings respectively), which might have had the effect of short-circuiting the desired grammatical relationships mentioned above. This was particularly important given the fact that while covering a considerable amount of floor area, these

Fig. 12: **Silahtarağa Power Plant, site plan after renovation.**

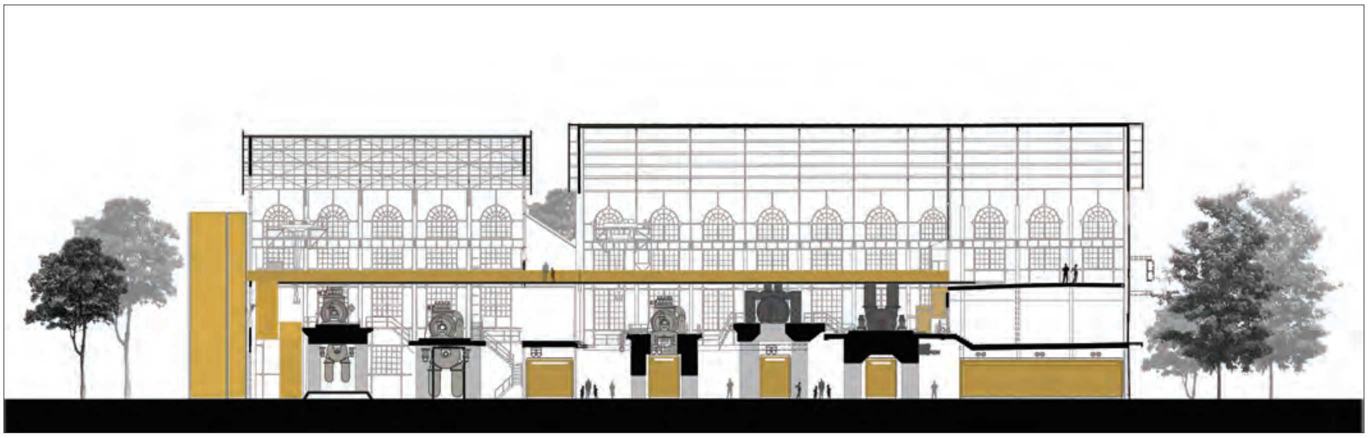


Fig. 13: **Silahtarağa Power Plant, the first and second machine halls were converted into the Energy Museum with the addition of a stairway and a viewing gallery.**

new educational buildings did not need to be housed under a single roof, as is the case with the CCA, and could instead be dispersed across the campus. In other words, the educational buildings would neither function as a dominant "primary element" on the lines of either the preserved industrial buildings or the entirely new CCA, nor as an exceptional "prestige object" like the director's residence, but rather as "secondary elements" infiltrating the fabric of the site from within. In avoiding a "third language," the most insidious pitfall in which one might fall would be that of formal repetition. An example of this would be a re-production of the "first language," specifically of the first-generation shop buildings, which, as mentioned above, were small-scale versions of the cast-iron thin-shell factories. This would have been akin to suddenly "being exposed" in an awkward garb while trying hard to blend into the fabric or "mingle with the crowd." While rejecting this decorative position in favor of a contemporary grammar with a high capacity for anonymity (fig. 15), we felt that taking a stance that aimed at deriving specifics from within that grammar would bring us closer to the area of tension with which we hoped to establish contact.

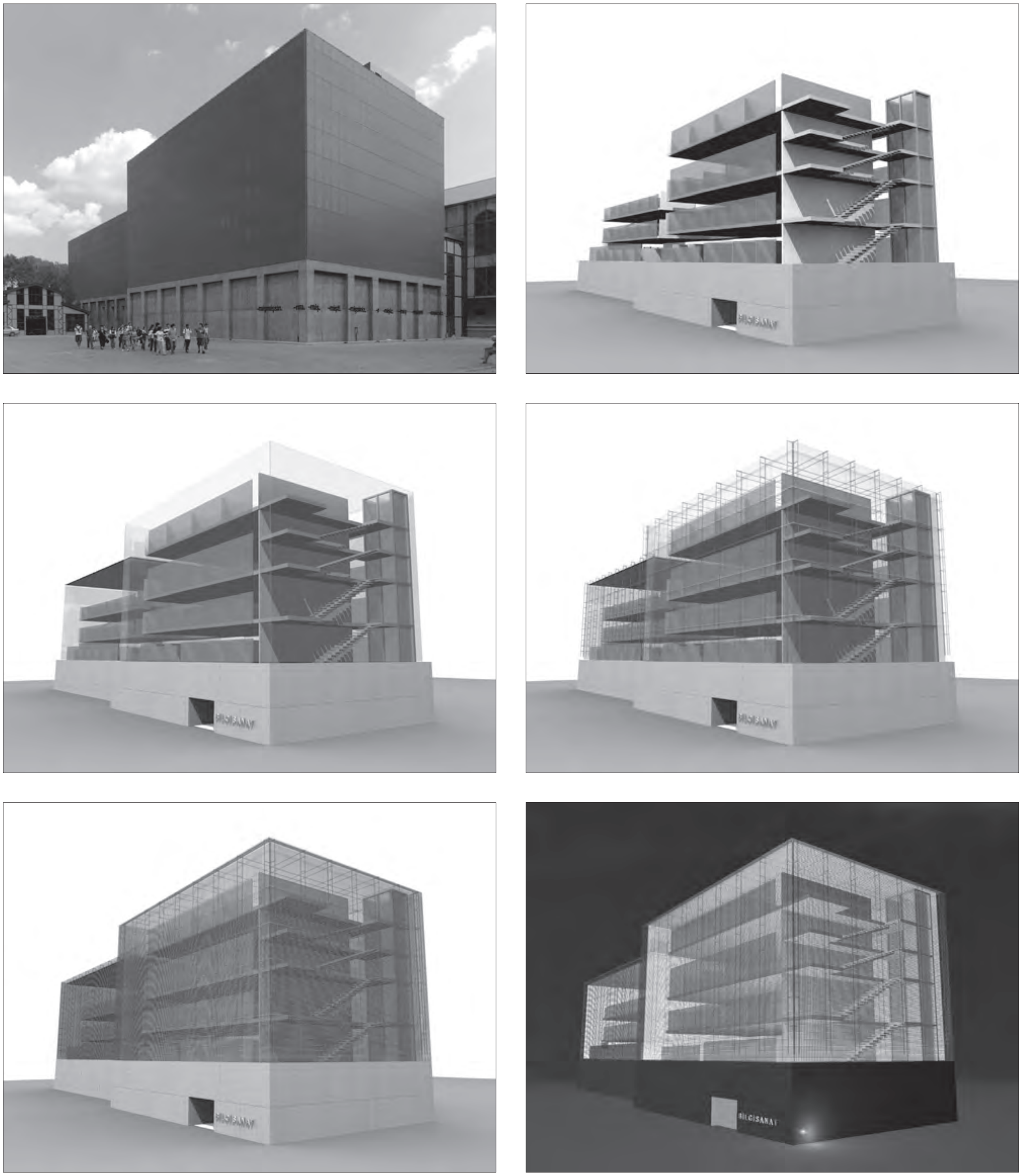


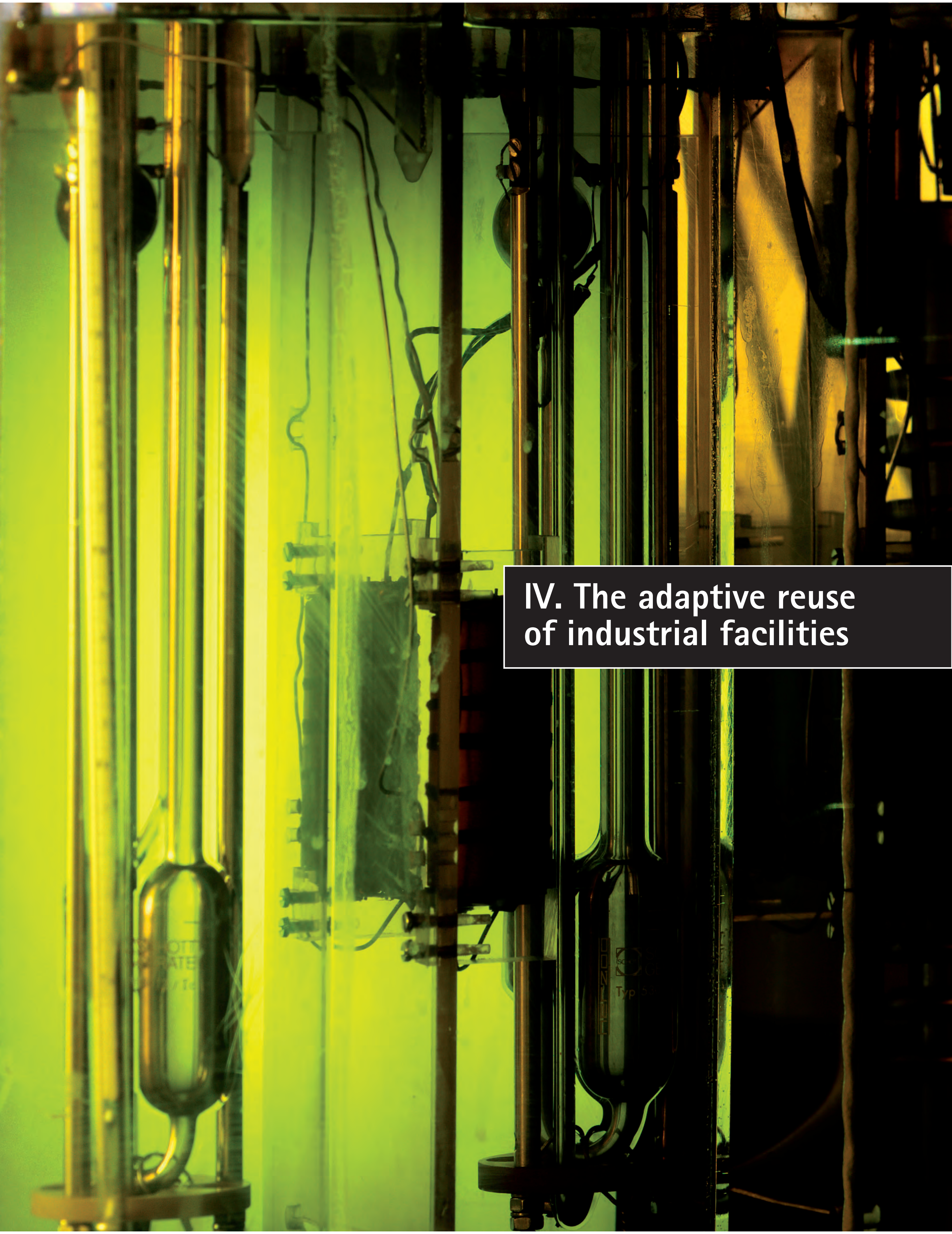
Fig. 14: **Silahtarağa Power Plant, the Center for Contemporary Arts (CCA) was built on the footprints of two torn-down boiler rooms, maintaining their respective scales.**

Fig. 15: **Silahtarağa Power Plant, one of the new educational buildings erected to replace the un-registered housing and small shops from the post-1950 period.**

Fig. 16: **Silahtarağa Power Plant, general view of Santralistanbul after the completion of renovation works in 2007.**

We had set out asking if change and resistance to change could point to one another, and whether these two phenomena that are embedded in modern life could turn into a strategy of awareness—a dialectical awareness of the new in the old and vice versa. We hope that the future life of Santralistanbul will encourage us to continue thinking about this question (fig. 16).

Translated into English by Fred Stark



IV. The adaptive reuse of industrial facilities

Adaptive reuse of industrial buildings at Bahçeşehir University (BU)

Ahmet Eyüce

The functional viability of the built form is rarely determined or limited by its physical durability. On the contrary, most buildings outlive their initial purpose of utilization, and physical deteriorations rarely prevail over functional and economic obsolescence. Built form and, in a broader sense, the built environment are subject to various types of deterioration, and at varying degrees, resulting from the peculiarities of specific situations.

Of prime importance among the forces acting on the functional life of built form are the consequences of changing modes of production, distribution, and consumption triggered by technological changes and developments. A large number of buildings that may be in good physical condition are now becoming functionally obsolete due to technological transformations. The presence of obsolete power plants in many cities is clear evidence of this transformation.

Equally important in the termination of functional viability is the transformation that takes place in the land-use patterns of urban settlements. Cities are dynamic entities subject to continuous changes affecting land use and the corresponding urban fabric. In the case of İstanbul, these changes have been greatly connected to the city's growth and sprawl.

Although the nature of land-use transformations will differ from one settlement to another, they often are manifest in the displacement of uses from certain areas. This displacement of uses in turn results in the functional and economic obsolescence of many building types in those areas. Residential quarters once located in the city center accordingly may become part of central business districts. Likewise, industrial buildings and complexes once situated at the outskirts of the city may become integrated within the city's urban fabric.

As far as urban changes are concerned, İstanbul presents numerous challenges. For one thing, the influx of large populations from other cities and from the rural areas of Turkey has greatly transformed the city's macro form, primarily through urban sprawl that has taken place at an exceptionally rapid rate. This in turn has resulted in radical transformations affecting both urban land-use patterns and the urban fabric in a manner that often has negatively impacted the city's historical parts. Urban density has increased at an unexpected pace, thus paving the way for the economic obsolescence of the city's originally low-rise and relatively low-density urban fabric. The majority of industrial premises located outside the city's residential quarters during the late-19th and early-20th centuries have become part of the city center. While some of them were either abandoned or demolished, those of historical importance or having architectural features worth preserving became the subject of adaptive-reuse projects.

An important consequence of the urban changes and transformations experienced in İstanbul—and this is of direct importance for the subject to this paper—is that the relation of the city to the sea has acquired new directions and new dimensions. Water has always played a determinant role not only in shaping the macro form of settlements, but also in the morphological evolution of their built form. Seas, lakes, rivers, as well as other natural and even manmade water bodies have always provided access and orientation for settlements. Besides creating excellent open visual fields and vistas, water is an important means of transporting both goods and people (figs. 1 & 2). Through water mills, they also provide a natural source of energy. Since the advent of the industrial revolution, however, they unfortunately also have served as a means for waste disposal on a very large scale.

İstanbul possesses all the possible advantages that interaction between land and water can provide a city. Besides the Bosporus, which is among the most beautiful waterways of the world, and the Golden Horn, which provides a natural harbor, İstanbul also possesses a number of rivers as well as the group of islands known as the Princess Islands. It is a city that displays considerable variety in the manner through which urban settlement relates to adjacent bodies of water.

Although in the past İstanbul boasted the undeniable advantages of a harbor city with excellent connections to the outside world, water nonetheless also was viewed as a source of danger until the Ottoman conquest in 1453. During the Roman period, the emphasis on defending the city meant that its defensive walls separated it from adjacent water bodies, and the city turned its back to them. Views of the sea therefore were mostly from afar and—taking into consideration the height of the walls—from above.

This emphasis on defending İstanbul against possible sea attacks continued during the Byzantine era, and additional fortifications were constructed along its shores. Palaces were designed with sea views, but always from a distance. The only exception to this was the commercially-active Port of The-

Fig. 1: **İstanbul, warehouses in Galata Port; these currently are usually vacant, but are used as exhibition halls from time to time.**

Fig. 2: **İstanbul, the Bahçeşehir University (BU) campus along the European coast of the Bosporus.**

odosius in the city's Yenikapi area, the remains of which currently are being excavated.

The Ottoman era brought about a different conception of relating the city to surrounding bodies of water. Although defensive structures like Rumeli Hisarı were built along the Bosporus, and the city continued to evolve within the boundaries defined by its pre-Ottoman fortifications (fig. 3), a seashore residential architecture peculiar to İstanbul also evolved. The visual impact of imperial seashore palaces and residences of high-ranking officials along both sides of the Bosporus was remarkable, particularly during the 18th and 19th centuries. Although fear of attacks from the sea was always a main source of concern for the city's rulers, ensuring proximity to the sea and interaction with it also was given importance, as evident in the summer residences and waterside recreational areas that came up along the coasts of the Golden Horn. The seashore building types that emerged showed a wide variety of architectural design solutions, based not only on the principle of proximity, but also on achieving maximum exposure to the water. These building types include residential buildings—known locally as yalis—as well as boat stations and boat houses. Beginning in the middle of the 19th century, water also became an increasingly-important means of transportation, moving people and goods between various parts of the city. Embankments along the coasts of the Bosporus, which nowadays accommodate a variety of activities such as seating, strolling, and fishing, and as such constitute important seaside urban spaces, were mainly realized during that period to facilitate the berthing of boats of all sizes (figs. 4a & b).

A third phase in the evolution of the relation of the city to the sea is marked by the advent of industrial buildings along the coasts of the Golden Horn and also partly along the Bosporus. Constructed during the second half of the 19th century, these mainly consisted of shipyards, factories, and warehouses, including their loading and unloading facilities. All display a rather insensitive and un-thoughtful utilization of both sea and seashore.

Adaptive reuse

The adaptive reuse of buildings can be defined as the process of converting existing structures to new functions. The process has mostly been applied to buildings with historical and architectural importance subject to functional and economic obsolescence, resulting in their protection from abandonment, deterioration, and demolition.

Adaptive reuse is a means of extending the life of historical built form, whose heritage value may well prevail over its economic feasibility. The role of architectural heritage in the formation, accumulation, and dissemination of the collective memory of a place is undeniable. Architect Pierre Thibault states that "the regions of Europe have an architectural heritage that is a thousand years old; today's challenge is to integrate this heritage into contemporary life in a sustainable way."[1] The history of İstanbul goes back to 8,500 years!

Adaptive reuse, however, is not always limited to extending the life of historical buildings with heritage value. It also

1 Pierre Thibault, *Old buildings Looking for New Use: 61 Examples of Regional Architecture Between Tradition and Modernity* (Stuttgart-Fellbach: Axel Menges, 2007), p. X.

Fig. 3: İstanbul, Rumeli Hisarı, an example of an Ottoman seashore military structure in the city.

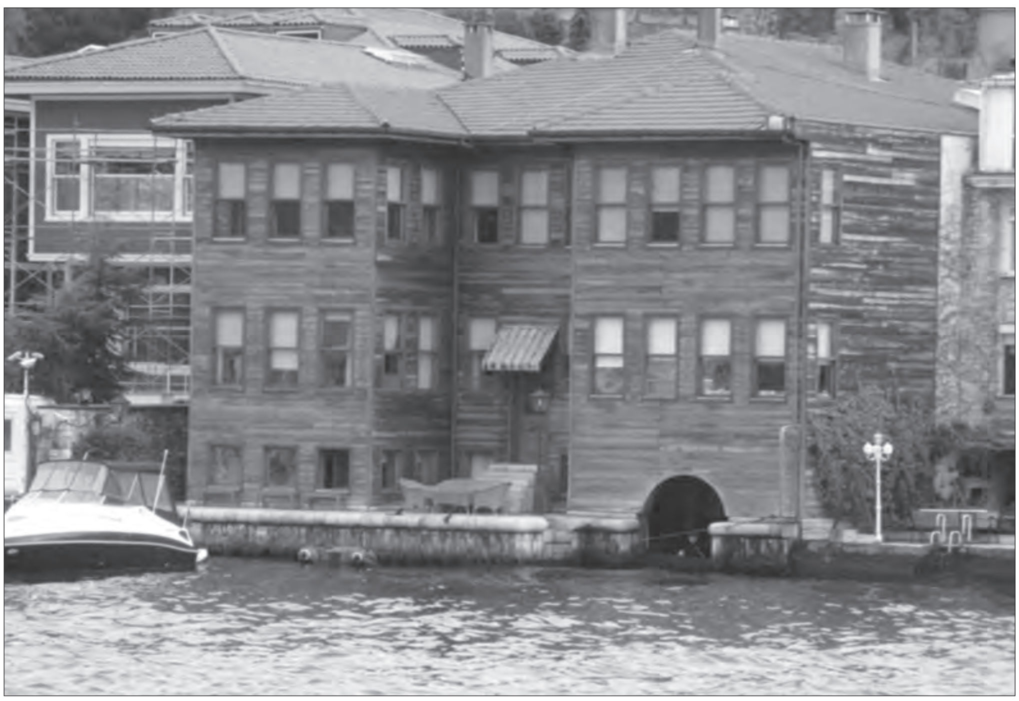
has proven to be economically feasible when applied to functionally obsolete but physically robust and adaptable structures, often of industrial origin.

The process of conversion

Most adaptive-reuse projects are realized inside the boundaries of an existing building envelope. Conversion for reuse therefore requires not only a careful reading of an existing building's architectural properties, but also sensitivity to its intangible spatial peculiarities emanating from its original functional requirements. Among the architectural properties of the existing structure, the constraints imposed by its form are of primary importance when it comes to accommodating new functional requirements. In other words, a fundamental question to be addressed when engaging in an adaptive-reuse project is whether the building's architectural form constitutes an obstacle to adaptive reuse?

Since there is little chance that the new program for a building undergoing adaptive reuse will conform to its original function, the process extends beyond repairs and renovation, to restorations of building features with historical / architectural importance, structural consolidations, or a complete redesign and treatment of outer surfaces. Adapting an existing building to a new set of functional requirements most often involves substantial transformations of indoor spaces such as rearranging its floor plans. Moreover, the new spatial organization scheme may entail totally new modes of indoor-outdoor interactions and new concepts of exposure to surrounding environmental conditions. These aspects of conversions for adaptive reuse depend both on the potentials of the existing structure and on the designer's talent and imagination.

The binary relation between form and function has been a very frequent issue of debate since Louis Sullivan's famous



Figs. 4a & b: **İstanbul, waterfront residences (*yalis*) along the Bosporus with boathouses and private embankments.**

statement that 'form follows function.' In this context, the architect Vani Bahl writes that "the famous quote by Louis Sullivan 'form follows function' seems to have become an outdated philosophy, as has 'form follows culture' by Indian artist Satish Gujral. Today's corporate approach to architecture often would suggest that these sentiments could be reworded as 'form follows fashion.'"[2] The debate on the determinants of building form will definitely continue to be on the agenda of architectural discourse. Take for example the statement by Theodore Adorno that "no form can be said to be determined exhaustively by its purpose."[3] This is not to be interpreted as a refutation of the connection between architectural form and functional requirements. Form, however, is not determined solely by function and there are other forces acting on it such as the interventions of the designer. These in turn are determined by factors including the designer's background, personality, and ability. Moreover, the history of architecture provides a plethora of building designs based on primary geometric shapes such as the square, rectangle, or circle, and that serve various and diverse functions. As Sherban Cantacuzino states:

There is nothing new about buildings changing their function. Because structure tends to outlive function, buildings throughout history have been adapted to all sorts of new uses ... change in urban fabric was slow, which enabled generation after generation to derive a sense of continuity and stability from its physical surroundings. ... In fact, until the industrial revolution, the common pattern was for buildings to be adapted to new uses; only since then has it become more usual to demolish and build new.[4]

It should be added that no clearly-defined methods and established procedures guide us when dealing with conversion projects. Adaptive-reuse projects are case-specific; each project depends on its specific constraints and opportunities, and defines its own unique process of design and realization.

Industrial buildings

Functional and economic deteriorations, which usually occur in tandem, are most conspicuously felt in industrial buildings. Unprecedented transformations in production processes have resulted in radical changes in their spatial requirements. Besides the surface area they occupy, industrial buildings possess innumerable physical properties that make them highly suitable for conversion to other functions and to a variety of spatial organizational schemes. As Cantacuzino notes, "industrial buildings have large volumes enclosed by brick walls, frequently occupying whole city blocks; they make considerable impact by their sheer bulk."[5]

Industrial buildings are large-span buildings; they have expansive floor areas that are unobstructed by structural elements such as columns and thick, load-bearing walls. They also have floor heights that allow for horizontal subdivision through various means such as the construction of mezzanine floors. Although some have thick, load-bearing outer walls, the majority have skeletal structural systems, which allows the building envelope to be adapted to a wide variety of design possibilities in line with the requirements of the new utilization.

İstanbul possesses a considerable number of 19th-century industrial buildings (factories, warehouses, power plants, and shipyards), the majority of which became obsolete, were abandoned, and have recently been the subject of adaptive-reuse projects. Many have been converted into cultural centers or educational facilities. I will mention a few, all located along the Golden Horn. One complex consists of a defunct shipyard founded in 1861 by the Ottoman maritime company Şirket-i Hayriye together with a military foundry constructed during the reign of Sultan Ahmet III (r. 1673-1736) on the foundations of a 12th-century Byzantine building. Situated on opposite sides of the same road, they have functioned as an industry museum since 2001 (Fig. 5). Another complex is the obsolete 1920s Sütlüce slaughterhouse, which was adapted into the Sültüce Congress Center in 2009. There also is the textile factory, the Feshane-i Amire, built in 1826, which was converted into a cultural center in 1992, and had to be restored (once again) in 1998 due to flooding. As for adapting obsolete industrial buildings for educational purposes, in 1997 the architect Mehmet Alper converted the 1824 Cibali Tobacco and Cigarette Factory in the city's Cibali district into the core building of Kadir Has University, and in 2007, architects Emre Arolat, Nevzat Sayın, and Han Tümertekin converted the Silahtarağa Power Plant along the Golden Horn, which provided İstanbul with electricity from 1914 to 1983, into the Bilgi University Santralistanbul campus. Adapting functionally and economical-

2 Vani Bahl, "Ethics of Adaptive Reuse," *Architecture Week*, online (June 22, 2005), available at http://architectureweek.com/2005/0518/building_1-2.html, accessed June 2010.

3 Theodor W. Adorno, "Functionalism Today," in Neil Leach (ed.), *Rethinking Architecture* (London: Routledge, 1997), p. 7.

4 Sherban Cantacuzino, *Re-Architecture: Old Buildings / New Uses* (New York: Abbeville Press, 1989), p. 8.

5 *Ibid.*, p. 189.

Fig. 5: **İstanbul, the Rahmi Koç Industry Museum, located along the Golden Horn, had been an abandoned shipyard and a military foundry.**

ly-obsolete structures to new uses already is a well established tradition in İstanbul. This tradition is not limited to industrial buildings. A large number of imperial palaces and other residential buildings, the majority of them situated along the Bosporus, now function as educational buildings. Moreover, the majority of Ottoman-era military buildings have been adapted, with minor modifications, to house facilities of higher education.

The Bahçeşehir University Building

The Bahçeşehir University (BU) campus is located in the Beşiktaş district of İstanbul on an exceptional site along the Bosporus (Fig. 6). It is composed of six buildings, two of which (Buildings A and B) were subject to an adaptive-reuse process. Building A houses the Faculty of Economics and Administrative Sciences as well as the Student Center, and Building B houses the Faculty of Architecture and Design, the Presidency, and a conference center. Building C comprises the Faculty of Communications and the Fazıl Say Auditorium; Building D houses the Faculty of Engineering, the Faculty of Arts and Sciences, and laboratories; Building G comprises the Faculty of Law and the university library; and, finally, Building H houses administrative offices. The project is a perfect example of how both issues of land-use transformation and the obsolescence of buildings may be effectively addressed.

The site, as evident from a historical map drawn by the Turkish cartographer of Croatian descent Jacques Pervititch in the 1920s, was occupied by the Osman Paşa Yalısı (fig. 7). The large garden of this 1899 seashore palace was surrounded by stables and other ancillary buildings, as is the case with most imperial palaces and pashas' residences. These seashore residences were then adapted to other uses. The Osman Paşa Yalısı came to function as a school named Osmanpaşa Mektebi, which also is the name of the street that passes in front of the BU campus. The third phase in the utilization of the site was its occupation by two warehouse buildings constructed in 1958 and 1959, neither of which had any historical significance or architectural features worth preserving (figs. 8-11). The two buildings were separated by a narrow street or passageway leading to the seashore.

A small restaurant that also functioned as the social center for a state-owned company—Sümerbank, was located in one of the warehouses, along its southern side, facing the Bosporus. Although partially open to the public, there was nothing else along the seashore bordering those existing structures, except for an embankment that served to facilitate the loading and unloading of small cargo ships. Surviving 19th century photographs of nearby sites along the coasts of Beşiktaş reveal similar seashore treatments. This brief overview of the site's history shows that with time, not only

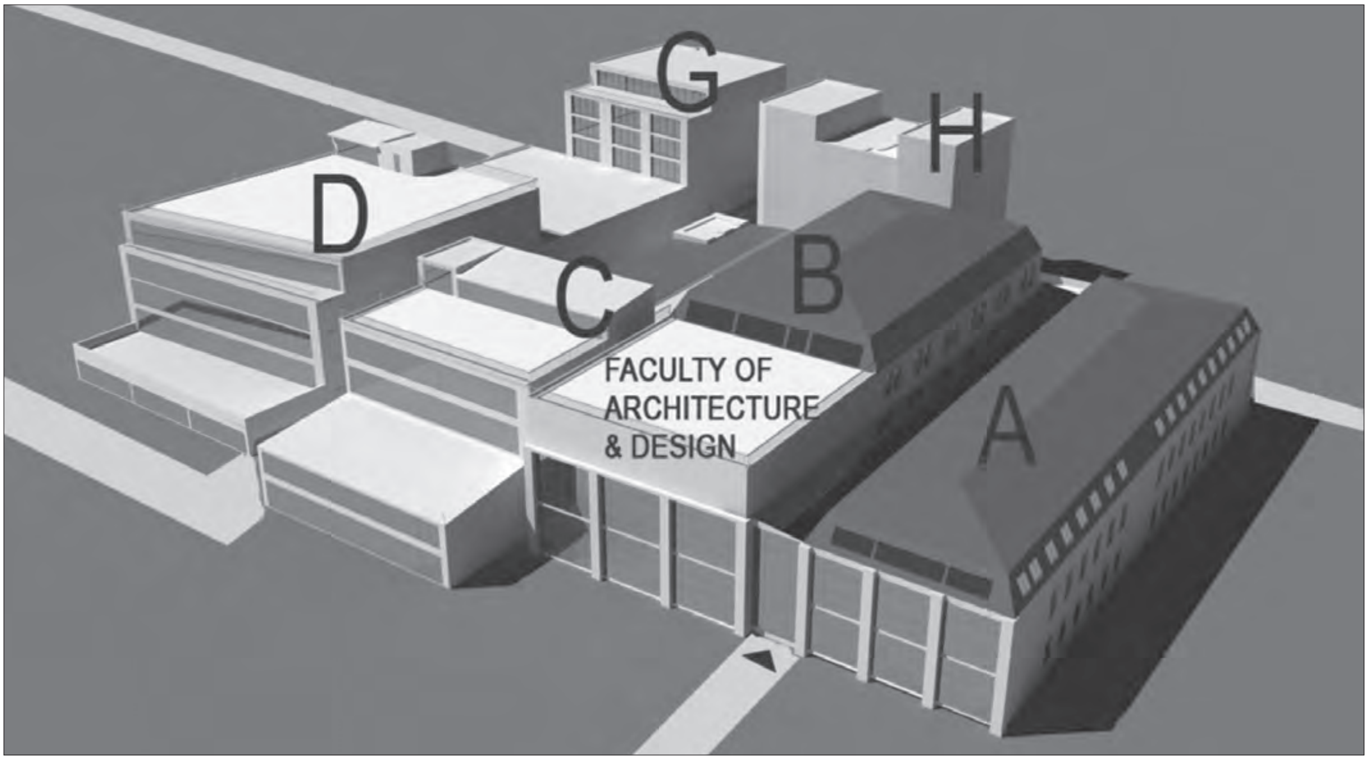


Fig. 6: **BU Campus, schematic perspective showing the layout of buildings.**

Fig. 7: **Map of the district in which the BU campus is located, as drawn by Jacques Pervititch in the 1920s.**

did it lose its original functions and come to accommodate other ones, but it also lost the original context within which it was located.

This BU project provided an opportunity to open the seafront area to the general public, and to replace this insensitive treatment of the seashore with recreational activities (figs. 12 & 13). The scope of the BU project—which was carried out between March 10, 2004 and July 30, 2004— consisted primarily of unifying the two existing buildings and incorporating the narrow passageway separating them, thus

Fig. 8: **BU Campus, one of the warehouse buildings prior to its conversion.**

Fig. 9: **BU Campus, the two warehouse buildings and the narrow street between them prior to their conversion.**

Fig. 10: **BU Campus, view of the narrow street located between the two warehouse buildings prior to their conversion.**

Fig. 11: **BU Campus, view from the seashore side of the narrow street located between the two warehouse buildings prior to their conversion.**

transforming it from an outdoor circulation area into an indoor one that is integrated within them (figs. 14-18).

Since adaptive-reuse projects involve a design process defined by the opportunities offered and constraints imposed by existing buildings, an evaluation of the two buildings is very important. Both buildings are reinforced concrete skeleton structures with modestly-dimensioned spans. Unlike most warehouse buildings, their relatively tight intercolumniation limited the range of possibilities available for adaptive reuse. In fact, the existing structural system imposed dimensional constraints on any attempts at designing new floor plans and circulation patterns (figs. 19 & 20). Furthermore, most building components were in poor shape and in need of replacement or at least major repair work. For example, the existing roofing system had to be completely removed, and a new roof had to be installed in its place (figs. 21-23).

The concept behind the BU adaptive-reuse project

As stated above, neither existing building had any historical or architectural features worth preserving, nor did either of them trigger a design concept applicable for an adaptive-reuse project. However, the narrow street between the two buildings, which effectively connected a main thoroughfare, Osman Paşa Caddesi, with the Bosporus, provided a source of inspiration for the concept behind the adaptive-reuse project. This concept is to redesign the passageway as a top-lit circulation space that integrates the two functionally-obsolete building blocks and provides access to the seaside.

While developing the main concept, the project designer, Ali Çiçek, a member of the teaching staff at the university's Faculty of Architecture and Design and a practicing architect in İstanbul, not only came up with this idea of a unified / integrated whole, but also with a completely novel spatial syntax that provided the adapted buildings with a brand new spatial organizational scheme. Prior to their integration through the conversion project, both buildings had poorly-designed outer surfaces with modestly-arranged fenestration. The integration of the two blocks to form a coherent entity involved a complete redesign of the building façades facing the passageway so as to visually and functionally connect them with the main circulation space, which may be described as a top-lit indoor street. This in turn necessitated removing all non-structural building components in order to provide maximum exposure to the connecting circulation space. According to this new spatial syntax, the introverted

Figs. 12 & 13: BU Campus, public use of the seafront area after the project's completion.

spaces of the original structures have been converted into extraverted ones (figs. 24-27). Moreover, the external surfaces facing the Bosporus were redesigned to provide maximum exposure to the sea.

Conclusion

The BU project is an interesting case of implementing an adaptive-reuse project in İstanbul in that it possesses numerous implications for later developments.

The project demonstrates the applicability of adaptive reuse to obsolete buildings without historical or architectural importance. Attempts at revitalizing older buildings do not need to be carried out merely as cultural or even nostalgic approaches to salvaging cultural heritage, but also as eco-

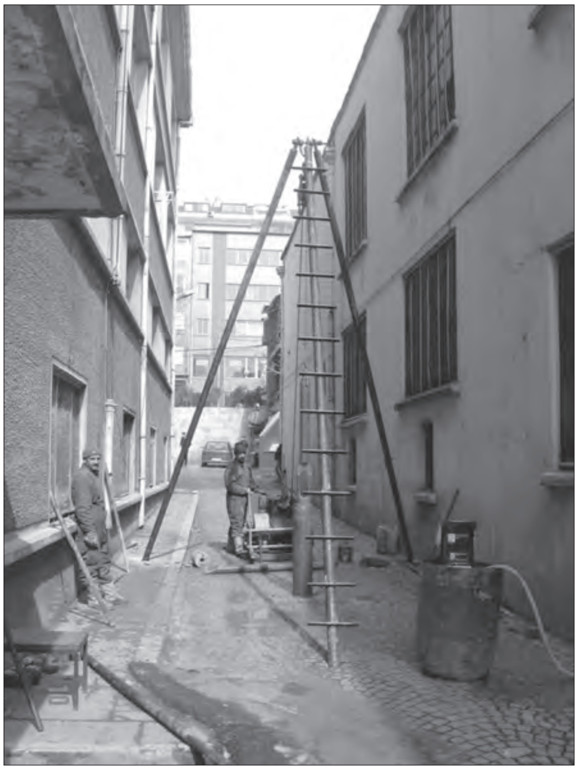


Fig. 14: **BU Campus, the narrow street separating the two buildings upon the initiation of work.**

Fig. 15: **BU Campus, the narrow street separating the two buildings during the construction process.**

Figs. 16–18: **BU Campus, views of the passageway after the completion of the project and its integration within the two adjacent buildings.**

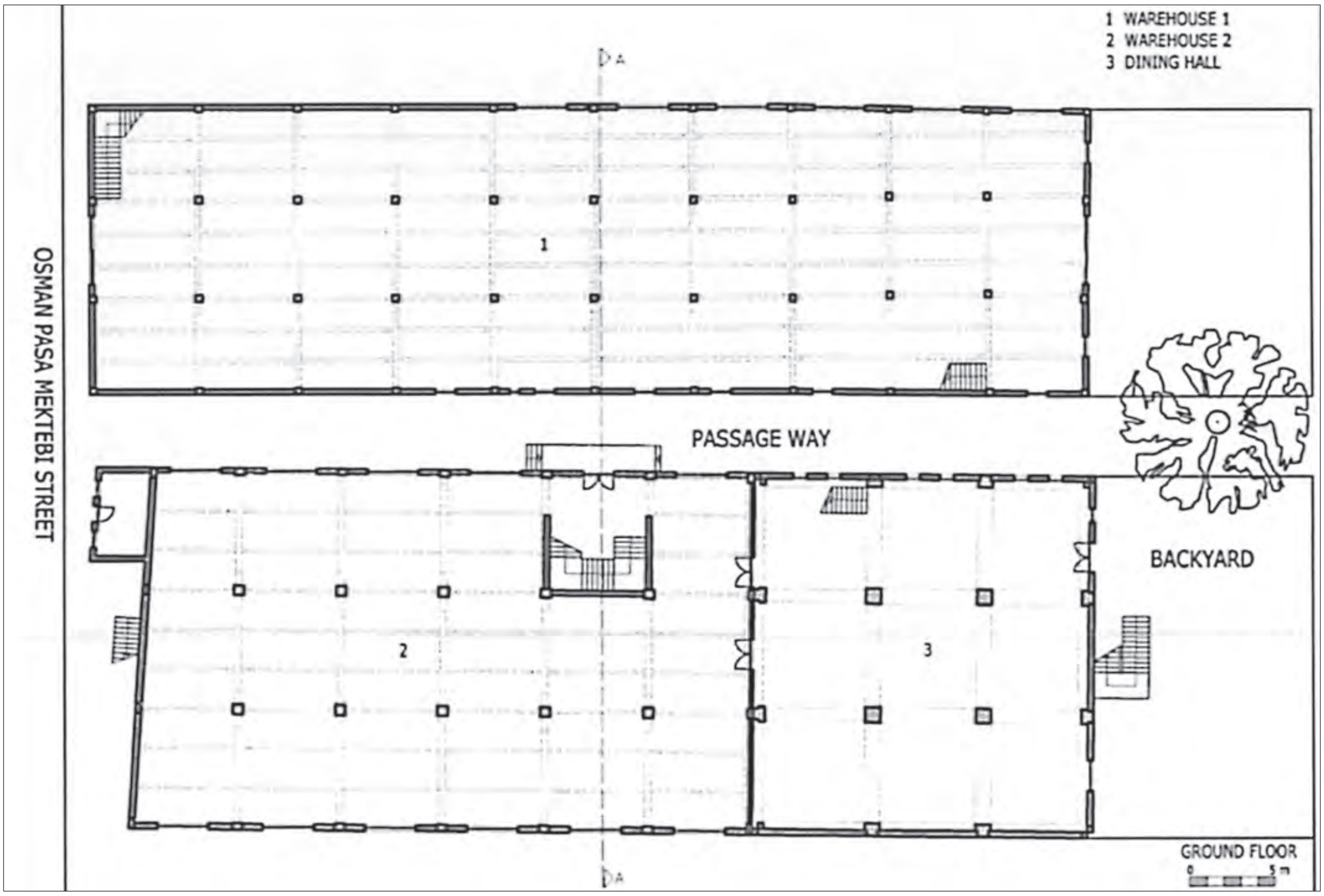


Fig. 19: **BU Campus, ground floor plan of the two warehouse buildings prior to their conversion.**

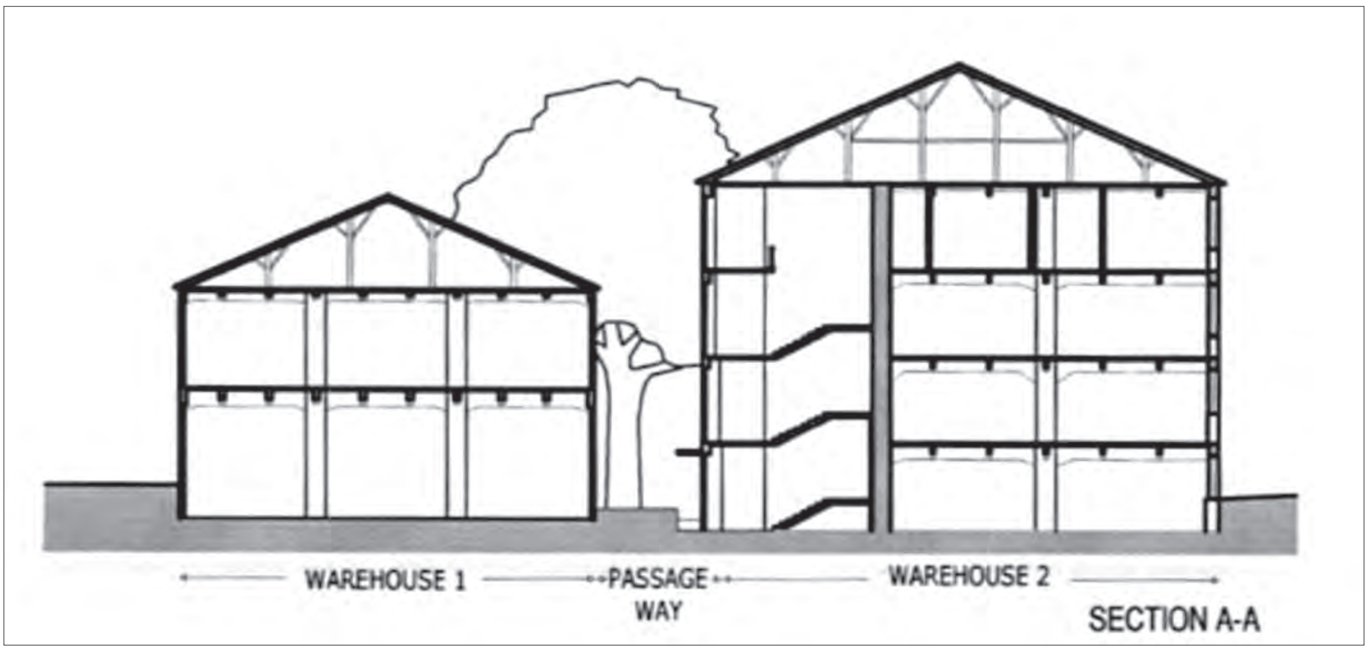


Fig. 20: **BU Campus, section AA cuts through the two warehouse buildings, showing their spatial arrangements prior to their conversion.**

Fig. 21: **BU Campus, view of the old roof.**

Fig. 22: **BU Campus, view of the new roof under construction.**

Fig. 23: **BU Campus, bird's eye view of the project after its completion.**

nomically-viable strategies for providing built space under the pressures of ever-increasing construction costs. In other words, the BU project points out the applicability of adaptive-reuse approaches to a wide spectrum ranging from "the building as art object to the building as the product of a whole socio-economic system."[6]

A second aspect of the project is applying the adaptive-reuse approach to more than one structure through an integrative design concept. In this project, two independent building blocks are unified into a single architectural entity. Adaptive-reuse projects are not necessarily restricted to the spatial organizational potentials of individual buildings, and may involve developing a totally new spatial morphology. The BU project has allowed for the emergence of a new set of relations between the spatial units and also between the parts and the whole architectural ensemble.

This project also has allowed for the emergence of a new set of spatial relations and a new spatial morphology between its interior spaces as well as between its interior and exterior spaces, all of which were unthinkable for the original structures. The architect Ali Çiçek has successfully explored these various relations, creating new and interesting visual fields both within and beyond the boundaries of the building.

The last point to be made relates to the project's contribution to its surroundings. The BU project not only has provided a viable strategy for creating educational spaces out of defunct and derelict structures located in one of the important centers of İstanbul, but also has revitalized a seafront public space in İstanbul's Beşiktaş district.

6 *Ibid.*, p. 9.

Fig. 24: **BU Campus, ground floor plan of the two buildings after their integration into a unified complex.**

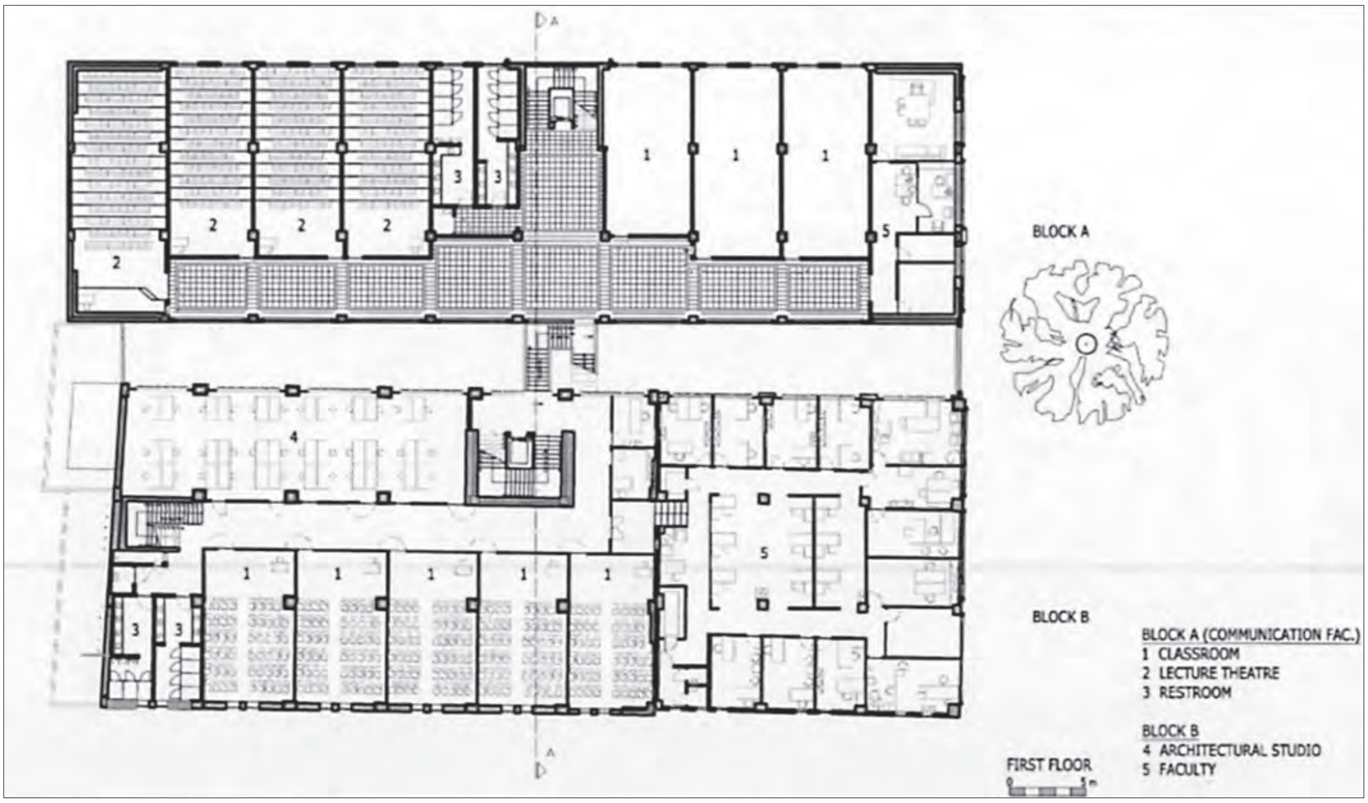


Fig. 25: **BU Campus, first floor plan of the two buildings after their integration into a unified complex.**

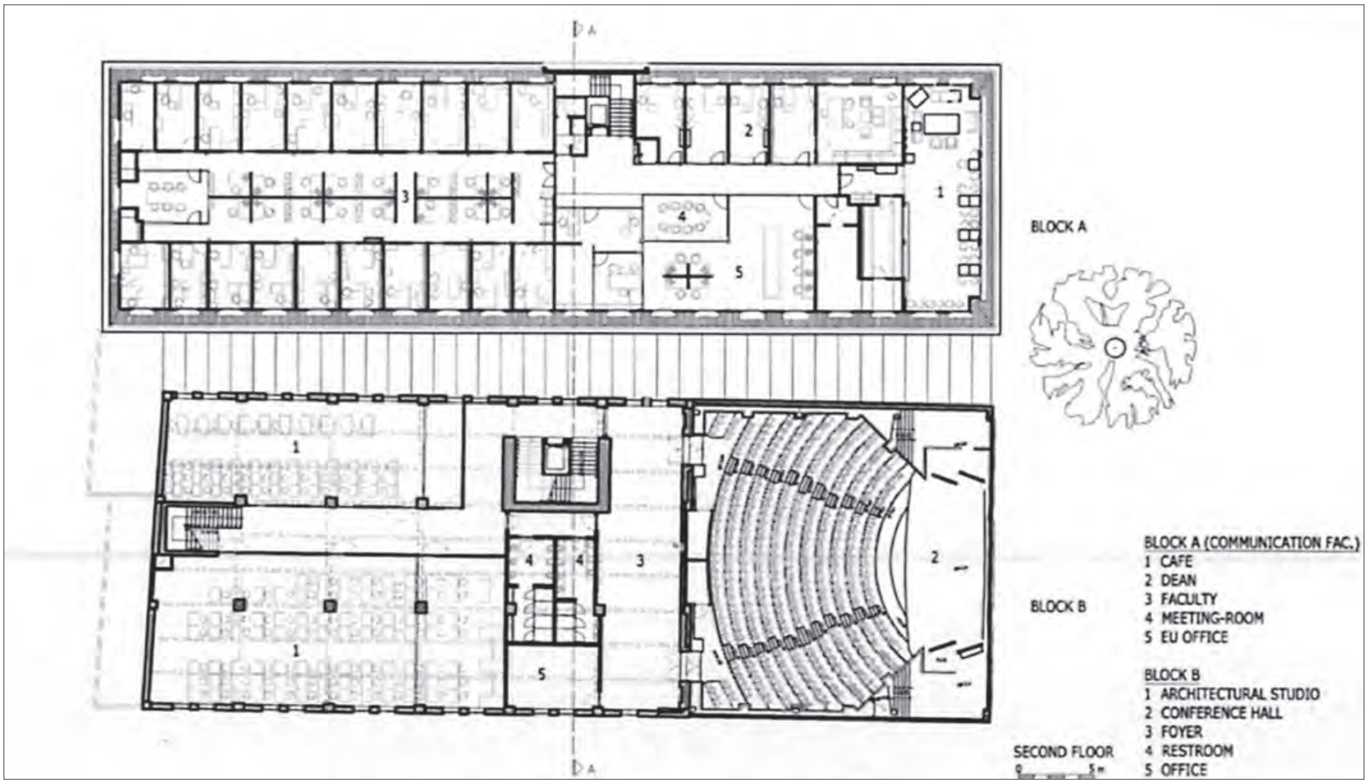


Fig. 26: **BU Campus, second floor plan of the two buildings after their integration into a unified complex.**

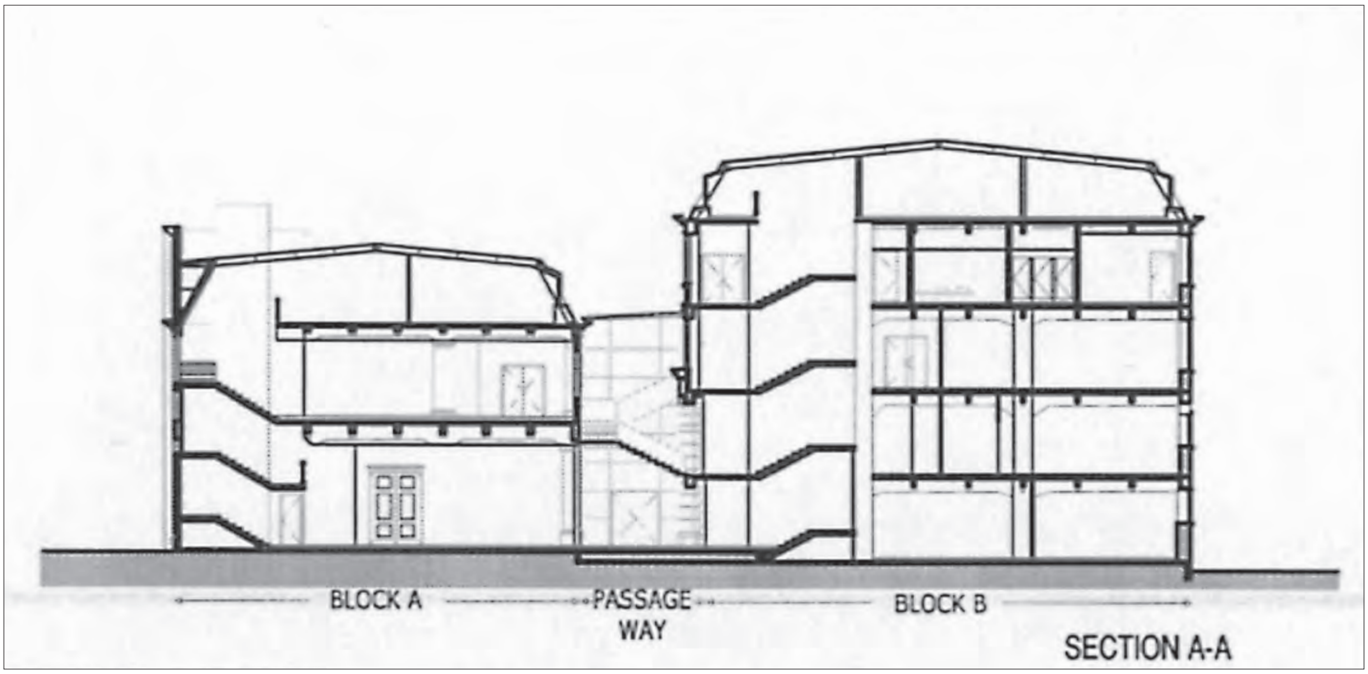


Fig. 27: **BU Campus, section AA cuts through the two integrated buildings, showing the spatial arrangements of the unified complex**

Working grounds: Four agro-industrial projects

HASHİM SARKİS

Land and labor

The physical qualities of the ground on which people work, live, and construct their workplaces and dwellings have been driving parameters in the designation of land-uses since early modern urbanism. Yet in the course of the 20th century these qualities have given in to abstract designations of land-use that were more determined in relation to each other than in relation to the land underneath them.

Patrick Geddes, the turn-of-the-century botanist and urban planner, devised his famous valley section to explain a geographical distribution of settlement based on the specialized work associated with each piece of the land as it descended from the mines of the upper hills, to the forests and their woodsmen and hunters, to the fields and farmers, to the cities and their tradesmen, and to the coast and its fishermen (fig. 1). Many motivations lay behind the invention of the valley section, from providing a continuum between the country and city, to naturalizing the dwelling, to essentializing a regionalist order. No matter how contested, this explanation has influenced and guided many Modernist discussions about the relationship between work and the land up to the very present, be it in the writings of the American regionalists or, later on, in the writings of the landscape architect Ian McHarg (d. 2001).

CIAM (Congrès International d'Architecture Moderne or International Congress of Modern Architecture, 1928-1959), borrowed some order of the land arguments from the valley section to explain the shift from a high level of association to an increasing isolation as one moved from city to country. The naturalization and flow between country and city to which Geddes aspired may have been translated into the transformation of the ground into a collective, liquid terrain in order for the amelioration of the complex inner-city conditions to occur. With time, however, the immediacy of the connection at every level was abandoned in favor of an inter-land-use order linked together more by infrastructure networks and less by land.

The criticisms of CIAM raised by TEAM X (the alliance of architects that came together to organize the tenth CIAM conference in 1956) and others since then have primarily focused on pushing this logic to better realization, arguing for

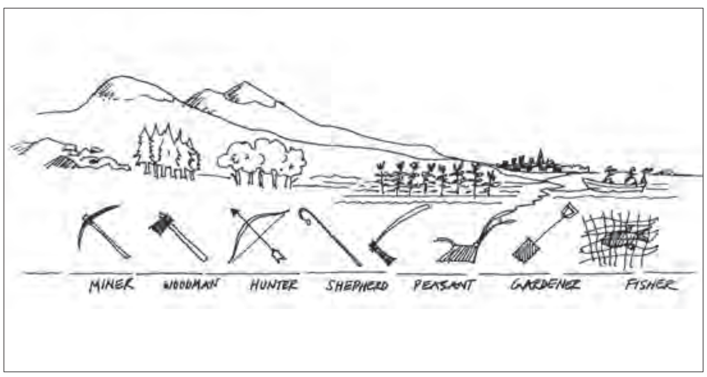


Fig. 1: **Sketch of Patrick Geddes' Valley Section, 1909.**

more mixing between land-uses at a finer grain and for the introduction of more flexibility in favor of the land users. But the connection to the qualities of the land was generally weakened.

A return to Geddes' naturalist position was led by Ian McHarg, who argued for a better fit in land-use planning between the occupation of the ground and the qualities of the land. But the continuum that Geddes sought between city and country had to wait until the advent of the field of Landscape Ecology as developed by Richard Forman in the 1980s, which also highlights the strong connection between the qualities of the ground and the diverse activities that occur on it. Landscape Ecology describes the terrain (both built and un-built) as a mosaic of fragments connected via corridors that cover a given matrix of the land. Forman provides a framework though which urban and rural conditions can be explained together. He also goes on to provide a spatial evaluation to ameliorate those conditions by designing in relation to this newly reconnected landscape of country-city.[1]

Each of the four projects by Hashim Sarkis, Architecture, Landscape, and Urban Design presented in this chapter addresses the relationship between the qualities of the ground and the work activity, trying to elevate an awareness of land features, be they topographic, ecological, climatic, or related to the accumulation of uses and their transformation over time. In many instances, this heightened relationship leads to redressing some of the attributes of the ground rather than naturalizing them or simply accepting them as givens. In all cases, the projects aspire to elevate the qualities of the land to a geographic aesthetic that at once expresses the contingencies of the site and the location, and transgresses them to relate to a larger geographic order.

Forms of habitation

Programming may have entered architectural thought in the 1950s and 1960s as a way to help rethink accepted building-use divisions and adjacencies, but in its professional implementation, it has, to a great extent, resulted in the reconfirmation of accepted models. This conformity to program in architectural design may have undergone another challenge during the 1990s, when a renewed fascination with program was introduced as a tool to generate new forms, but the innovation ultimately remained at the level of form rather than program. These moot experiments may lead us to conclude that architecture may not be able to question the way people use spaces or to propose different ways of combining uses or changing them. It may also suggest that the questioning of inherited programs may need to be re-examined.

In the course of the 20th century, the workplace has often been subject to this level of examination. Perhaps office space, the space of flexible layouts and relationships, was the central focus of much of these investigations, but this flexibility has also led to the deprivation of any edifying relationship between work and architecture.

A proposed alternative is to rethink program as forms of habitation, registering questions about how certain aspects of the accepted adjacencies between uses, flows, and sequestered uses could be revised through the observation of the work process and how this revision could then be expressed in the architecture.

Each of the four projects presented here questions the forms of habitation in its own way, proposing transformations of the order of organization based on internal adjacencies, but also on the employment of the ground as a means to achieve that. In many instances, the continuity between the activities of the architectural and productive landscapes is explored as a means to help reconnect architecture with geography.

The geographic aesthetic

Designers are increasingly being compelled to address and transform larger contexts and to give these contexts more legible and expressive form. New problems are being placed on the tables of designers (e.g.: infrastructure, urban systems, regional and rural questions). Problems that had been confined to the domains of engineering, ecology, or regional planning are now looking for articulation by design. This situation has opened up a range of technical and formal possibilities that had been out of reach for designers. The need to address these 'geographic' aspects has also encouraged designers to re-examine their tools and to develop means to link together attributes that had been understood to be either separate from each other or external to their disciplines.

Yet engaging the geographic does not only mean a shift in scale. This has also come to affect the formal repertoire of architecture, even at a smaller scale, with more architects

1 For a good account on Patrick Geddes' urbanism, see, Volker Welter, *Biopolis: Patrick Geddes and the City of Life* (Cambridge, Mass.: MIT Press, 2002). Concerning CIAM's principles, see, Eric Mumford, *The CIAM Discourse on Urbanism, 1928-1960* (Cambridge, Mass.: MIT Press, 2000). McHarg's seminal text is Ian McHarg, *Design with Nature* (Garden City, N.Y.: Natural History Press for the American Museum of Natural History, 1969). Regarding Forman's work on landscape ecology, see, Richard Forman and Michel Godron, *Landscape Ecology* (New York: John Wiley, 1986).

becoming interested in forms that reflect the geographic connectedness of architecture, its ability to bridge the very large and the very small, or to provide forms that embody geographic references (e.g.: continuous surfaces and environmentally integrated buildings).

This makes the need to articulate the geographic paradigm all the more urgent, because the role of synthesis that geography aspired to play between the physical, the economic, and the social is now being increasingly delegated to design.

Within this broader ambition, the attitude towards context has been changing very rapidly in design. Just over the past twenty years, we have moved from a general apathy towards context, to an increasing and then increasingly overbearing appreciation of every aspect of it, to a general rejection and even opposition to context. In the past decade, the pendulum has begun swinging back towards trying to understand not only new scales of context (bigness, landscape urbanism, regionalism), but also new contexts by ways of mapping and documenting emerging phenomena, thus the proliferation of larger-scale mapping exercises, especially of unconventional terrains, as well as the documentation of emerging settlement patterns, particularly in the developing world. The geographic could be understood as a further step towards the possibility of both addressing and also shaping context at the larger scale and in response to some of these new phenomena.

Even though the term 'geographic' is used primarily in a metaphorical way to designate a connection to the physical context, the paradigm does overlap with the conventional understanding of the role of geography as a discipline. Some clarification is necessary in this respect in order to benefit from the overlap, while avoiding confusion. The history of geography is strongly linked to the history of discovery and colonization. The instruments for the discovery of territory were extended into its documentation and then, in turn, were extended into its appropriation and transformation. And yet the discipline has evolved to become more diverse and broad, to become institutionalized around geographic societies; to split into human and physical geography producing very different approaches and even subject matters; then to disintegrate and migrate into other disciplines such as sociology, public health, and information systems; and then to be revived around central contemporary issues such as globalization. The paradigmatic role of geography could be taken in the narrower sense of the geographic as an attempt to study the relationship between the social and the physical at a larger territorial scale, but also to attempt a synthesis along the lines of 'high' geography by design.

A geographic attitude, both in method and in content, guides different strands of ideas and decisions in these four projects about the context, the program, and the reconsideration of the workplace in general. Something like a geographic aesthetic also guides the formal pursuits.

Project descriptions

Olive-Oil Press, Batroun, Lebanon, 2002 (partly completed)

Project team: Hashim Sarkis, Pars Kibarer, Winifred Wang, and Jonathan Cicconi.

(Figs. 2-11)

In 2002, the René Moawad Foundation, a non-profit organization dedicated to the economic and social development of rural areas in Lebanon, helped establish a cooperative among a group of villages in the Batroun area of north Lebanon that are lacking in olive-oil presses. The town of Kfifane was chosen as a site for the press because of its central location in this network of villages and because of its proximity to the coastal highway. The site features three pre-existing vaulted single-room structures, two of which will be transformed into a winery and one into a showroom to exhibit the products of both the winery and the olive-oil press.

Sitting on a sloping terrain, the building provides a clear separation on the site between the pedestrian upper zone and the lower vehicular zone. The upper zone consists of the showroom and a pedestrian path that links the showroom, olive-oil press, and winery. The lower zone allows for truck entry to both the olive-oil press and the winery.

The cooperative serves individual owners who may sell their olives to the cooperative or have them pressed there for a fee. The press equipment is automatic and meets the highest standards of hygiene. As such, farmers can no longer partake in the traditional method of pressing their own olives. The design, however, tries to maintain an element of participation by placing a viewing platform into the building at the upper level so they can follow the whole process from outside the press area. The building also provides for a roof-terrace café where, as is customary, farmers and visitors may eat while waiting for their oil.

Because olive oil does not take well to strong light, the windows, passageways, and terrace are shaded by a metal canopy that is covered with bamboo mats. Strips of transpar-

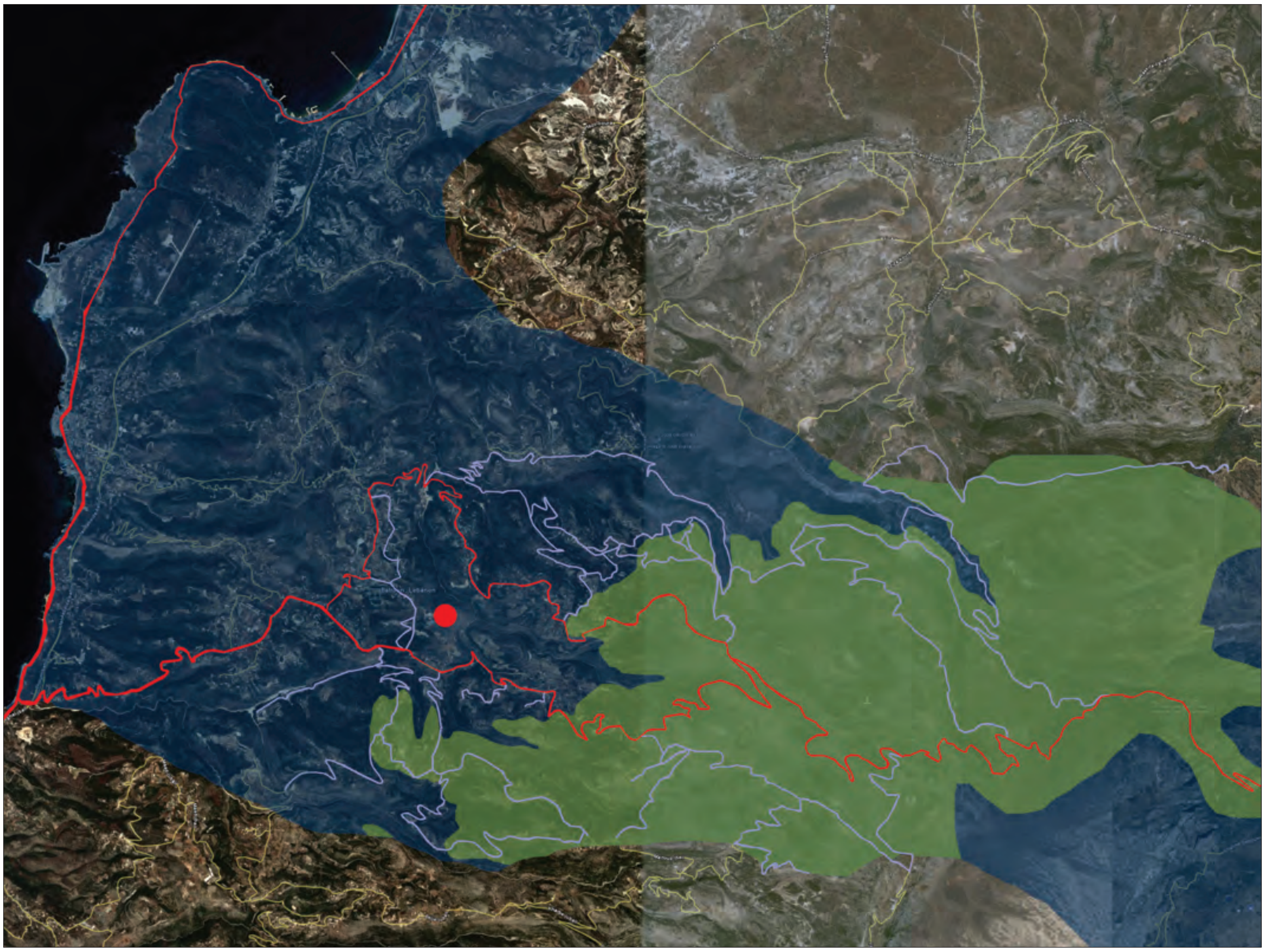


Fig. 2: **Batroun, Lebanon, Olive-Oil Press, Hashim Sarkis, Architecture, Landscape, and Urban Design, 2002 (partly completed); satellite map showing site and main road through Batroun.**

Fig. 3: **Olive-Oil Press, satellite map showing main access to site and nearby pre-existing buildings.**

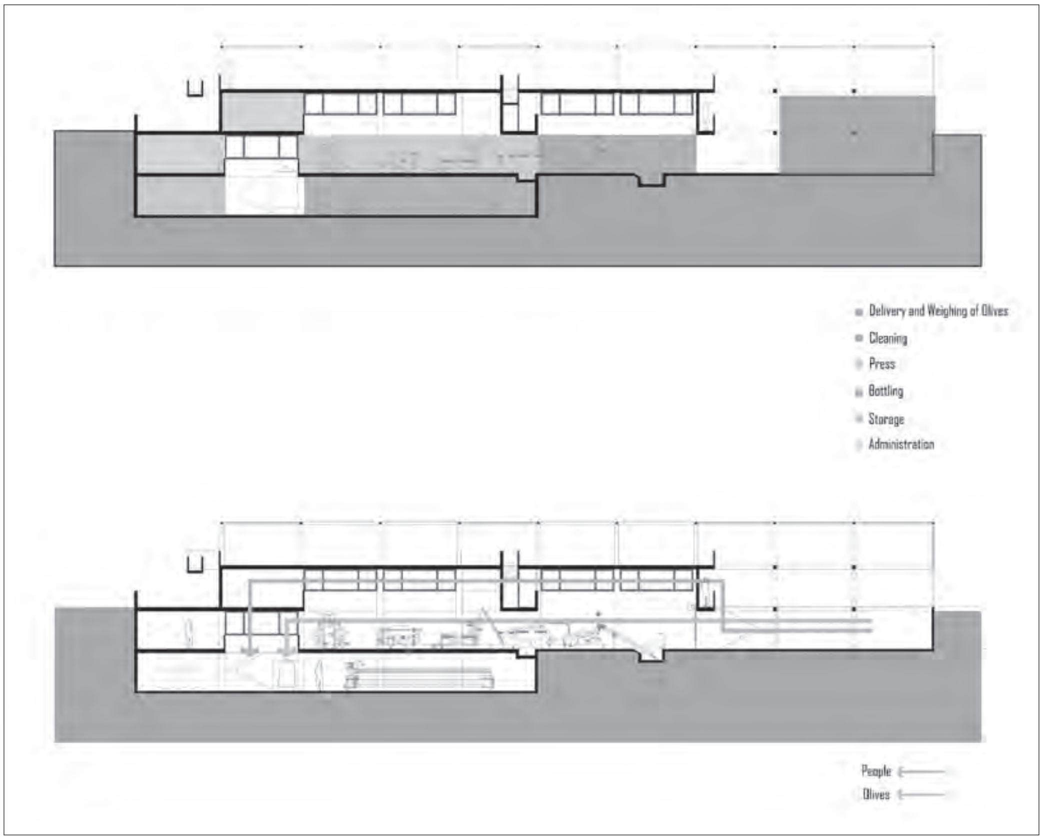


Fig. 4: Olive-Oil Press, longitudinal section explaining the building's program.

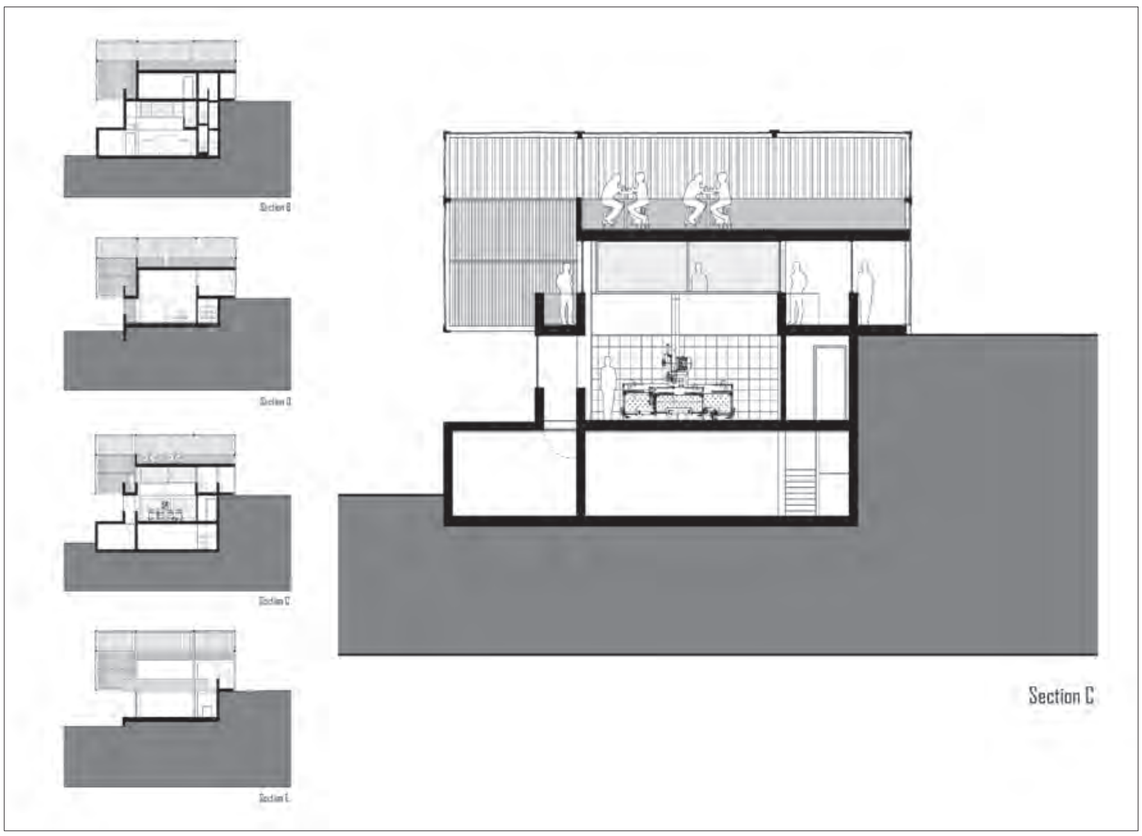


Fig. 5: Olive-Oil Press, transverse sections showing the olive-oil press machinery area and restaurant above.

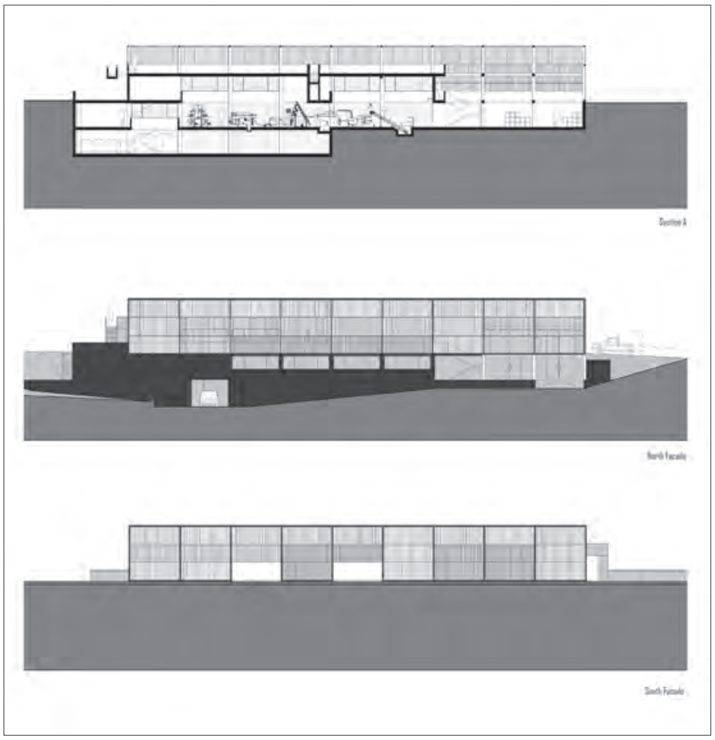


Fig. 6: **Olive-Oil Press, north and south elevation as well as longitudinal section drawings.**

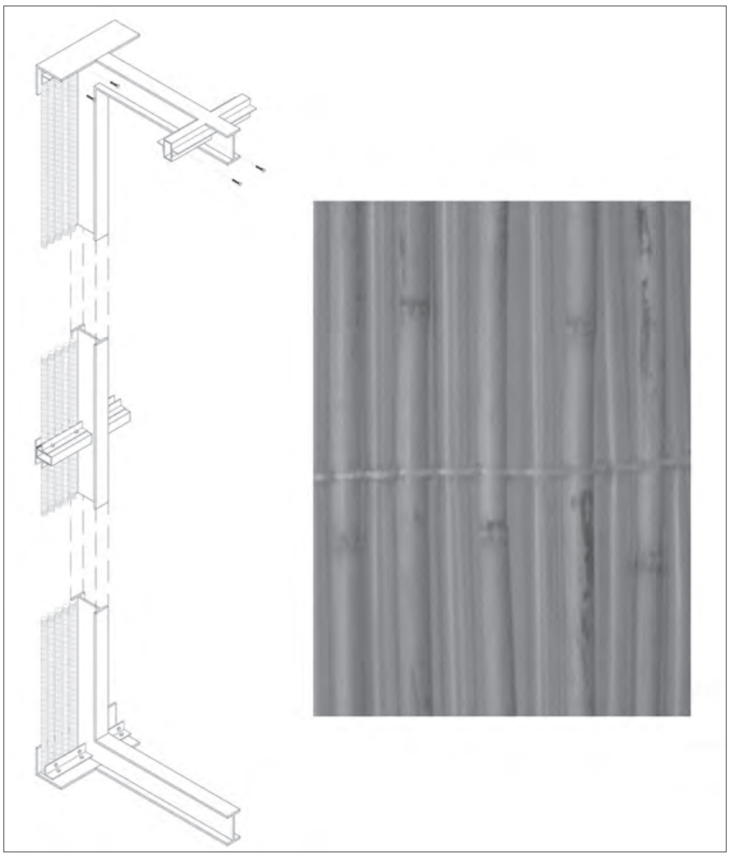


Fig. 7: **Olive-Oil Press, exploded axonometric showing how the bamboo skin is attached to the structure, and a detailed photo of the bamboo skin.**

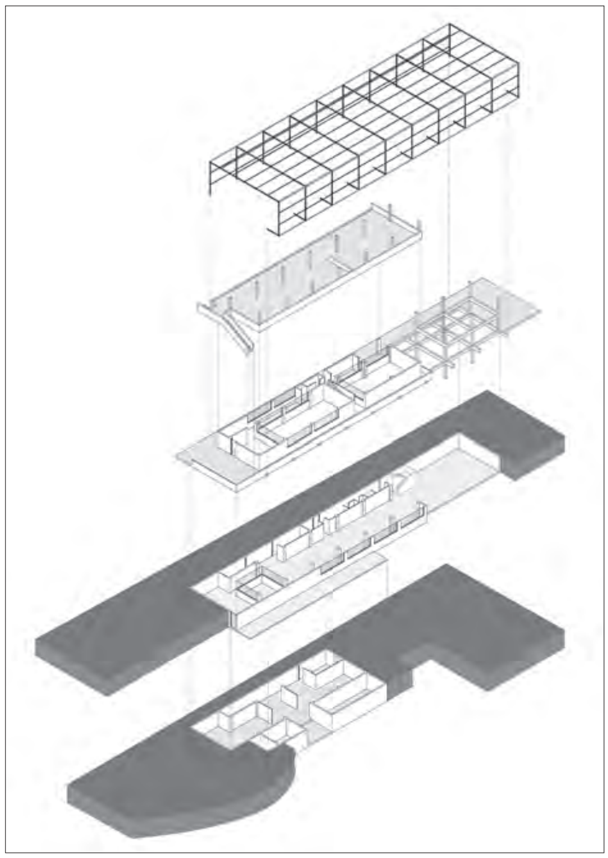


Fig. 8: **Olive-Oil Press, exploded axonometric showing the levels of the building.**

Fig. 9: **Olive-Oil Press, view of the south elevation during construction, and a reconstructed image of the elevation showing the applied bamboo skin.**

Fig. 10: **Olive-Oil Press, view of the north elevation during construction, and a reconstructed image of the elevation showing the applied bamboo skin.**

Fig. 11: **Olive-Oil Press, interior view the olive-oil press machinery and the second-floor viewing platform.**

ent watering hose are woven in with the bamboo to introduce more light where needed.

The building consists of a linear box with a big, hat-like canopy that covers the external intermediary spaces and provides shade for the roof area. The canopy also helps filter and subdue light into the press area. The building benefits from the slope to allow for access on three levels. The landscape surrounding the winery is planted with olive trees, while the canopy of the olive-oil press is shaded with a vine.

Food Canning Factory, Bekaa Valley, Lebanon, 2003 (on hold)

Project Team: Hashim Sarkis, Colin Koop, William O'Brien, and Pars Kibarer.
(Figs. 12-16)

A cooling and refrigeration company, currently located in Dora, Greater Beirut, intends to move its main factory to the Bekaa Valley in eastern Lebanon. The factory will be located on a site of about sixteen hectares. Two entrances have been designated along the main road leading to the site from the north, one for trucks and factory-related services, and the other for staff and visitors. A second main road allowing access to the site from the south is being planned. The site will be framed with tall trees to visually enclose the premises and to protect the factory from the winds.

In addition to the main plant, the factory includes auxiliary functions such as a vinegar plant, an aluminum can production factory, and other facilities that either function autonomously from the main factory or require physical isolation.

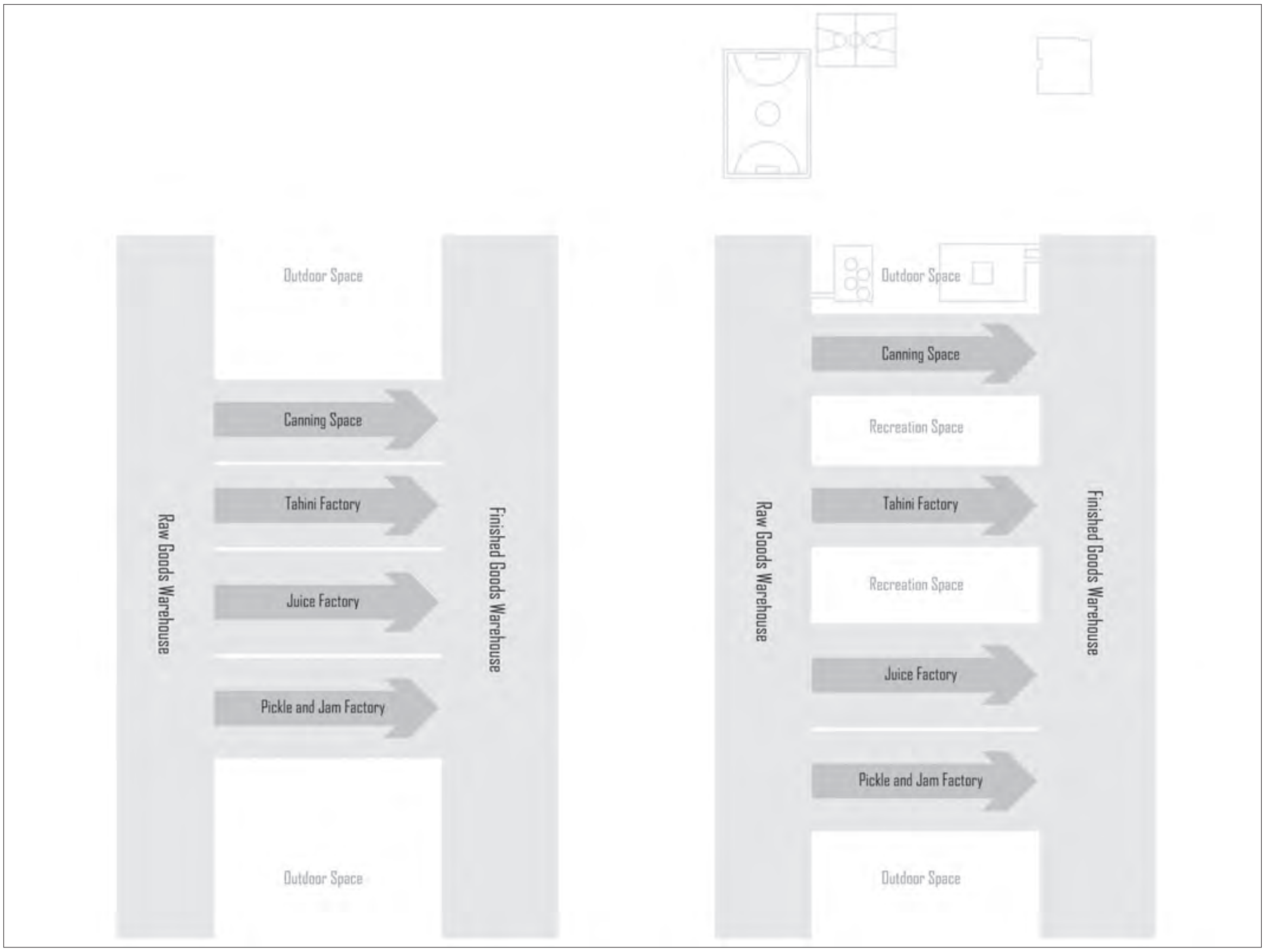


Fig. 12: **Bekaa Valley, Lebanon, Food Canning Factory, Hashim Sarkis, Architecture, Landscape, and Urban Design, 2003 (on hold); ladder diagrams showing the path of goods in the production process.**

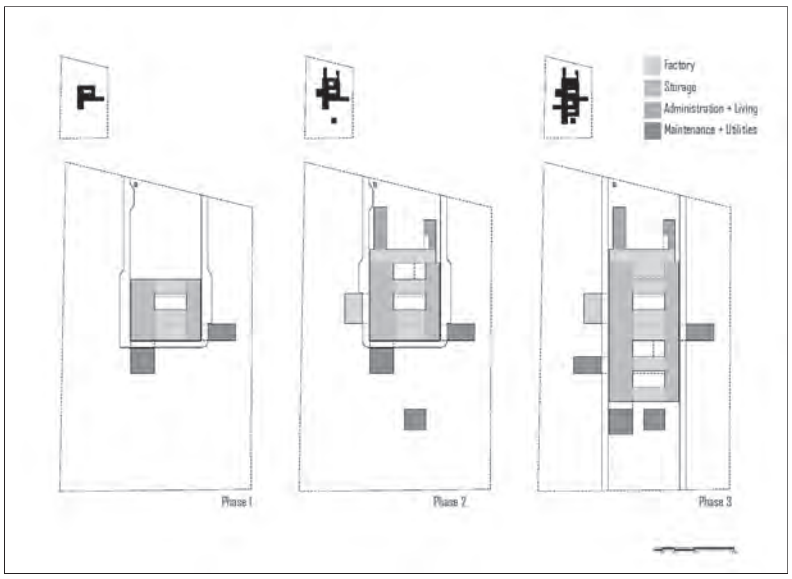


Fig. 13: **Food Canning Factory, diagrams showing the three-phase evolution of the factory plan.**

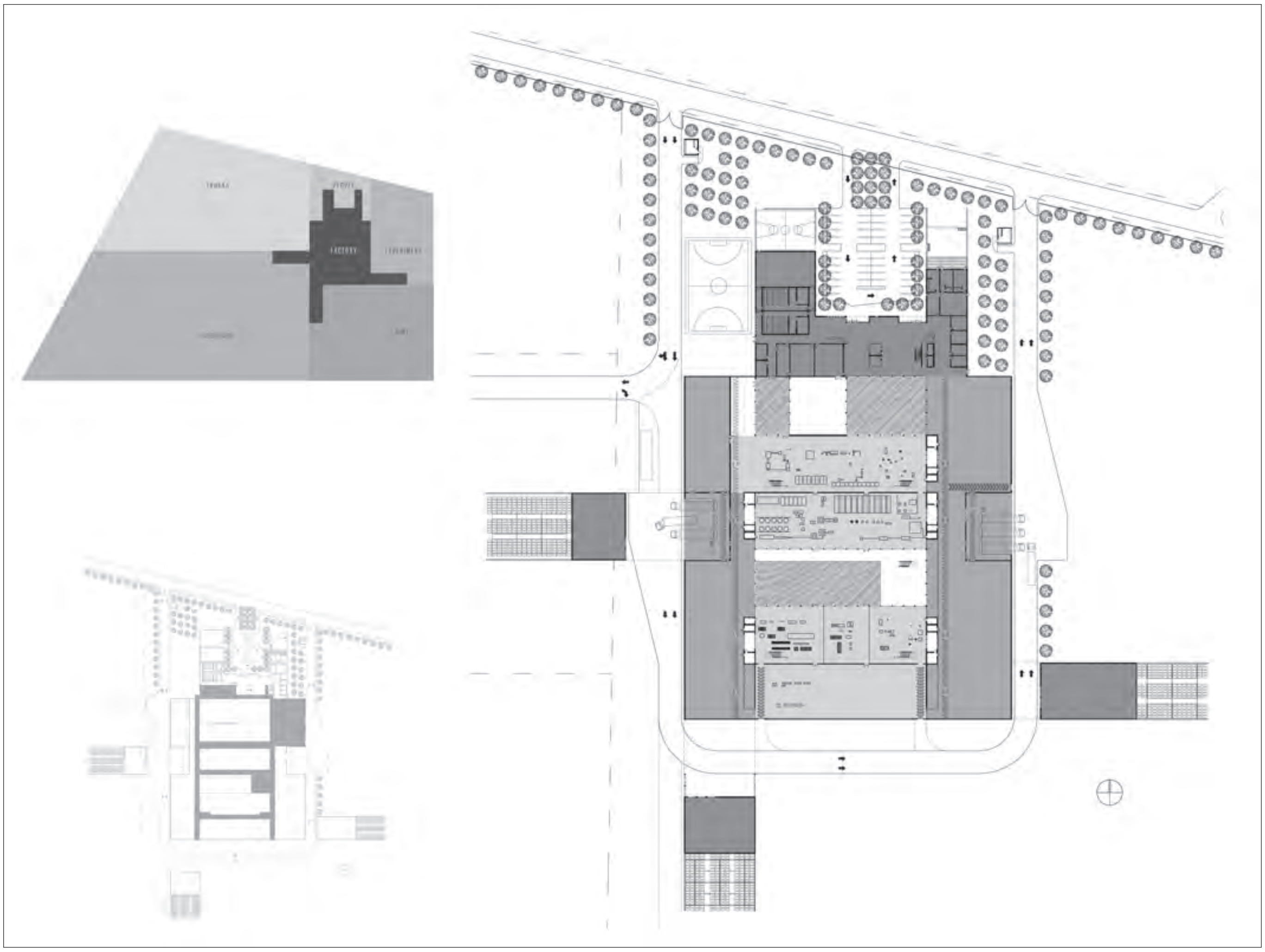


Fig. 14: **Food Canning Factory, ground-floor plan, site plan, and upper-mezzanine plan.**

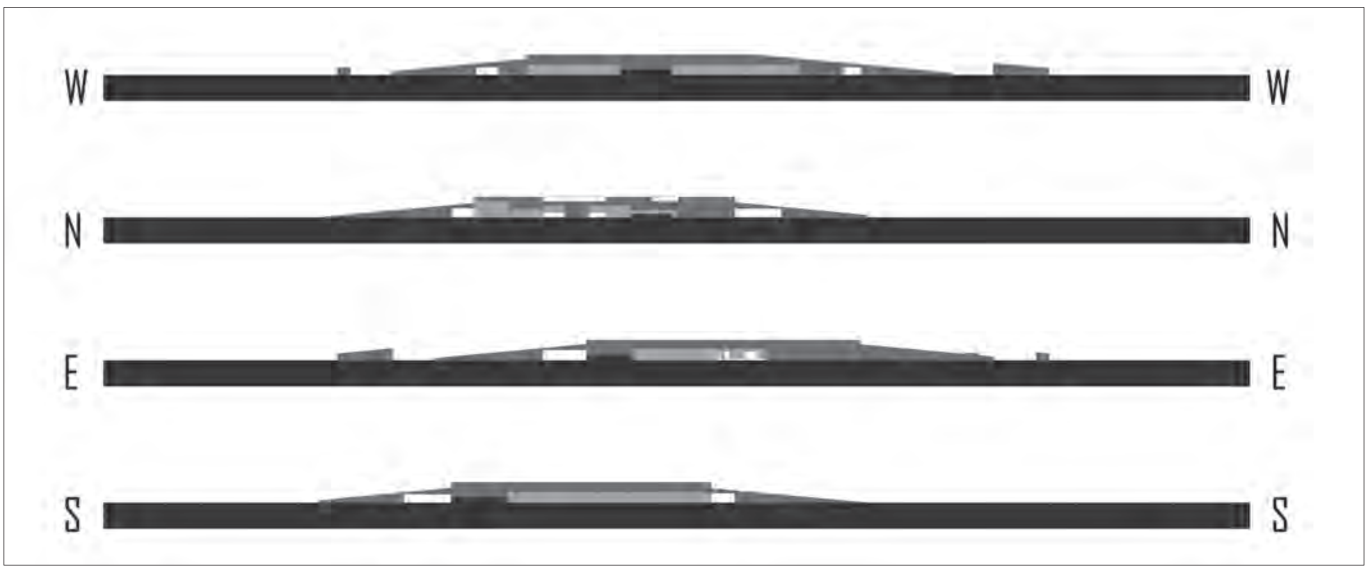


Fig. 15: **Food Canning Factory, elevation drawings.**

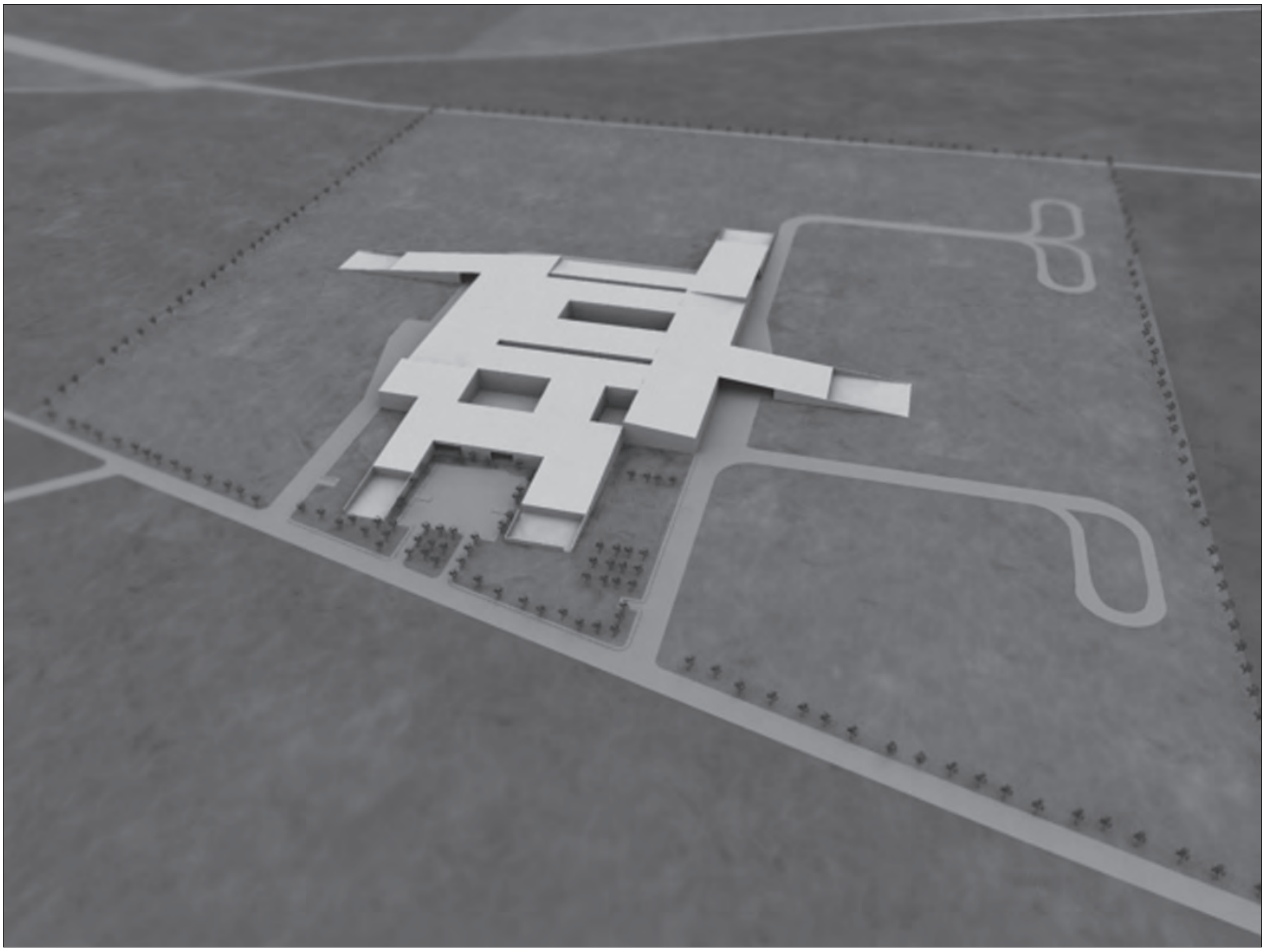


Fig. 16: **Food Canning Factory, aerial perspective from the northwest.**

The food-canning factory is organized along two large parallel bars connected according to a ladder diagram. One bar receives, stores, and prepares all raw goods coming into the factory; the opposite bar packages, labels, and ships finished goods going out. In the middle, a series of programmed "rungs" provide space for all major manufacturing operations with a sequence of courtyards and recreational areas in-between. The overlapping of the social and manufacturing ladders within the project allows for greater adjacencies and interaction to occur between the workers, administration, and the day-to-day operations of the factory.

The external form of the factory recalls a *tal*, a slight topographic elevation or hill on which settlements are usually found in the vast Bekaa plains. The interior provides a more intimate experience. Once inside, staff and visitors encounter a layered intensity of work and play, contrasted against the emptiness of the plains. All necessary supplemental and energy-related functions are contained within this sloping mass, which also shields the project from the high winds that commonly sweep the plain.

Agricultural School, Mejdlaya, Lebanon, 1999 (partly completed in 2007)

Project Team: Hashim Sarkis, Evy Pappas, Brian Mulder, Pars Kibarer, David Hill, Jonathan Cicconi, and Anuraj Shah.
(Figs. 17-23)

In 1994, the René Moawad Foundation built an agricultural center in the town of Mejdlaya in north Lebanon on an elevated plateau of olive groves. The center serves the small

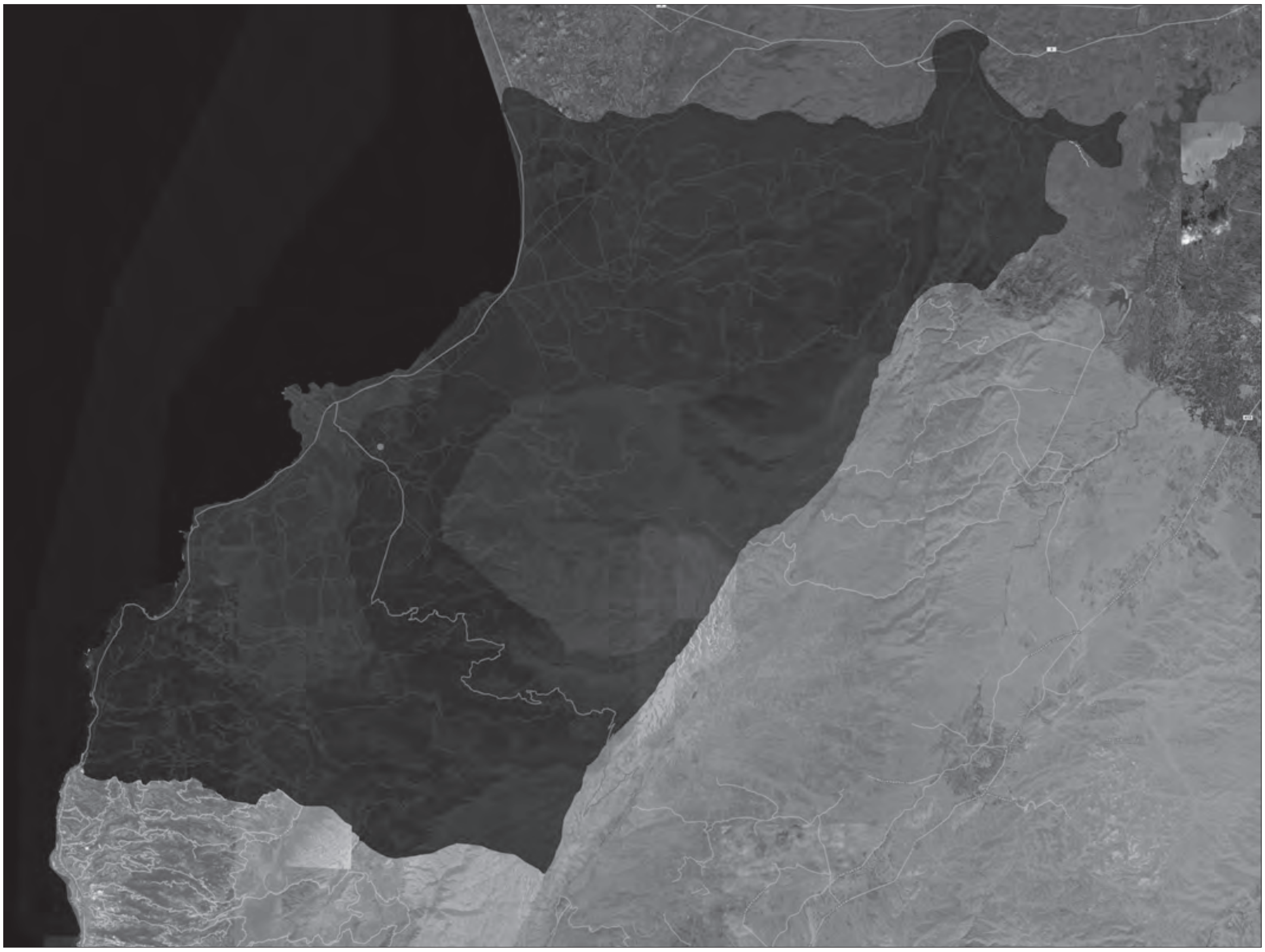


Fig. 17: **Mejdlaya, Lebanon, Agricultural School, Hashim Sarkis, Architecture, Landscape, and Urban Design, 1999 (partly completed in 2007); satellite map showing site and main road through Mejdlaya.**

Fig. 18: **Agricultural School, ground floor plan.**

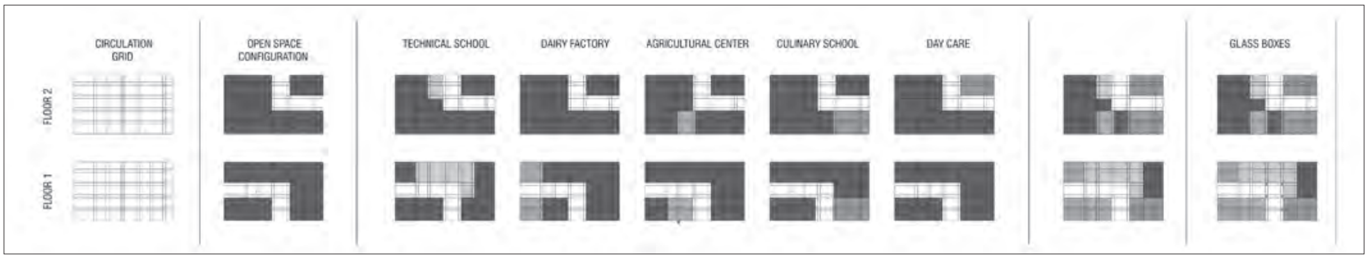


Fig. 19: Agricultural School, program figure-ground diagram.

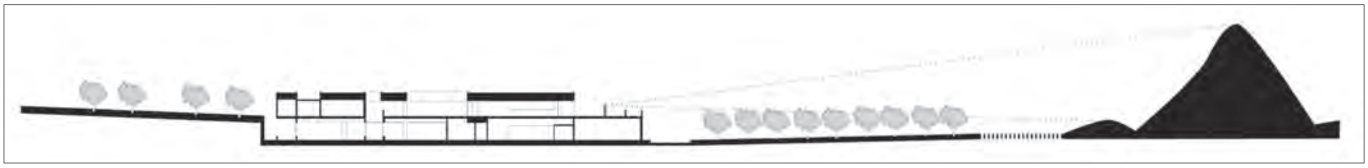


Fig. 20: Agricultural School, section drawing through the site looking south.

Fig. 21: Agricultural School, sectional perspective through the building looking south.

farmers of surrounding towns by providing a produce storage cooler at a reduced cost. It also provides a sorter for fruit packaging, a dairy facility for producing cheese and ice cream, as well as technical support programs and educational services. In order to expand the center and its educational services, the Foundation raised funds from international agencies to build a vocational school. The school includes a culinary training center, sleeping facilities for workers and students, and a daycare center that serves the region. The design program accordingly called for a 4,000-square-meter addition to the pre-existing structure and for improving on the ability of the diverse components of the complex to operate separately and together.

Internally, the different programs are separated by a sequence of internal courtyards directly accessible from the road at two main points, one leading to the agricultural center facilities, namely the dairy center, administration, and auditorium, and the second to the showroom and culinary and agricultural schools. The second level houses the restaurant, library, dorms, study rooms, and daycare center, and looks over and across the plateau of olive trees. The building operates like an interlocking framework in both plan and section, allowing the different activities to coexist, change, and interact.

Allfruits EPZ Ltd. Plant, Malindi, Kenya, 2009 (on hold)
Designed in collaboration with Han Tümertekin, Principal, Mimarlar Tasarım Danışmanlık Ltd., İstanbul.
Project Team: Hashim Sarkis, Han Tümertekin, Ezra Block, Remon Alberts, Laci Videmski, Ted Lin, and Scott Hagen.
(Figs. 24-27)

IPS (Industrial Promotion Services) agro-industries in Nairobi asked us to help develop the design of their passion fruit processing plant, Allfruits EPZ Ltd., located along the Kenyan coast, which provides a newly-established line of their food products.[2]

The site, which consists of a large mango field, is located along the main road between Mombasa and Malindi,

2 Editor's note: for a detailed discussion of this plant as presented from the client's perspective, see Jim Garnett's chapter in this monograph, "IPS Agro: Industrial projects in the coastal regions of Kenya."

Fig. 22: Agricultural School, view from building showing nearby olive trees and mountain ranges in background.

Fig. 23: Agricultural School, view of the southwestern corner of the complex showing the entrance and the parking area.

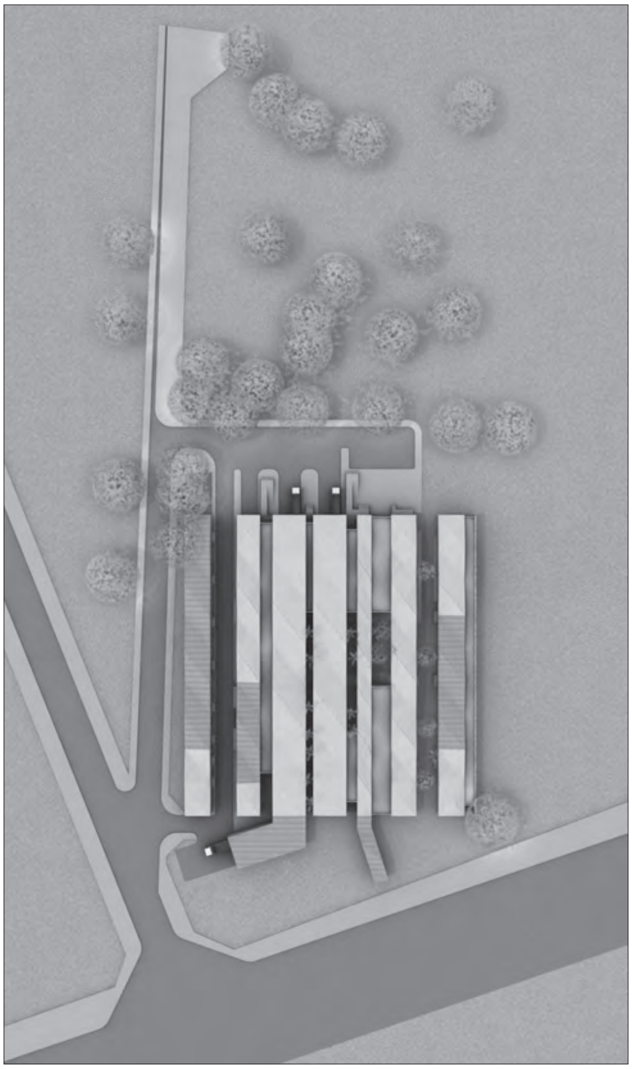


Fig. 24: **Malindi, Kenya, Allfruits EPZ Ltd Plant, Hashim Sarkis, Architecture, Landscape, and Urban Design in association with Han Tümertekin, 2009 (on hold); site plan.**

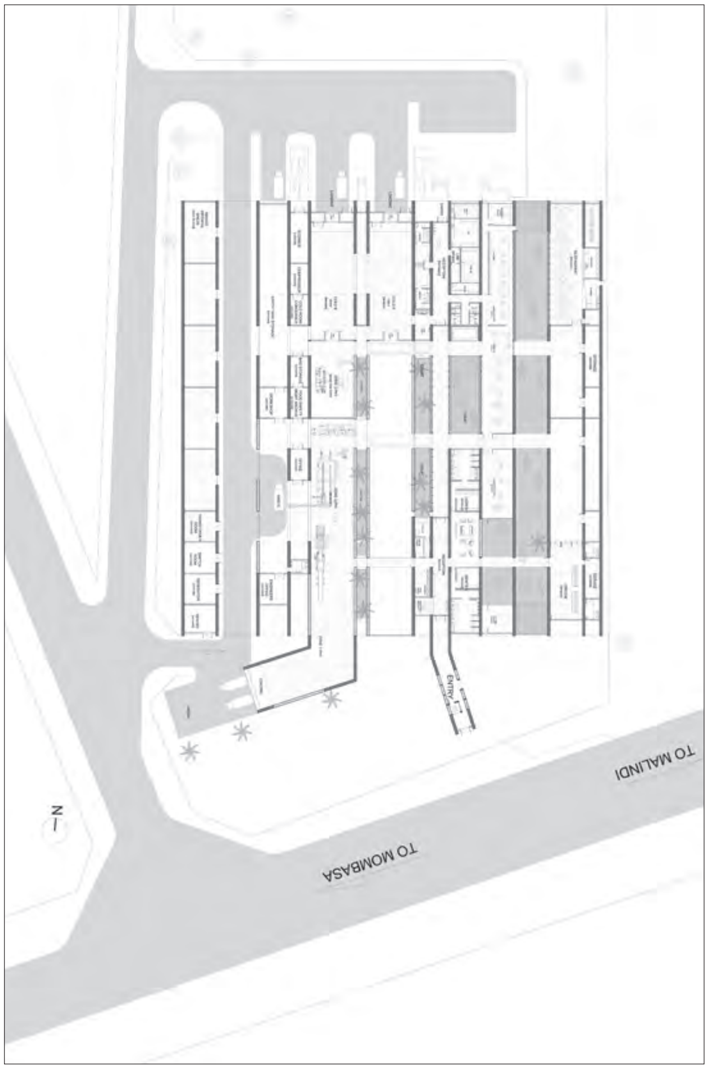


Fig. 25: **Allfruits EPZ Ltd Plant, floor plan.**

close to the Malindi airport. We were asked to rethink the pre-existing design program in order to integrate social facilities and open spaces, and to provide for future expansion. A series of double-height parallel strips interrupted by open spaces contain the lines of production, the storage units, and the social facilities. The open areas, which are used for breaks and recreation, allow the vegetation to overlap with the factory spaces. These factory spaces are brought down in scale from usual factory spans and ceiling heights. Lower ceiling areas act as viaducts and wet zones. Rain water is harvested and stored in these areas as well. In order to preserve the building's identity on the outside, the plan for expansion entails growing into leftover gaps within the square figure between the staff services band and the first production line, as well as in other open intervals interspersed throughout the plan.

Two of the strips bend at the entrance, one to receive the employees from the main street and the other to receive the trucks and cars from the service road. The walls are made of local coral stone. Where there is a need to provide for natural ventilation or a level of visual transparency, the walls are made porous. The roofs are rotated along an oblique axis in order to capture the dominant breeze. The roof material changes according to the function underneath: palm leaf mats for the entrance and receiving areas; tin for the machinery; mosquito net for the fruit storage; jute for shading

Fig. 26: **Allfruits EPZ Ltd Plant, section drawings looking south.**

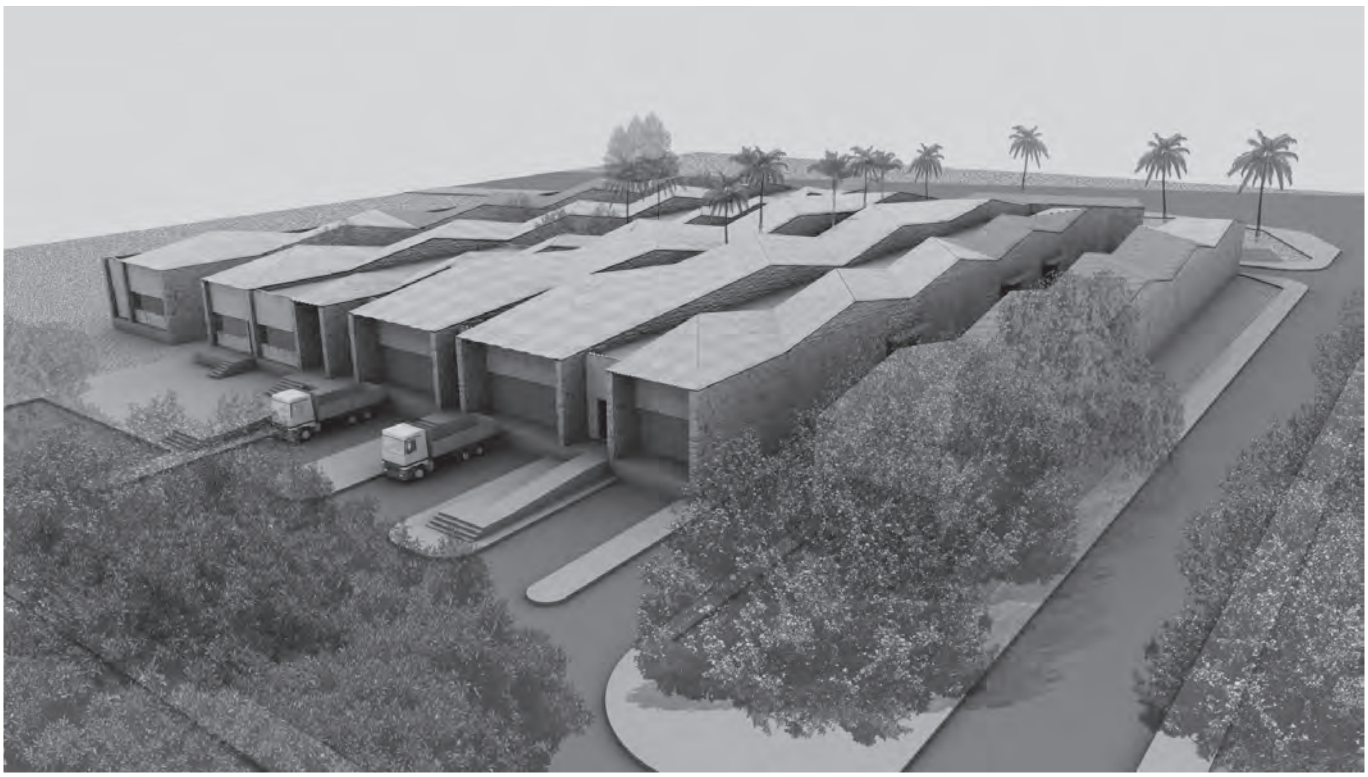


Fig. 27: **Allfruits EPZ Ltd Plant, aerial perspective from the northwest.**

some of the outdoor recreation spaces; and concrete for the water collection areas.

All four projects attempt to extend beyond the bounds of the single building to engage the surrounding landscape. They derive the logics of their siting, orientation, and land-use distribution from a larger order of the land, which they also ameliorate and make visible. Context is no longer simply given. It is, in part, constructed. Each of the projects examines closely the processes of production and the relationships between workers, producers, administrators, and visitors. Wherever possible, the social aspects of the program are amplified, and spaces of interaction are created among the different user groups. The factory is interpreted as a social space. The geographic aesthetic extends out of these attributes as an expression of a connectedness with the land and between the social and the physical.

III. Agro-industrial projects and socio-economic development

IPS Agro: Industrial projects in the coastal regions of Kenya

Jim Garnett

The Aga Khan Development Network (AKDN) is a group of international, private non-denominational development agencies and institutions that seek to empower communities and individuals in order to improve living conditions and opportunities, usually working with poor people in resource-poor areas. The network is headed by His Highness the Aga Khan, who is the 49th hereditary Imam of the Shia Imami Ismaili Muslims and a direct descendent of the Prophet Muhammad (peace be upon him).

The quote below from His Highness the Aga Khan emphasizes the need for providing opportunities and improving the livelihoods of the less fortunate in society:

> There are those who enter the world in such poverty that they are deprived of both the means and the motivation to improve their lot. Unless they can be touched with the spark which ignites the spirit of individual enterprise and determination, they will only sink into apathy, degradation and despair. It is for us, who are more fortunate, to provide that spark.[1]

AKDN has three focus areas, namely economic, social, and cultural, and is organized accordingly. The economic arm of the network, the Aga Khan Fund for Economic Development (AKFED), focuses on developing economically-viable entities that address activities such as financial services, tourism, media services, aviation, and industrial production. These activities are all for-profit and are intended to have major positive impacts on the socio-economic development of the regions in which they operate.

AKFED often works in collaboration with local and international development partners to create and operate companies that provide goods and services essential to economic development. These range from banking to electric-power generation, agricultural processing to hotels, and airlines to telecommunications. AKFED also works with governments to help create enabling legal and fiscal structures that encourage private-sector growth.

Industrial Promotion Services (IPS) is AKFED's industrial activity arm. It was established in the early 1960s with the objective of promoting socio-economic development by encouraging and expanding private enterprise. The projects undertaken are continuously reviewed, and their approaches are adjusted according to changing social developmental needs and economic environments. IPS operates today in Sub-Saharan Africa as well as in Central and South Asia, and is involved in manufacturing, agro-processing, and infrastructure projects.

In East Africa, IPS operates in various sectors including agro-industrial processing, printing and packaging, specialized textiles, pharmaceuticals, and infrastructure. It employs

1 From a speech delivered at the inauguration of The Aga Khan Baug housing project in Versoya, India on January 17, 1983. The full text of the speech is available at: ismaili.net/speech/s830117.html, accessed June 2010.

over 8,000 people of whom over fifty percent are women. It also generates foreign exchange of over seventy million US dollars and works directly with over 65,000 small-scale rural farmers, thus directly impacting the lives of over 500,000 people.

IPS's approach in implementing projects is unique as it responds to the socio-economic developmental needs of the country / region in which it operates through self-sustaining commercial ventures that often are considered unattractive or high-risk to traditional investors. In addition to having the desired social development impact, the projects are expected to be economically sustainable in the long term and to withstand the highest scrutiny of international standards on issues including environmental impact, health and safety, and human resource management. This approach is reflected in all the projects undertaken and in every sector. The successful implementation of projects in developing economies requires thought processes and solutions that take into account the settings in which the projects are located. The following examples illustrate the IPS approach as explained above:

Frigoken Ltd.

When this project was set up in 1989, the Kenyan horticulture industry was exporting vegetables in the form of fresh produce, with exporters essentially procuring their needs from farmers via brokers. The industry at the time was limited to exporting produce to Europe during the winter months, i.e. from October to April, even though the crops could grow year-round in Kenya. Thus, there was an opportunity for IPS to create a year-round value-added product through industrial processing. This was achieved by supplying unique, hand-arranged canned products. It created a significant marketing point of difference that both enhanced as well as stabilized the value of the produce, which otherwise would decrease in price during periods of low demand, as with the summer months.

The operation was initially housed in existing premises adopted and adapted to meet global standards. However, as industry standards evolved to include more stringent requirements, a custom-built facility was constructed incorporating the highest global standards for vegetable processing, but that nonetheless remained labor intensive to accommodate employment needs. The factory was equipped with appropriate technologies while incorporating numerous locally-available solutions for its operations such as manually snipping the produce and packing it in an orderly fashion by hand instead of machines. The building design and manufacturing process also incorporated natural light and ventilation, along with water-recycling and energy-conservation measures. Today, Frigoken is East Africa's largest exporter of processed vegetables and is viewed by the European market as the industry benchmark for the products it processes and exports.

Leather Industries of Kenya

This project was set up in the mid-1980s, at a time when even the possibility of high-quality finished leather processing in Africa was unheard of. Leather from Africa was sold either raw or semi-processed. IPS identified opportunities relating to enhanced value addition, better returns to farmers, and high-export potential that would generate much-needed foreign exchange earnings. A fully-integrated tannery with the capability of processing hides and skins to high-quality finished leather was set up. This involved constructing a state-of-the-art leather tannery specifically designed to handle the tanning process with a view for an optimal use of resources such as water and energy.

A major challenge for any leather tanning industry is effluent management. The tannery accordingly incorporates a highly-efficient effluent treatment process using appropriate yet simple technologies instead of the default, difficult-to-maintain and expensive machine solutions that would have threatened the project's viability. For example, it uses gravity flow rather than mechanical pumping for moving effluence, thus taking advantage of the site's natural slope. Large aeration ponds also are employed since adequate land was available. In addition, the tannery was built away from any major residential areas. Part of it in fact had been used before as an unofficial rubbish dumpsite. The project was carried out at a time when effluent treatment in tanneries was uncommon owing to the significant costs involved globally, and particularly in the developing world. The quality of effluent coming out of this treatment system far exceeds normal global standards, and is even significantly cleaner than the river into which it is discharged.

Alltex EPZ Ltd.

In 2000, new opportunities came into being through a preferential trading facility set up by the United States government under the African Growth and Opportunity Act (AGOA), which created a unique opportunity in the highly-competitive global textile sector by allowing duty-free and quota-free access to the US market. Kenya has a large population of trainable, unemployed persons, many of whom are women. IPS was attracted to the potential of developing a fully-integrated textile industry, which incorporates processes from cotton growing to garment making, as an avenue to creating significant employment opportunities. IPS opted to set up garment manufacturing as a starting point, with a view to ultimate backward integration.

While IPS was not alone in making this move, it made a conscious decision to avoid the traditional sweatshop factory design, and set about creating a modern work environment utilizing a sixty-meter single-span structure, which at that time was the largest factory structure in Kenya. This created a light, airy work-enabling environment. In addition, a custom-built crèche facility was added to the complex to allow the high proportion of women employees to continue working in the secure knowledge that their children were being cared for safely. Such an initiative was largely unheard of in Africa and in many competing locations elsewhere in the world.

Today, Alltex competitively supplies well-known brands of specialized textiles including Dockers and IZOD, while maintaining high global environmental and social standards.

Allfruits EPZ Ltd. (a passion fruit processing factory)

Agriculture remains the most important economic activity in Kenya although less than eight percent of the land is used for crop and feed production. Moreover, less than twenty percent of the country is suitable for cultivation. Twelve percent of the country's area is classified as high-potential (adequate rainfall) agricultural land and about eight percent as medium-potential land. The rest is arid or semiarid. Still, about eighty percent of the country's workforce engages in agriculture or food processing. Farming in Kenya is typically carried out by small-scale rural farmers who usually cultivate no more than two hectares of land using basic farming technology. These small farms, operated by about three million farming families, account for seventy-five percent of the country's total agricultural production.

IPS is currently implementing new agro-industrial projects in the underdeveloped parts of Kenya's coastal region. Although known for its idyllic beaches and high-quality tourist hotels, it also has some of the country's highest poverty levels. The tourism industry largely bypasses the majority of the region's population, which is far removed from the immediate locality of tourism establishments and resides in more remote and inaccessible areas.

In line with AKDN's vision, IPS set out to provide economic opportunities to the mainly subsistence-level, rural, coastal population. Many past initiatives by NGOs in the area have failed to fulfill sustainable economic solutions despite their best efforts. IPS worked on identifying an appropriate activity that is based on its strategy of incorporating long-term economic sustainability while also addressing the community's social development needs.

Various experiments have shown that growing passion fruit as a commercial crop would be suited to the coastal region's climate. Passion fruit is conventionally cultivated on large plantations where the plants are grown against wires and poles, requiring high capital investment (fig. 1).

The farmers of the Kenyan coast are small-scale rural farmers with very small holdings and limited or no capital resources. An original approach to passion fruit growing accordingly was developed. This approach recognized environmental and economic realities, but also allowed small-scale farmers to grow the crop without capital investment.

The solution was to utilize existing structures and bushes around the simple homesteads, or plant fast-growing shrubs suited to the local environment on which the passion fruit vines could climb. The fast-growing shrubs not only provide support for the passion vines, but also provide a source of firewood, the only form of energy used for cooking in these rural communities. This arrangement has also allowed the farmers to develop social spaces in and around their homes where everyday activities can take place under the shade that the passion vines create (fig. 2).

Fig. 1: **A conventional large-scale passion fruit growing plantation.**

Fig. 2: **Innovative passion fruit growing by small-scale farmers.**

With this new-found ability to grow passion vines on small farms, the need arose to develop a facility that would process the passion fruit in juice and concentrate forms, for which global market demand exists. A plan is in place to develop and implement a state-of-the-art processing factory. Supplying the factory with the necessary quantity of fruit will require the participation of over 30,000 small-scale farmers in the coastal area, bringing much-needed employment and income to many households and positively impacting the lives of over 250,000 people.

Processing passion fruit requires specialized equipment that is readily available and a plant could be sited anywhere in Kenya. However, in line with the development principles of IPS and AKDN, it was decided to site the factory in the town of Malindi, which is close to the passion fruit growing areas. The town has practically no industrial activity and is very reliant on the tourist trade. It is hoped that the project will provide employment opportunities for the local population, which suffers from very high unemployment rates, particularly among the youth. It is also hoped that over time this development will act as a catalyst for new industrial ventures by other investors.

Malindi is a small town with a population of 119,000 people (1999 census) and a diverse history. It was one of the first places visited by Arab traders in the 12th century, was a port of call for Vasco de Gama in 1498, and has evolved in the 20th century as a retirement community destination for European nationals. The local indigenous inhabitants are descended from African and Arab traders. Islam is the primary religion and Swahili is the primary language.

The town has no local architectural style, and the main buildings are tourist hotels and mosques. The other town buildings are largely functional in their designs (fig. 3). Its only examples of historical architecture are those of the Swahili settlement of Gedi, which was a thriving community along East Africa's jungle coast with a population estimated in excess of 2,500 people during the 13th and 14th centuries (fig. 4).

While the main town enjoys basic services (electricity, water, and sewage systems), only electricity is available at its extremities, which is where the factory will be sited. The processing plant has no special needs other than to be housed in a weatherproof, hygienic environment, but the design of the factory does offer many other design challenges.

The factory is located in a region of fairly constantly warm temperatures (30C-38C) with high humidity. The primary aim is to develop a design that blends with the locality and adapts to local conditions.[2] The factory design accordingly needs to address the following issues:

- Exploring the economic viability of using photovoltaic panels for generating electricity and solar panels for water heating.
- Exploring the possibility of utilizing wind power for generating electricity.
- Incorporating natural light without creating heat traps.
- Emphasizing the use of natural ventilation by incorporating courtyards and open pre-preparation areas as well as providing the main processing rooms with high ceilings, which encourages the upward flow of warm air.
- Incorporating ventilation slots in the exterior walls while ensuring that mosquitoes are not able to enter.
- Maintaining as many of the pre-existing trees on the site as possible, which include coconut and mango trees.
- Addressing the issues above while adhering to the highest global standards regarding food safety and hygiene as well as environmental concerns, and ensuring that the factory environment is secure from vermin and insects.

The processing of passion fruit into juice will produce a large quantity of bio-waste and liquid effluent. This will have to be managed in a manner that ensures there is no adverse impact on the environment. Moreover, at full output, the bio-

2 Editor's note: IPS commissioned Hashim Sarkis, Architecture, Landscape, and Urban Design, in collaboration with Han Tümertekin, to develop a design for this factory. For an overview of the design, see Hashim Sarkis' chapter in this publication, "Working grounds: Four agro-industrial projects."

Fig. 3: **Malindi (clockwise from upper left): a mosque, hotel, residential huts, and main street.**

Fig. 4: **Gedi, remains from 13th and 14th-century settlements.**

waste will comprise approximately sixty percent of the weight of the processed passion fruit. This could amount up to 100 tons of bio-waste per day.

A sustainable solution for this amount of bio-waste and liquid effluent needs to be found. Possibilities include the following:

- Generating energy and electricity using a biomass boiler.

- Carrying out semi-processing activities in the farming areas.

Semi-processing would create additional opportunities for value addition in rural areas. Liquor would be scooped from the fruit using local labor, and the liquor as well as seeds would then be chilled while awaiting transportation to the factory. Local farmers could use the discarded skins for composting, as animal feed, and as fuel for cooking. This would also help preserve the limited number of trees in the area, which currently are used as firewood, and provide the main source of fuel. The semi-processing would be carried out in appropriately-designed structures that meet industry requirements and are acceptable by discerning global buyers.

- The wastewater effluent needs to be treated through aerobic and anaerobic methods that reuse the wastewater in the manufacturing process wherever possible. There also is a need to ensure that the final discharge after the effluent has been treated conforms to the highest hygienic and environmental standards.

- An opportunity will also be created for small and medium enterprises (SMEs) to produce briquettes from the solid biomass that would be used as fuel to meet the cooking and general energy needs of the local community.

Projects by Foster + Partners

David Nelson

Introduction

When we think of industrial architecture in the Islamic world, we first need to consider the types of manufacturing and commerce the region has traditionally been engaged in, and how this could evolve in the future. A certain amount of industry has long been established in India and Turkey, so it is interesting to consider why the rest of the Islamic world has not been similarly industrialized. While the populations in many of these countries have been prohibitively small to support certain scales of industry, the simple fact is that it has never been a necessity for a good number of Muslim countries to develop alternatives to the wealth of natural resources that oil has provided them.

However, this situation is changing. If you examine oil data across the globe from the last fifty years, it is clear that the quantities found are ever decreasing. The last major find took place in the 1970s in the North Sea, and there have been few discoveries of any real significance since then. Demand for oil has outstripped the rate of discovery since the 1980s (fig. 1). This particular data has been supplied by an oil company, Exxon, yet establishing the exact rate at which oil will deplete is difficult to ascertain, and it is estimated that at any point within the next ten years, oil production will flatten out and then begin a decline.[1] It is inevitable, however, that in the not too distant future those countries that currently depend on oil as their main export will need to find alternatives. Some form of industry could provide one such alternative.

Recent industrial developments in the United Kingdom

Before discussing possible industrial alternatives for oil in the Islamic world, it would be helpful to examine recent developments affecting industrialization in the United Kingdom. Amongst the world's ten centers of large-scale industry, the UK is eighth in terms of industrial output. This figure may be surprising as the accepted view is one of ongoing decline in British industry, yet it also reflects the changing nature of that industry over the last forty years. Looking back over Foster + Partners' history, one of its very first projects was a factory in Swindon for Reliance Controls, which was carried out in 1967 by Team 4, the name of the architectural practice which Norman Foster co-founded (fig. 2). In fact, much of the studio's work in the early years focused on industrial projects. Control systems were manufactured and assembled by Reliance in the UK at that time. Since the 1970s, however, such production has largely ceased as the manufacture of these types of components moved from Britain to the United States, and subsequently on to Asia, driven largely by labor costs. The Swindon building was demolished a few years ago and this type of manufacturing in the UK is still in sharp de-

1 UK Industry Taskforce on Peak Oil & Energy Security (ITPOES), *The Oil Crunch: Securing the UK's Energy Future* (2008).

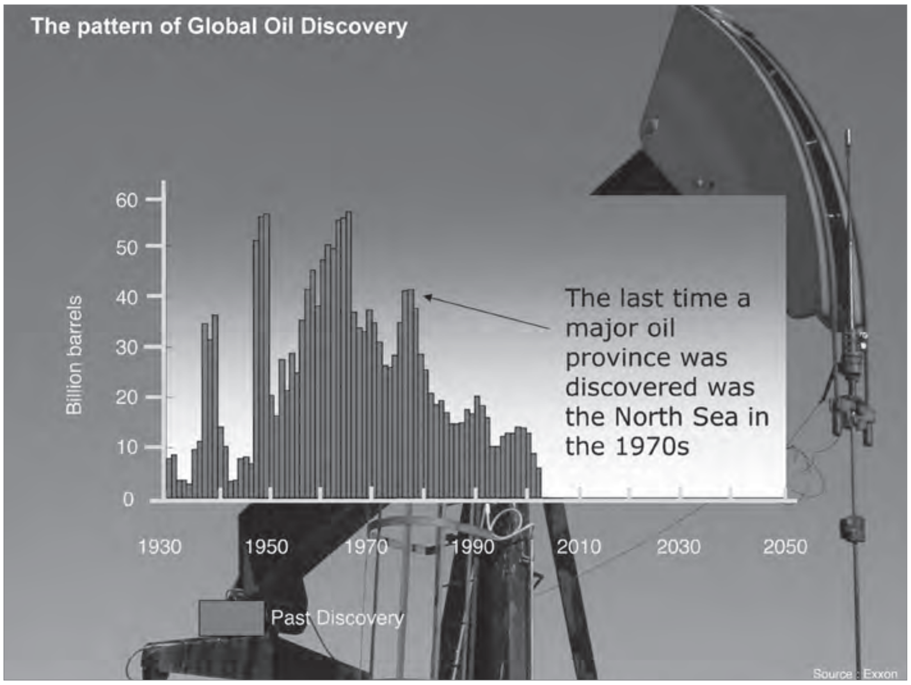
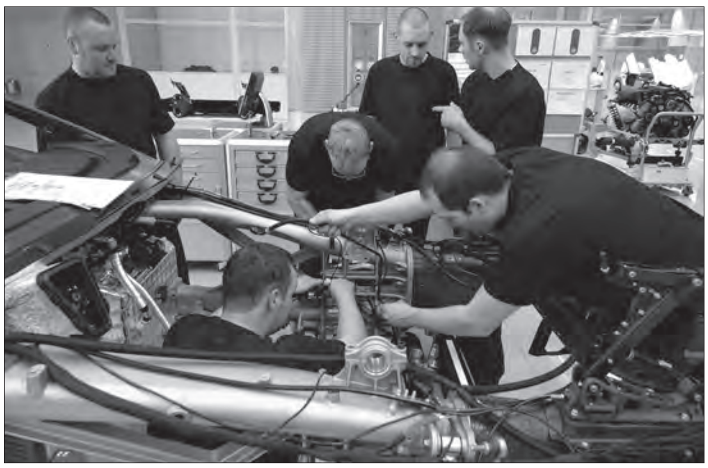


Fig. 1: **Amounts of oil discovered globally since 1930.**

Fig. 2: **Swindon, United Kingdom, Reliance Controls Factory, Team 4, 1967.**



Figs. 3–5: **London, McLaren Technology Centre, Foster + Partners, 2004; development spaces and part of the assembly line.**

cline. However, through the application of newer, more advanced technologies, a new basis for industry has evolved.

By definition, the opportunities are highly specific, and have evolved around particular technology and science applications, which are often described as specialist or niche developments. In the UK, many of these minor industries can be found close to universities with a specific focus on the northern and western fringes of Central London. One example of this new advanced industry located in this catchment area is the McLaren Technology Center, which was completed in 2004 (figs. 3-5). While McLaren is well known as a manufacturer of Formula 1 cars, they are also specialists in automotive engineering for a range of different applications, not just within racing. It is a highly integrated organization, and within its headquarters, the design, development, administration, management, manufacture, testing, and promotional activities of the company all take place under the same roof. It is this level of integration that separates the newer industries from the more usual production-line processes of larger or mass market production. The design of everything McLaren manufactures happens within the building, and the direct feedback from manufacturing instantly informs and advances design.

McLaren's administrative groups are engaged in activities such as buying parts and specialist components from all over the world, establishing racing patents, and seeking sponsorship, so there is incredible diversity, even within the deskbound nature of this type of work. Similarly varied is the work of the electronics group, the team responsible for making the components for racing and road cars, developing hi-fi systems, and designing electronic technology for a wide variety of applications and markets. The manufacture of racing and road cars is also highly sophisticated, employing specialist devices such as an autoclave—a pressurized chamber where the different carbon fiber elements are heated and cured under pressure to produce very lightweight, high-performance components. All of these parts come together at the Technology Center to complete the McLaren Mercedes SLR road car, where it is finished, assembled, and road-tested before it reaches the consumer. The whole process takes place within the same building. From development to delivery, McLaren represents a typical advanced manufacturing company and is a good working model of the current nature of industry in Great Britain.

This type of industry and the way it functions is a very good example of current trends in all areas of the working environment. In particular, there is a growing tendency to move away from an individual to a more collective way of working. Since the 1980s, there have been far fewer people working in cellular office spaces, as the nature of the work itself is becoming increasingly complex and often beyond the capabilities of a single person. Solving today's business, finance, and scientific problems requires team effort and group activities that now far outstrip the capacity of an individual. One by-product of this is to reorganize and refocus on developing the social aspects of working just as much as the day-to-day concentrated activity of the work itself.

Figs. 6-8: **London, Electronic Arts building, Foster + Partners, 2000; staff socializing.**

In 2000, before designing the McLaren Technology Center, Foster + Partners had completed another new type of industrial building within the same belt around Central London, this time for a computer games company called Electronic Arts. Here, much greater attention was focused on the spaces where social interaction takes place. Everybody in the company is driven by deadlines, yet there is tremendous freedom in how they are achieved. Creative interaction is central to success and there is an awareness that the work seeks much of its inspiration in a highly-charged social environment (figs. 6-8).

This new relationship between a more advanced approach to manufacturing and new working environments could provide a possible route for future industrial development in the Islamic world. Its smaller-scale, higher-value focus relies much less on a developed industrial infrastructure. However, it does require a sustainable knowledge platform.

Clark Center at Stanford University

Organized centers of technical excellence around the world tend to be focused in long-established locations where major advanced technologies have been prevalent for some time. However, there are a few surprises (fig. 9). There is a notable hub in Israel and a strong technology focus in Bangalore in India. The latter is a result of the dot-com era, when a lot of cable connection investment took place. It is still one of the most 'wired' and connected places on earth, proving that change can be achieved very rapidly. One pre-eminent center of technical excellence, Silicon Valley in the United States, offers an interesting case study as it has evolved from humble beginnings into a centerpiece of the US economy in a little over 100 years. At its heart lies Stanford University, the institution that started it all.

Stanford, built towards the end of the 19^{th} century, has created new wealth and prosperity for the nation, derived directly from its educational mission. The Clark Center at Stanford University, designed by Foster + Partners and completed in 2003, is structured around a science program called Bio-X, which has remodelled the landscape of science and technological research. Bio-X was designed to bring together a number of different fields within science, mix them up, and allow them to work together via advanced imaging techniques to foster new relationships and bridge connections between different scientific disciplines (fig. 10).

The Clark Center's collective approach to science and technology is supported by its architecture (figs. 11 & 12). The

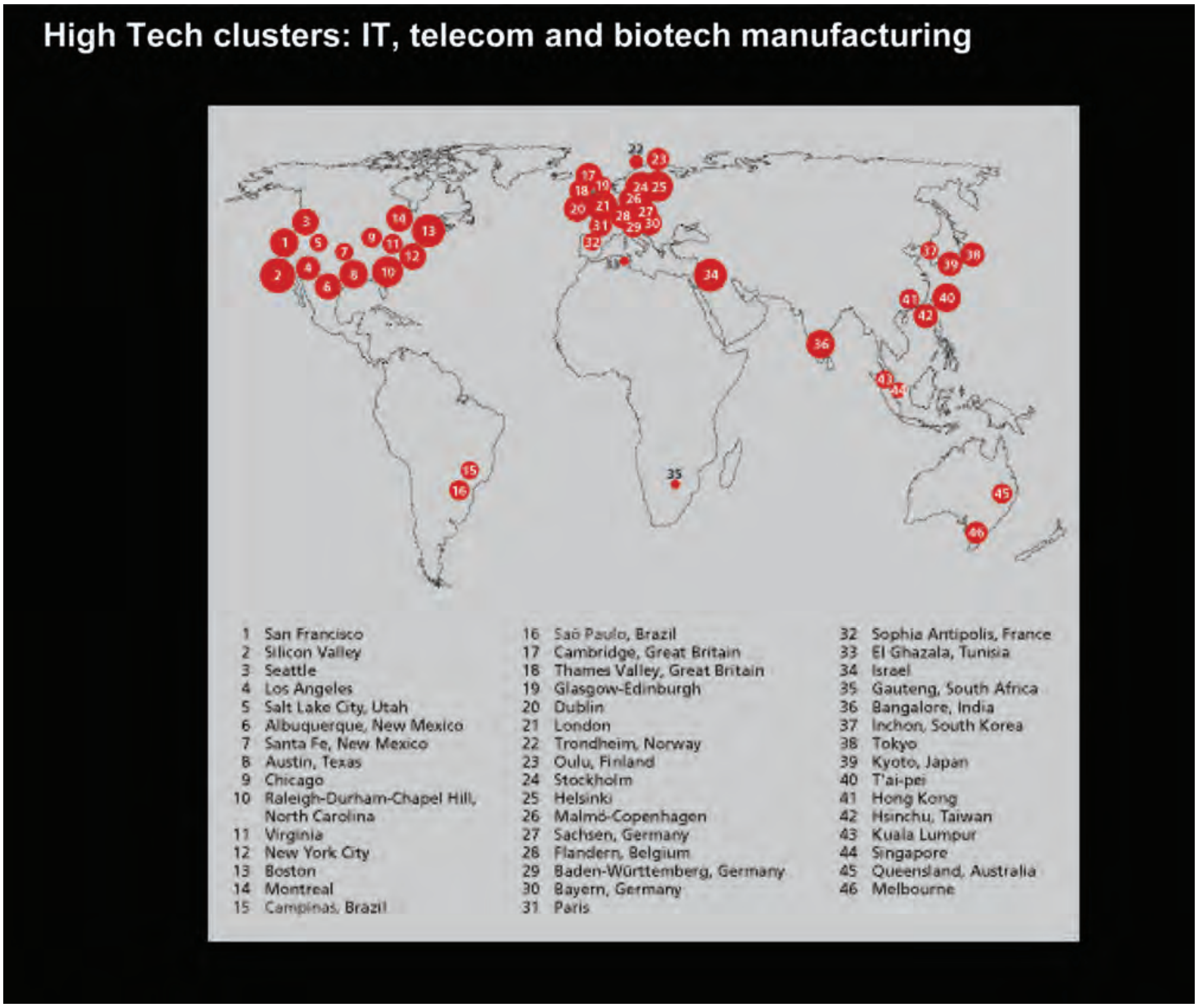


Fig. 9: **Map of global high-tech clusters.**

Center is oriented and strategically positioned to draw people inside and allow function to be clearly articulated through the fabric of the building. Some of the best work is developed in social spaces. Restaurants and cafés are therefore considered essential, along with a real awareness of the importance of work-focused social interaction. When you eat and chat, you loosen up a bit, but the brain is still working and the mind is freer; ideas flow more easily and things can connect. As the scientist involved with the project noted, more science is invented in the café than the labs. The space was conceived to bring people together, and its form is the result of close collaboration with its users. The Clark Center's philosophy is founded in flexibility, openness, and transparency. People on the inside are visible to people on the outside. Inside, the space is adaptable by the scientists themselves.

A pioneering university such as Stanford invariably gives rise to start-up companies by its nature. It is focused on post-graduate activity and its targeted teaching is aimed at developing new technology, products, and scientific applications. The development of Silicon Valley around Stanford demonstrates the enormous potential for future industries in and around the university. Since the Clark Center opened in 2003, there has been a massive shift in emphasis towards the climatic and environmental issues facing us today. If we examine this new focus and how Stanford is applying itself to this new task, we can see a new epicenter of mechanical engineering. This new series of linkages within the campus clearly indicates the new directions that future start-up businesses will take. Over the next ten years, new start-up companies specializing in environmental science are likely to grow in

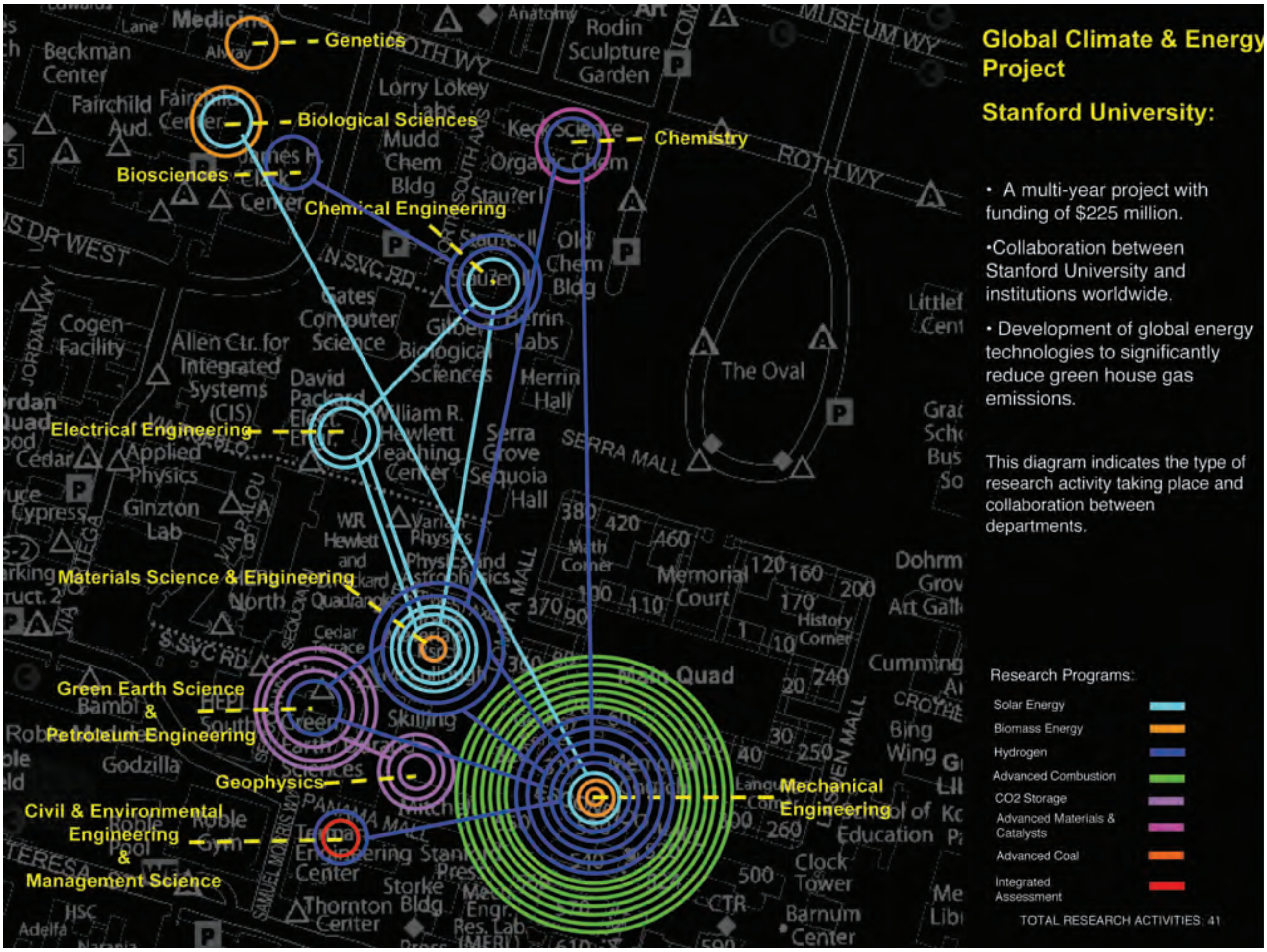


Fig. 10: **Types of research activities and collaboration between departments being carried out at Stanford University's Climate and Energy Project.**

and around Silicon Valley, illustrating the progression from electronics to bio-science on to new environmental industries. Analyzing the interrelationship between commercial knowledge and learning, it is clear that we can create, via a university, a potential new universe of industries, and this is happening at a much faster rate than in the past.

The Masdar initiative

With the increased nature of our construction capabilities today, we are working at much larger scales of development. We can complete the construction of whole cities within incredibly short time scales. In contrast, the development of universities has historically taken many years to achieve a functioning critical mass of activity. Today, we create a whole university as if it were a single project. Petronas University of Technology in Malaysia, completed in 2004, offers an interesting case in point (fig. 13). The whole campus was designed as a single phase and contains a number of specialized laboratories, with a clear focus on the petroleum industry, earth sciences, and a series of related disciplines. Their work, however, inevitably will increasingly encompass the environmental industries in a much broader sense. So if we couple the creation of universities with the concept of a new advanced type of manufacturing base, and if we can realize those universities as larger-scale projects completed in a relatively short timescale, a new 'post-oil' economy based on a continuous learning population / advanced technology platform is clearly conceivable, particularly if present-day oil economics are directed to the task. In this context, it is sobering to note that there are approximately 550 universities in the entire Muslim world. To put that figure in context, Japan alone has over 1,000 universities.

Occasionally, a project comes along that draws together all the current thinking into a cohesive new program. Masdar

Fig. 11 & 12: **Palo Alto, California, United States, Clark Center, Stanford University, Foster + Partners, 2003; exterior and interior views.**

Fig. 13: **Bandar Seri Iskandar, Malaysia, Petronas University of Technology, Foster + Partners in collaboration with GDP Architects, 2004.**

Institute of Science and Technology has been designed from the outset as a generator, which means that in addition to the knowledge center, start-up businesses, supporting administration, and all related services are planned from day one. The Masdar Initiative, conceived and driven by the Abu Dhabi Future Energy Company, is an extraordinary proposition—using the wealth generated by oil production, it has been able to focus on a much longer-term future in education, power generation, science, manufacturing, and agriculture.

Students at the Masdar Institute will focus on the environment and renewable energies, embracing the entire future science and manufacture of everything relating to our long-term survival: not just alternative sources of power and energy, but also related sustainable technologies, from desalination, water management, waste control, and embodied energy, to agriculture and its future in extreme climatic conditions. Each of these activities and areas of research are accommodated within the city and are an integrated part of its fabric, alongside homes, businesses, and recreational spaces. After all, if Masdar is to be a success, it must be an attractive place to live and work in. It must create something unique and special for the 90,000 people who will use it (50,000 inhabitants and 40,000 visitors).

If the footprint of Masdar City were overlaid over Venice, it would appear similar in scale, but greater in density. As the intention is to achieve a zero-carbon, zero-waste community, all aspects of its design and engineering must support a sustainable approach to achieve this target (figs. 14 & 15). You therefore move around the city by public transport or by walking; cars stay at its perimeter and there is a pilot project for a personal rapid transit system to shuttle you in to the center. Conscious of the hot climate and the need to keep walking distances to an absolute minimum, the buildings are placed close to one another to create shaded space. Designing a city from scratch allows ideas that wouldn't be feasible in existing urban settlements. For instance, the entire city is raised 7.5 meters above the desert so that below the pedestrian level, all technical services such as the personal rapid transit system infrastructure, the water pipes, as well as the networks for telecommunications, deliveries, and waste collection can be accommodated.

Due to Abu Dhabi's climate, the majority of Masdar City's energy will be generated by the sun, either directly via photovoltaic cells or indirectly through collection by hot water pipes. Wind technology plays a lesser role, though the processing of waste generated by the city will contribute to additional power generation. Looking at the waste cycle in full, the lifespan of everything within the city must be analyzed. This is a complex equation—to achieve zero waste, which is the ambition of Masdar, the lifecycle of every element within the overall design has to be addressed.

Water is an especially vital resource given the region's extreme temperatures, and desalination has been investigated for some time. Though the process itself consumes considerable energy, if the sun's energy is harnessed, it is then possible to create a more ecologically-sound means of creating desalinated water. As well as being careful with the available water supply—recycling where possible and using graywater for flushing toilets or irrigation—the design also explores how the residual salt from desalination can be put to use, potentially within construction as there exist a variety of technologies focused on achieving just that.

Our dependence on mechanical air conditioning is a relatively recent phenomenon. Before it became widespread, there was tremendous invention when it came to naturally heating and cooling buildings. If we look back over thousands of years, at the different ways people created comfortable environments in which to live and work, one can see how buildings are clustered together to form shaded streets, creating the dense urban grain that can bring a city to life.

In fact, if we look beyond the last fifty years, we can learn a great deal from indigenous forms of desert architecture in the Gulf. One example is a cluster of wind towers built in part of Dubai's historic center (now destroyed) that catches the natural movement of air immediately above roof level. The air is directed down to street level, creating a cooling effect. This cooling process demonstrates a highly-developed approach to the manipulation of the natural environment. If one strips away the architectural design and style of the towers and focuses on the science employed, their future reinvention could have great potential. This ingenuity could provide a foundation for new industries in the region, with an impact that is felt beyond the Islamic world, as Masdar, which is intended to become a center for the development of new ideas for energy production worldwide, aims at demonstrating. These new industries have the potential to change the way people think about the environment and to create something unique through the fusion of vernacular traditions and new technology, from applying the engineering principles of a sophisticated water-cooling system in Iran to replicating the urban planning of the traditional walled city. The Muslim world could learn from its own past and also from its own experience with harsh climates, which are universally predicted to increase throughout the world as a direct result of global warming.

If we look at agriculture and the way things grow, further opportunities for exploration start to appear. Can we grow plants in partially desalinated water, with different dilutions of salt? How can we use algae for water purification and to produce plant nutrients? How can we utilize the area surrounding the city to grow food and undertake research and development while also creating recreational space for Masdar's residents? The industrial buildings within the city will be flexible since the outcome of the scientific endeavor within the Masdar Institute is yet to be known. There could be an industry for wind turbines, electronic components, or photovoltaic cells, or alternatively it may concern agriculture or microbiology—these activities will emerge as the development evolves. Possibly the most wonderful thing about this project is that it is becoming a reality—the first phase, the Masdar Institute, is due to open to students by the end of 2010.

The future of industrialized building within the Islamic world holds great potential. Oil is a valuable commodity, but a carefully-managed transition away from oil-dominated economies will be required over the next few decades. Education, science, development, and manufacture provide a positive route, and a real comprehension of the extremes of the environment and climate that encompass many parts of the Islamic world could be a major source of industrial development.

Figs. 14 & 15: **Masdar City, Abu Dhabi, United Arab Emirates, Foster + Partners, under construction; bird's eye view and general streetscape view.**

II. Contemporary designs

The factory factor: Two industrial projects from Syria

SİNAN HASSAN

Introduction (personal, theoretical, and historical background)

The German architectural historian Walter Müller-Wulckow (d. 1964) once wrote: "it is first and foremost the powers of modern economic life that attract new creative personalities and allow them to develop." In fact, the search for new forms by the masters of the early Modernist period in architecture concentrated to a great extent on the industrial sector, as with the AEG Factory by Peter Behrens and the Fagus Factory by Walter Gropius. One century later, and one continent further, this still holds true as the factory has proven once again to be a hard "fact" and a positive "factor" in the domain of architecture, and the "factory factor" has proven to be as crucial and critical for the formation and thrust of my own architectural development, as it was for Behrens and Gropius.

My professional career and architectural profile have been shaped by a set of complex factors, but none more important than the "factory factor." Especially during the formative years of my career a decade ago, this particular building type became, and remained for some time, my most seminal breeding ground. Moreover, the unprivileged and marginalized urban outskirts of the city, like the sites of the two projects I will discuss in this chapter, have become, both by chance and choice, my preferred building grounds and my home turf.

As such, these two projects represent a special personal and sentimental bond with this particular building type, which started to materialize, coincidently, almost a decade ago, with the easing of socialist public-sector regulations and policies in Syria during the promising transitional era of reform and systematic modernization undertaken by the visionary and new president at the time.

These two projects are in fact intended as socio-cultural statements and as part of a progressive visionary mission aimed at elevating the discourse on industrial design, both locally and regionally, in order to reveal its changing status in contemporary local culture. These two projects therefore should not be viewed merely (or unfairly) as examples of bombastic rhetoric or formalist ostentation, for they strive for a profound impact that extends beyond a quest for the eye-catching corporate-signature building and visual branding, or the mere fulfillment of functional and utilitarian needs.

Having said that, in retrospect I have to admit that when the opportunity initially presented itself for designing the first of these two buildings, I was somewhat hesitant to take it on. I had doubts about the viability of the factory as a "factor" in respect to the local architectural scene. I was not certain that such a seemingly ordinary and purely utilitarian building type could relate to my own life-long interest in the synthesis of poetry and geometry, or the fulfillment of a visionary premise and revolutionary promise to produce architectural statements charged with socio-cultural implications in an architectural environment such as that of Syria, which was not the most suitable location (to say the least) for unconventional architectural experimentation.

It is in fact rarely that one would expect or accept indulgences in fancy and in unusual design for a mundane building type that is intended to fulfill a mundane function, especially in our part of the world. It is even less expected that such a building type would take on a visionary and sophisticated intellectual agenda, and that the two factory projects presented below would in any way become the nucleus of, or catalyst for, up-market, large-scale surrounding developments, let alone a source of civic pride.

This does not negate or undermine my awareness and full appreciation at the time of the relevant lessons of great previous examples of industrial architecture, which include Claude-Nicolas Ledoux's Royal Saltworks of 1775 in Arc-et-Senans, and the pioneering projects by the Modernist architects of the German Work Federation, or the Deutscher Werkbund, namely the 1910 AEG Turbine Factory in Berlin by Peter Behrens and the 1911 Fagus Shoe Factory in Alfeld on the Leine by Walter Gropius and Adolf Meyer. For me, what was especially significant in these important works by such legendary architects is that they not only aspired to advance general notions of Modernity in architecture, but also to reflect the power of industry in modern life, and to bring *architectural dignity* to the workplace by creating a *joy of work* through improved spatial qualities. As the German architect and planner Fritz Schumacher declared on the occasion of the Deutscher Werkbund's foundation in 1907: "we must recreate the joy of work; this is tantamount to an increase in quality."

These architects fully appreciated the fact that industry could no longer do without *promotion and publicity of the most sophisticated kind*, not only externally, to the passersby, but also internally, by impressing and inspiring the workers themselves. They also intended to trans-position industrial architecture into the domain of monumental architecture, and to transform it into a manifestation of an architecture of culture.

According to Walter Gropius, this could only happen through the intervention of what he calls the "creative will." In fact, Gropius urged for a new consideration of "the field of secular industrial building within the sphere of monumental art." He referred to this notion of monumentality as the need for "a dignified guise" of the technical shell, which would impress the passersby. As a result, industrial construction became an *art form* rather than merely a *technical form* as it was before. The significance of this monumentality is also expressed in the notion of "building as advertisement," as expressed by the late German architectural historian Julius Posener (d. 1996), who insisted that "the industrial building should naturally make an impression, and be an advertisement." This monumentality and advertisement was twofold: it was meant to publicize the building and the institution it housed both externally and internally, and it was intended to impress, first and foremost, the workers themselves. The architects of these new industrial buildings also argued that workers in companies that commission such factories would proudly feel that they are part of these companies.

The building as sign and presentational form constituted "publicity of the most sophisticated kind," which industry could no longer do without, a sentiment expressed by many factory owners in the journal *Der Industrielau* in a discussion of Walter Gropius' Fagus Factory.[1]

But again, it was not easy for me to apply these (theoretical) lessons to conditions in Syria, and it was not easy to develop designs that aimed at elevating the industrial workplace within such an underdeveloped and hostile architectural context, where building regulations as well as prevailing tastes and technologies are still in a semi-primitive state. Nor was it easy to sell such design ideas in an architectural environment that rejects anything that might allude, even remotely, to the avant-garde, an environment that is not known to accept or reward innovative and unconventional architectural thinking in any, let alone this particular building type. Addressing these difficulties consequently was a lengthy and difficult process that involved challenging conventional norms, forms, and meanings associated with this building type, breaking its existing mold that is old and cold, and transforming the industrial building into a new, captivating, and seductive object that projects a forward-looking identify and also assumes a symbolic gesture.

Taking all these factors into consideration, my industrial design work has been more of a venture, rather than an uncalculated adventure. It was a contribution to the local architectural scene intended to elevate the discourse on building

1 For a more detailed discussion of the ideas presented above, see the chapter "The Modern Factory" in Peter Gössel and Gabriele Leuthäuser, *Architecture in the Twentieth Century*, vol. 1 (Cologne: Taschen, 2001), pp. 127-143.

to the level of *Architecture* (with a capital "A"), not only in formal and visual terms, but in other more profound terms as well: conceptual, intellectual, and socio-cultural. In order to achieve this, I had to bring the clients on board and to convince them to become patrons, making them an essential part of this undertaking. More importantly, I had to articulate a definitive philosophy and to devise a comprehensively-integrated and relevant design strategy that would ensure the success of this mission and guide its process.

In carrying out this process, all previously-established and long-held normative ideas of "industry" had to be questioned. All conventional norms regarding forms, both morphological and typological, that have been historically ascribed to this underrated and overlooked building type had to be challenged by deconstructing its stereotypically mediocre visual presence, and emphasizing instead a bold, creative, and expressive image of technology, while respecting general local non-industrial architectural frames of reference. In short, it was a venture intended to bring what is generally considered "low art," or low architecture for that matter, up to the level of "high art" or high-end architecture. It was about expressing (in language preference and in historical reference) a reverence for *Architecture* in the domain of industry, a domain that is concurrently hostile and volatile (yet very fertile) in relation to the field of architecture. It was also (as I would like to term it) about finding a way out of the vicious dichotomy and binary opposition between the "fast pace" and the "past face" of this building type in Syria.

Design philosophy– conceptual design strategy

The philosophical intentions behind the design strategy I have adopted for these two projects are centered on several factors, articulated as follows:

Glorifying and dignifying the concepts of "work" and "work value" by creating motivating work environments and quality architecture, thereby contributing to the well-being of the workers and improving their overall efficiency and productivity.

Using architecture as a promotional and branding tool, thereby contributing to the commercial and personalized ambitions of this enterprise (including the client's "ego-factor"), but only in the positive and profound meaning of the words branding and promotion.

Elevating the architectural, intellectual, cultural, and social status of this "low" building type or low-end building genre into a privileged and prestigious "high-end" type through a process of ennoblement and enablement that goes beyond mere formalism.

Aestheticizing industry and synthesizing it with poetry and artistic imagery, thereby giving it a glorious and theatrically-festive, as well as seductive image full of aesthetic lure and pictorial appeal. This involved raising it, in effect, to a humanist (as well as) humane level as an "art form" rather than maintaining its status as merely a "technical form." This was to be achieved by endowing its otherwise banal image with social, artistic, and architectural dignity.

Improving the buildings' urban and environmental contexts by engaging and positively impacting the surroundings and their inhabitants on the tangible economic levels and also at more intangible levels, as with providing a source of civic pride and identity as well as a positive sense of belonging.

General formal design strategy

In these two projects (as in most of my other projects), the intention, first and foremost, is to escape the growing dichotomy in Syria between "past face" and "fast pace" architectural practices. But the direct intention (as expressed in both the syntax and vocabularies of the employed formal language of these two particular buildings) is to produce forms in tension that are meant to project a dynamic image of crumbling and crumpling elements played off against static masses, and expressed into planar and spatial representations through different mediums and sensibilities. Industrial and vernacular tectonics, semantics, as well as contemporary formal syntactic tactics, such as skewed and intersecting geometries, diagrid structures, and forms of dynamic character that result from multiple skews, shifts, tilts, and folds in section, plan, and elevation are all used. They bring together high breeds of hybrids of opposites in order to forge a harmony and marriage between traditional and modern languages. This is achieved through introducing Classical design principles, such as incorporating dramatic axes with strong terminations and clear hierarchies from minor to major forms, into an otherwise completely modern design. In the process, eternal principles of design are emphasized, and forms that are both old and new are used to achieve an architecture that provides an interface between the modern and the Classical. This design methodology also aims at addressing the inherent contradiction between the local and the global or universal as well as the temporal and the eternal, creating a place where the platonic is combined with the tectonic, and poetry is intertwined with geometry.

As such, the two projects featured in this essay complement each other since they share a common ideology and philosophical grounding as well as a similar architectural language (in terms of both semantics and syntax). Yet, as applications they differ in terms of their implications, primarily in their relationship to the levels and character of surrounding urbanization. The following will provide a relatively detailed discussion of the first project, the Chocolate Factory, and a brief overview of the second, the JG BLDG, since it represents, for the most part, a variation on themes and intentions already expressed in the first project.

First, the Chocolate Factory, designed and built between 2000 and early 2004, is a multiple-building ensemble built on a one-acre plot located south of Damascus, off the road leading to the city's airport (figs. 1-13). The project's total built area is about 4,000 square meters distributed on two floors. It is a semi-urban project that represents a collective, or group form, scheme. It is an ensemble that is composed of several interrelated and interconnected components disposed along a long central binding axis that ties the composition to its surroundings. It is also an isolated and far-removed entity within a defined and delineated precinct situated in the surreal and calm landscape of escape at the edge of sub-urbanity, in the southern part of the historical and lush rural zone surrounding Damascus.

Second, the JG BLDG, designed and built between 2004 and 2007, is—in contrast to the Chocolate Factory—a single architectural construct in terms of its massing and composition, despite its overall compositional complexity and formal multiplicity (figs. 14-29). It is situated in much closer proximity to Damascus, in the so-called "rurban" zone, which is neither fully urban nor rural. This zone represents the landscape of informality, sprawl, and poverty located at the city's eastern edge. It is a generally rundown, ignored, marginalized, and unprivileged part of the city that has become a center for its lumber, carpentry, and furniture industries.

The Chocolate Factory therefore is removed from the city in terms of its geographic and physical environment, but the JG BLDG boldly engages it at its edge and entangles with the urban fabric of its outskirts, constituting an integral, yet highly-differentiated part of its setting.

Finally, it is imperative to assert that these two projects have to a great extent satisfied their intention of positively impacting social, economic, and environmental conditions, both inside and outside their premises. For this reason, they bear great implications for issues including land use, land value, natural and physical environments, as well as commercial branding and promotional needs. Since its opening about five years ago, the price of land around the Chocolate Factory has risen more than tenfold. The project itself has turned into a major attraction, becoming the nucleus and catalyst for mixed-use developments that include both industrial and residential complexes. It has attracted a major international industrial corporation to build its regional plant nearby. It has brought life back to an otherwise deserted area neglected by the city's municipality. It also has contributed greatly to improving the physical infrastructure in the vicinity, specifically, its road and sanitary networks. Furthermore, the project has provided sustained and dignified work opportunities for the residents—mostly female—of nearby village communities, who had not been exposed before to such modern industrial labor systems. Finally, it is interesting to note that the Chocolate Factory has been used on a number of occasions as a backdrop and setting for television productions due to its "theatricality and its spatio-visual scenographic splendor," according to one Syrian television director.

The Chocolate Factory

General description

The intention behind the design of this complex was for it to react elegantly to its open site; to reside comfortably at the edge of a marginalized, unprivileged suburbia; to claim a place in the surreal and calm landscape of escape outside the city with festive luster and positive bluster; and to respond, in a complex, sculptural way, to its roadway-dominated environment. It is a highly-orchestrated project that consists of an ensemble of forms featuring three successive buildings (one rectangular and two segmental complementary components) disposed along a long central binding axis that represents the formal and experiential backbone of the composition. These components add up to and—through pairing—also cohere into a sensible and intelligible whole that is bound by formal and visual structures.

The basic (and largest) part of this overall composition consists of a rectangular structure housing the main production hall. This is fronted by a spacious area in which is located a circle, segmented diagonally to accommodate a pair of buildings. One of the buildings is "internal," housing admin-

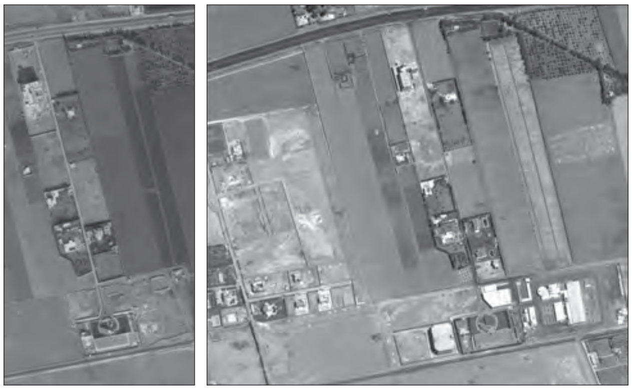


Fig. 1: **Damascus, the Chocolate Factory, Sinan Hassan, 2000–2004; two aerial views showing new development around the Chocolate Factory in the span of the five years since its completion.**

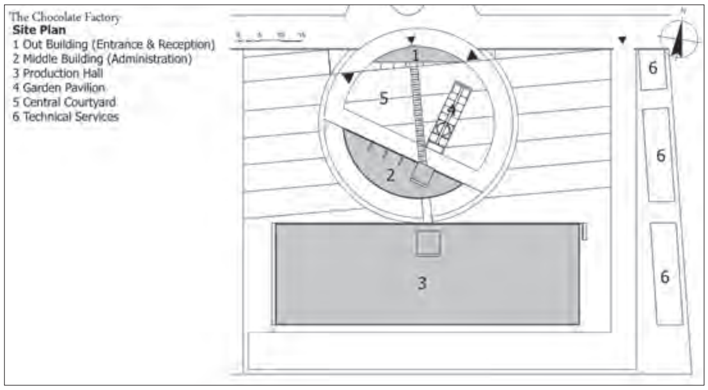


Fig. 2: **The Chocolate Factory, site plan.**

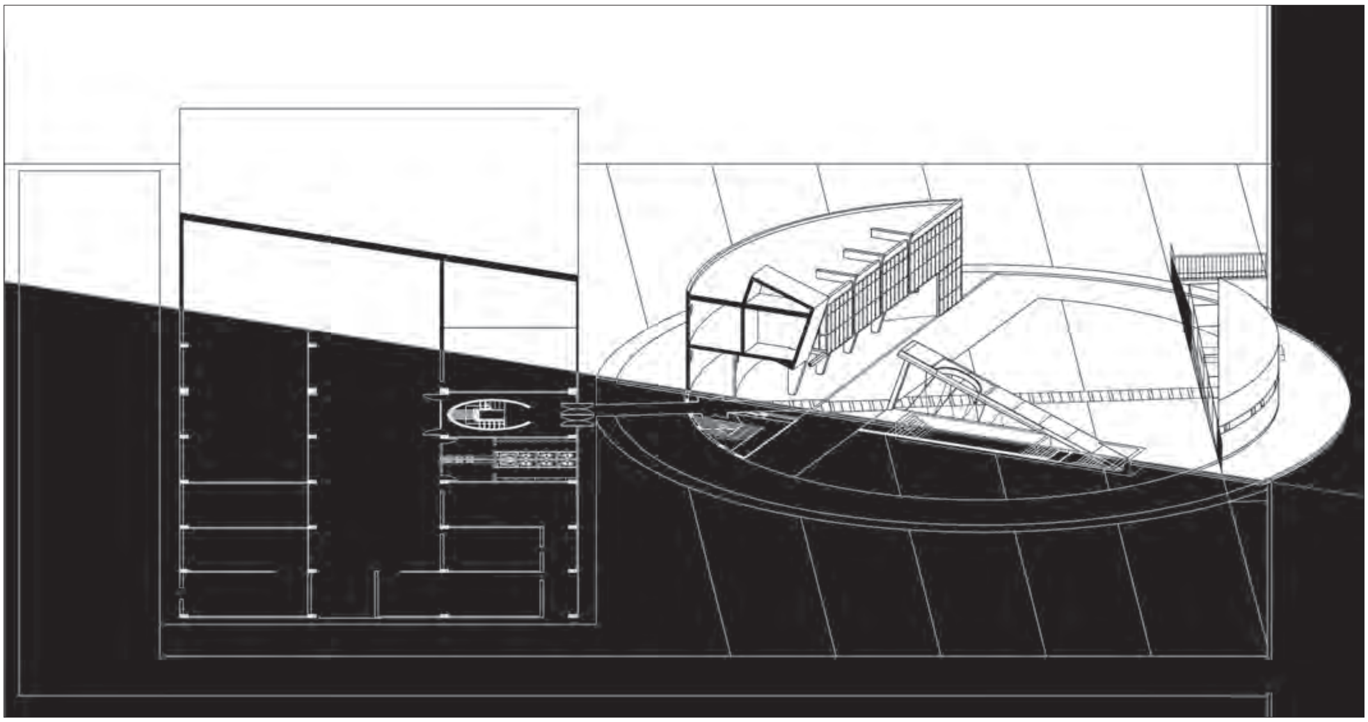


Fig. 3: **The Chocolate Factory, conceptual composite (section/perspectival projection) drawing.**

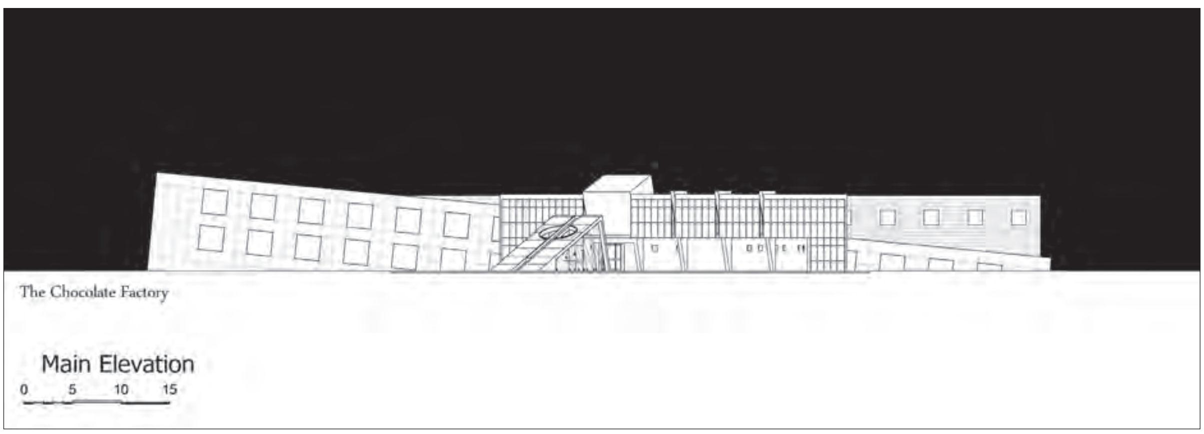


Fig. 4: **The Chocolate Factory, main (north) elevation.**

Fig. 5: The Chocolate Factory, frontal (north) view illustrating the succession of the project's components along its axial spine.

Fig. 6: The Chocolate Factory, view from the west showing the administrative building in the middle fronting the production hall to the right and facing the outbuilding to the left.

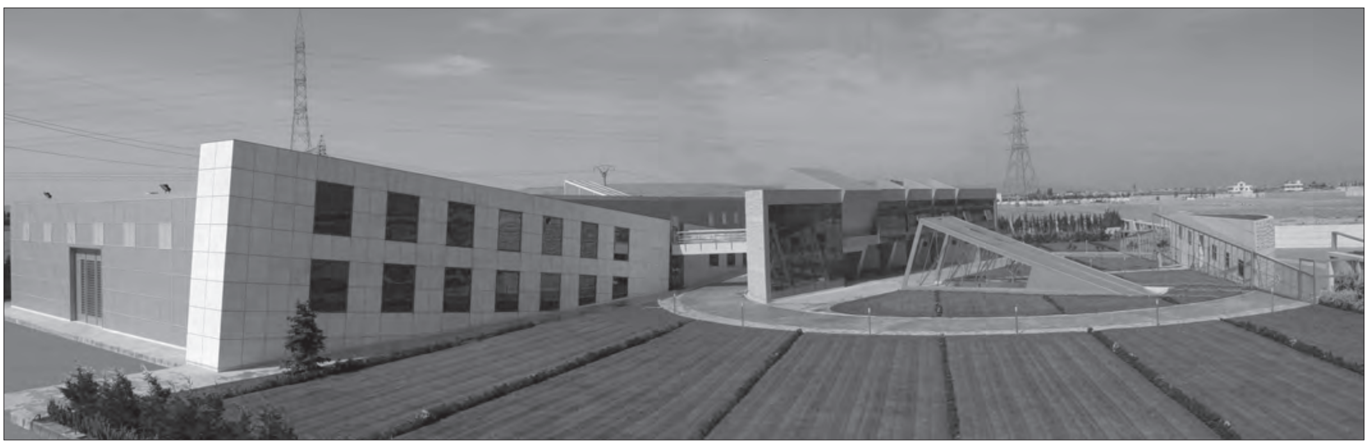


Fig. 7: The Chocolate Factory, general view from the east showing the central courtyard as a point of conversion connecting all components of the project. The production hall to the left is presented as if encased with a semi-flipped-over chocolate box.

Fig. 8: **The Chocolate Factory, panoramic view from the west showing the lush landscape and the dynamic profiles of the project components converging, diverging, and fanning out in different directions.**

Fig. 9: **The Chocolate Factory, close-up view of the slanted garden pavilion dramatically emerging from the ground and fronting the administration building, which in turn is foregrounded by the production hall in the background. The garden pavilion, which is roofed by a fountain channel, is suggestively oriented to align with the electricity power tower in the distance.**

Fig. 10: **The Chocolate Factory, detailed view from inside the central court, along the experiential spinal pedestrian path that penetrates the administration building's lower floor to terminate in the innermost section of the production hall.**

Fig. 11: **The Chocolate Factory, view of the circular central court with its garden pavilion and the two segmental buildings to its right and left.**

Fig. 12: **The Chocolate Factory, interior view of the administration building.**

Fig. 13: **The Chocolate Factory, interior view of the production hall's central atrium showing the circular window that opens onto the production line. The window represents the termination of the journey along the project's axial compositional and experiential spine.**

Fig. 14: **Damascus, the JG BLDG, Sinan Hassan, 2004–2007; aerial view showing the site context. The project acts as urban hinge or anchor and as an architectural hybrid at the point of intersection and collision between different grids and conditions.**

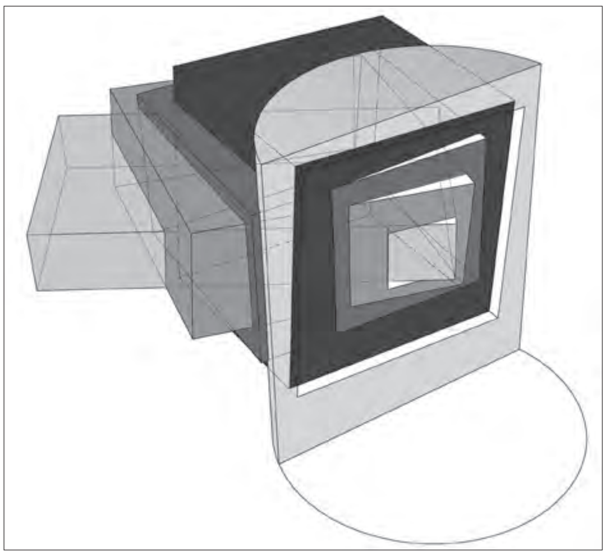


Fig. 15: **The JG BLDG, a three-dimensional diagrammatic projection showing the formal interplay between the alternating, interpenetrating, and rotating (in section and plan) cubic components making up the administration and showroom spaces. This formal composition registers on the street front in the form of multiple concentric enframements as the cubes intersect with the building's cylindrical segment and project out of it.**

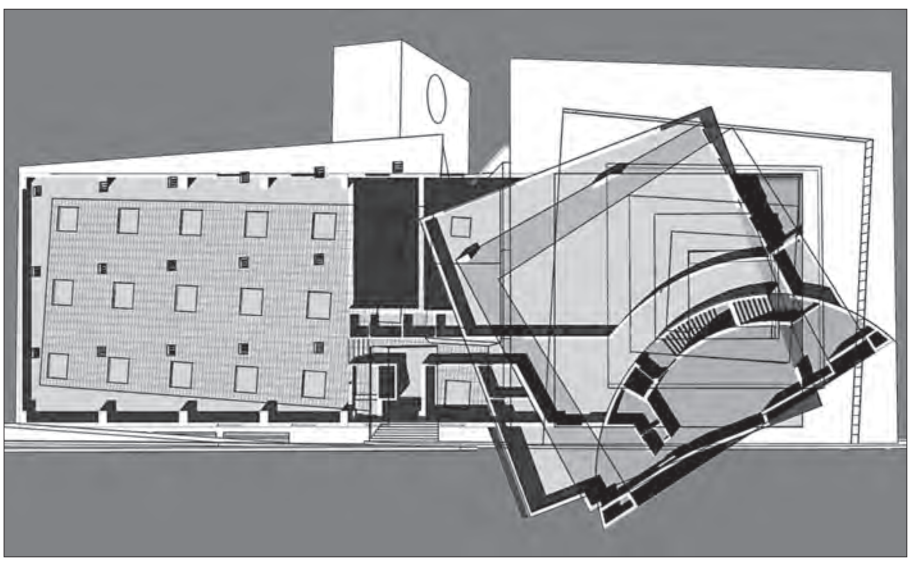


Fig. 16: **The JG BLDG, composite image showing plan superimprosed on the frontal perspective.**

Fig. 17: The JG BLDG, general view from the north.

Fig. 18: The JG BLDG, general view from the west.

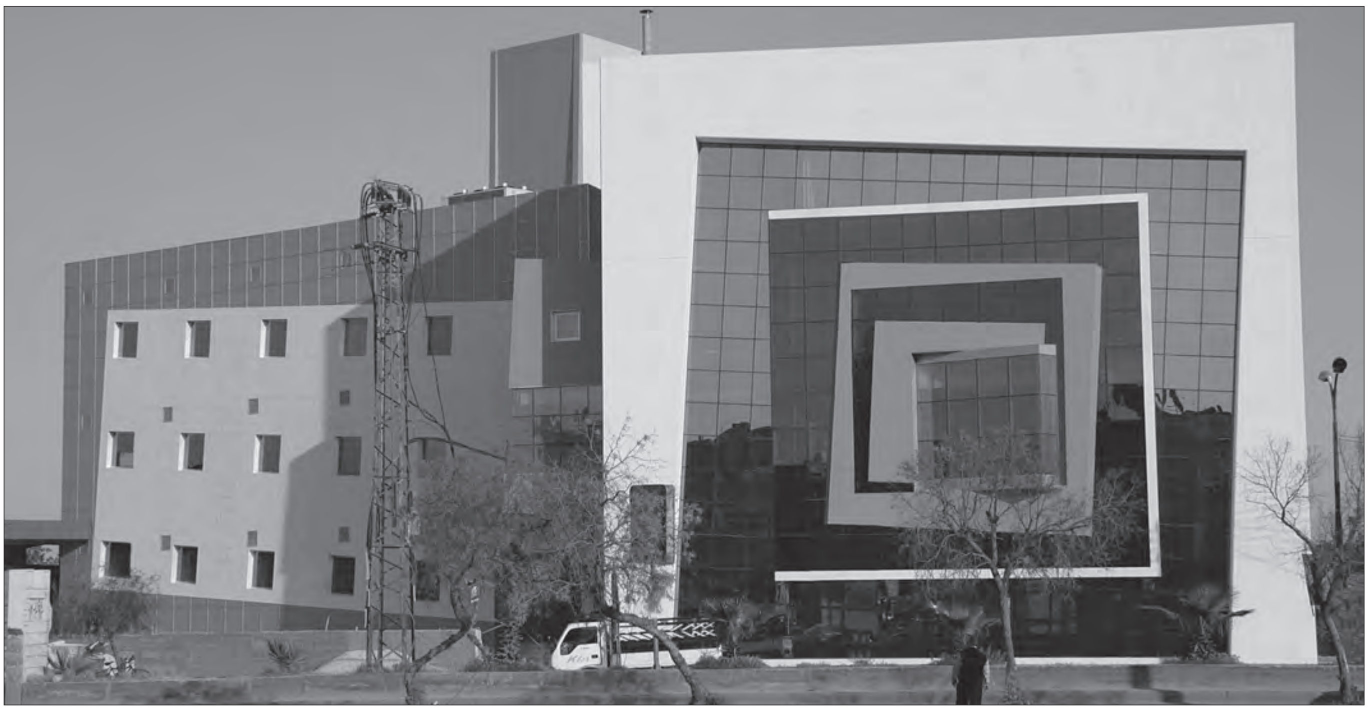


Fig. 19: The JG BLDG, street-front (north) view with the general manager's office projecting from the center of the concentric enframements.

Fig. 20: **The JG BLDG, street view showing the articulation of the building mass into its two main interconnected parts: the administrative offices and showrooms in the cylindrical segment to the right, and the warehouses in the rectangular part to the left.**

Fig. 21: **The JG BLDG, general view from the east.**

Fig. 22: **The JG BLDG, view from the south showing the interlocking articulation and interconnection between the storage section to the right and the offices to the left.**

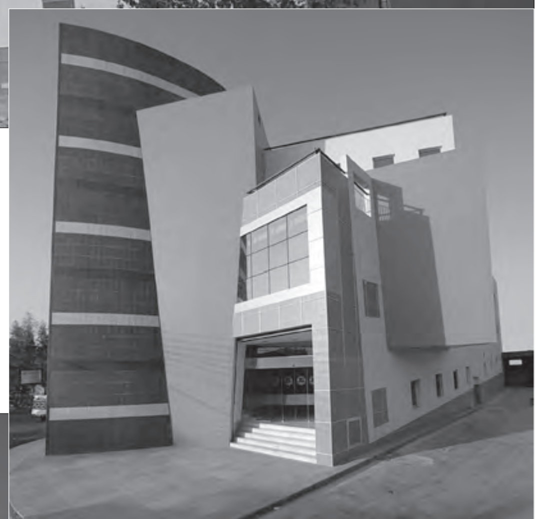


Fig. 23: **The JG BLDG, detailed view from the west showing the main entrance.**

Fig. 24: **The JG BLDG, view of the main lobby showing the anchoring curved wall of the cylindrical segment, which acts as a referential element of orientation due to its dominant presence on all floors and along both the building's interior and exterior. It also uses the same cladding on both its exterior and interior sections, which serves to exteriorize the interior and interiorize the exterior.**

Fig. 25: **The JG BLDG, view of the segmented showroom on the first floor.**

Fig. 26: **The JG BLDG, view showing the slanted fenestration system, which contributes to the building's spatially dynamic and experiential effects.**

Fig. 27: **The JG BLDG, view illustrating the spatial intersection and interpenetration between the interior's cubic components, with the clerestory openings heightening and highlighting the dynamic effects of the arrangement.**

Fig. 28: **The JG BLDG, view of an office space.**

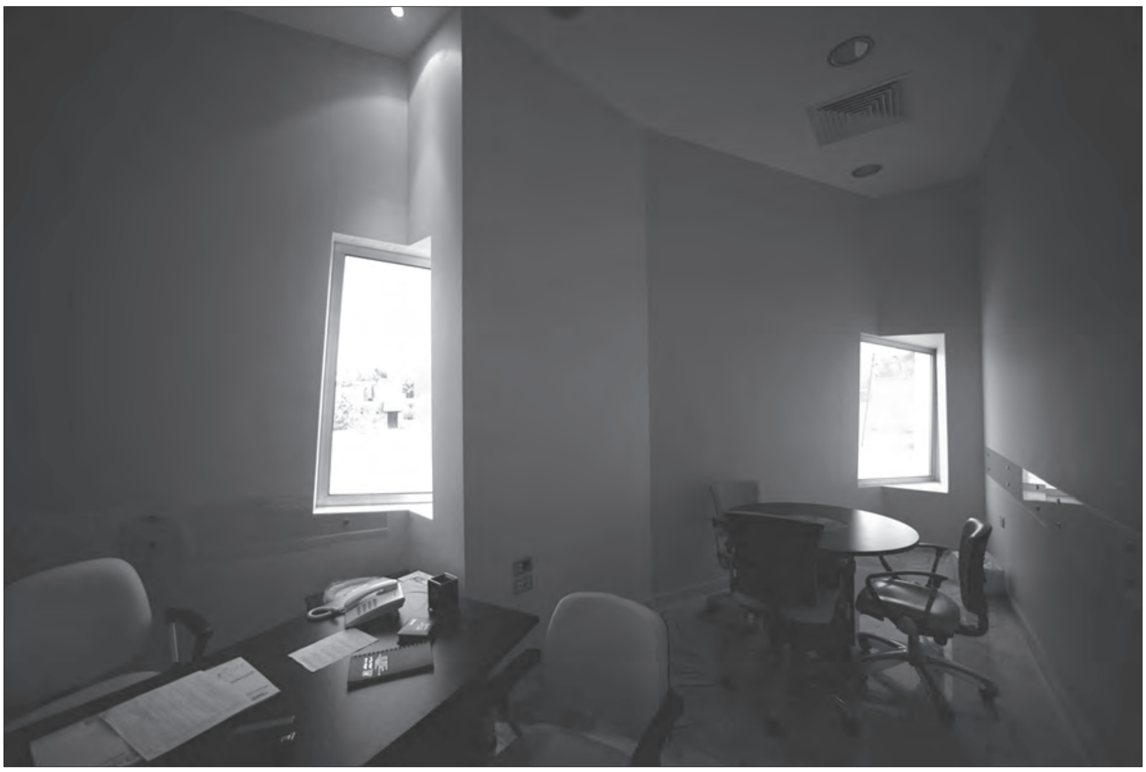


Fig. 29: **The JG BLDG, view of an office space with unconventional sculpturally-arranged windows.**

istrative offices, and the other "external," featuring the project gateway (a sort of initiatory structure or out-building), with an asymmetrical pyramidical / prismatic garden pavilion located between the two that is intended for leisure purposes and for receptions. The complex in effect is a suburban industrial park or a corporate campus turned into a spectacle by means of engagingly-sculpted forms and a state-of-the-art facility for an ambitious local chocolate manufacturer, Choco D'or.

Acknowledging the significance of branding and advertising promotion in such a commercial enterprise, and of using architecture to shape its brand, this local company is both very keen about, and fully aware of, the significance and implications of architectural design. Moreover, the area in which the project is located had been intended as the nucleus for a speculative development of light and clean mixed industries as well as single-family residences (with partial involvement by the factory owners). Notions of monumentality (iconic or otherwise), pictoriality, and theatricality, as well as sentimentality based on thematically-relevant metaphors (as shall be elaborated upon in the description of the project components) were incorporated as points of departure for devising this project's design strategy.

This strategy aims at investing in a seductive image—as stated in the introduction—that symbolizes Syria's new era of modernization and industrialization. Beyond the merely functional, this project is intended as part of a representational scheme that is expressive of a contemporary aspiring industrial culture, and hence encompasses what is far more than a brand statement for a readily-identifiable image or an example of eye-catching corporate-signature architecture. It is intended as a lyrical and visionary statement of poetic and artistic imagery with a profound and multi-layered content. Such an intention entailed incorporating several poetic analogies and paradoxes, opting for obvious oppositions rather than understated differentiation, and bringing together opposites usually held apart. The difficult pairing and reconciling of these contrasting opposites was intended to establish a dialectical dialogue between different architectural sensibilities and manifestations. These include the curvilinear vs. the rectilinear, hard-edged, and angular; formality vs. soft informality or roundedness; frontality vs. obliqueness; mantling or wrapping vs. dismantling or unwrapping; rationality vs. irrationality; and simplicity vs. complexity and multiple axiality that is conflicting and inflecting inside out—and outside in—to reflect external and internal dynamics and conditions. By combining powerful frontality, dynamic obliqueness, angularity, and sensuous curvature, this scheme aims at generating a rich and complex set of spatial experiences out of simple geometries and also out of hybridity, as with contrasting and combining cubism with expressionism by introducing lyrical curves into a skewed angular geometry.

Finally, this project is purposefully governed by a deft sense of form based on intersecting geometries with a distinct modern bent, producing an immersing visual experience full of conflicting vistas in several directional pulls oriented mostly towards entrances. The overall effect is intended to be complex yet clear, whereby external spatial complexity smoothly gives way to internal lucidity in order to facilitate functional efficiency.

Detailed description / project components

A / B– The outer and middle buildings

Starting with the outer building, which includes the main gateway housing the security checkpoint and the reception office, and moving to the middle building that houses the main administration and executive offices, and then to the innermost building, which takes on a rectangular shape, alluding to a box of chocolates, and houses the main production hall, these buildings increase in size and significance in a clear, Classically-inspired, hierarchical order, and in a carefully-orchestrated procession of spaces and masses. The outer and middle buildings, connected through an axial path, are bound by their shared belonging as complemental segmental parts to one circular whole placed in front of the rectangular production hall. Set at an angle to each other and cut out of one circle, these two buildings define an open court space. A vehicular circular route forms a continuous ring that surrounds the two buildings and passes between the middle building and the production hall, moving below the overhead walkway that connects the two buildings and also acts as an entrance canopy for the production building, thus accentuating the axial spine of the project.

The middle building acts both as a formal and functional hinge connecting the outer building at the front to the production building at the rear, not only by being literally placed in the center of the complex, but also by visually complementing one and physically as well as functionally connecting to the other. In that, it links to, yet clearly sets itself apart from, the other two components of the complex.

The interior of this building reads like a series of rooms connected by a sensuously-rounded corridor whereby greenish reflective glass framed with golden frames, silver aluminum composite panels, and dark brown oak woodwork form a rich palette of materials. Muted chocolate brown and golden paint dominate the carefully-devised color scheme, occupying the two principal curving walls of the interior in order to literally denote the name of the brand: Choco D'or (Golden Chocolate).

C– The open court space

Entering the open court space, one is confronted by opposing, complex three-dimensional visual forces at work, as with the visual interplay of backgrounding and foregrounding. The administrative building's curving wall drops and wraps behind a façade of strongly-delineated and tilted structural members that modulate a glazed, reflective façade, thus intensifying the experiential and visual effect of the court by acting as a mirror. It is a calculated spatial drama that draws away from the primary entrance in multiple directions along opposing and conflicting angles created by the garden pavilion's angular geometry, and also the tilted prismatic object engaging the administration building's front and roof, as well as its structural elements.

A visual fabric or spatial system that is intermeshed with the above-mentioned elements fanning out in several directions is produced and intensified by the fact that the outer building collides with an open-lattice structure intended as a pergola, or a green cage, and by the prismatic object of the garden pavilion inclining dynamically into the open court space, signaling the entrance to the administrative building. Defining and framing an arrival plaza, the outlines of this court coordinate and accommodate all arrivals to the site. They define vehicular entry and exit by means of the outer building's convex front, and define a pedestrian entrance by means of a portal that punctuates its middle part.

D– The garden pavilion

Layered grids (or geometric organizational systems) resulting from the geometry of tilting and sliding spaces crisscross the courtyard and keep the eye in constant motion. This notion of motion is best expressed by the presence of the garden pavilion at the very heart of the open court space, where the project's utmost complexity lies. Open to all sides, the pavilion is a glass and steel skeletal structure of a luminous silvery quality, seemingly projecting downward from the tilting part of the administration building's front façade , but also emerging from and erupting out of the ground as a form of built landscape that represents a dynamic diagonal (in both plan and in section) as it is set at an angle to the main pathway. This delicate steel structure is intended to work in crisp counterpoint to the imposing bulk of the other buildings, helping, in effect, to heighten and intensify the project's complex visual drama. In terms of function, it may be best described as a hybrid folly in the form of a canopy, an elevated fountain with water channeled through the roof, and a transparent room for receptions and leisure activities. It is an aluminum-clad steel and glass pavilion-like structure that emphasizes permeability so as not to block views, but to veil and overlay them. It also further accentuates the modernity of the structure and signifies technology. This notion is alluded to by the pavilion's orientation—almost in a spiritual and religious manner—towards a nearby electrical power tower that seems to assume the symbolic traditional role of the bell tower in the medieval city.

E– The production hall

In this modernized and industrialized version of the Classical tradition, one finds a tripartite basilica plan consisting of a nave and two aisles that conveys the feeling one gets inside monastic halls and temples. One side bay is allocated to administrative offices and employee services (on two floors), and the other to the production line.

Encased in a shell that is intended to allude to an opened box, the exterior of this hall is a kind of multiple foil. The design of the production hall façades in fact is meant to embody in building form the process of opening a chocolate box and exposing the wrapping foil, peeling off and peering between layers that are the wrapping of the building, providing a multiple skin. The arrangement provides the impression that the skins are pulled apart, and the stone box is slipped away and flipped over in order to reveal an inner chocolate foil layer, rendering the skin of the building akin to chocolate skin.

A rustic and organic charm provided by the textured stone and planting is combined with a high-tech industrial aesthetic to harmonize the production hall with the rest of the complex. The panelization of outer skins is part of a strategy of modulating surfaces and creating conflicting and dynamically-patterned façade surfaces that incorporate tiling and scaled-down glazing, thus mitigating boxiness and massiveness.

F- The path / spine (from the entrance building to the production hall through the middle building)

Creating a forced perspective that directs views, this principal organizational element axially connects the open court and buildings, rendering them a continuous and successive line of pylons. It extends the project outwards and heightens a grand sense of arrival, whereby the act of entering takes on semi-ritualistic implications. It also renders the project a pronounced articulation of the whole as parts arranged in a sequencing of different spaces and places along a long axis. This axis acts as both a formal spine and a line of events that presents a linear experiential narrative as opposed to the more complex and cyclic reading provided by the site's curved vehicular route.

As a linear, spine-like path traversing the space with the attenuated grace of a thin passageway, this access promises new experiences as the buildings prompt one to journey not only through them, but also around them. It offers a rich variety of experiences with its unfolding array of surprises, both indoor and outdoor. In its journey, the path counters the rigidity implied in its geometry. It also initiates highly-orchestrated circulation patterns and a far-reaching visual range via an elongated expansive line that stretches the visual reach of the project outward, constituting an entry sequence and a series of happenings or events along a long processional journey through successive thresholds marked by the sequence of buildings. As a result, an atmosphere of festivity and theatricality is created whereby architecture itself is staged as an event, not only as a stage for an event.

Representing an extension to the street and creating a controlled vista that works in both directions (inside-out and outside-in), this path penetrates the project right to the very center of the production hall building. It acts not only as the composition's formal backbone, but also as the experiential unifying axial force and the dynamic directional pull towards the production hall through the project's various elements. It is also manifested as an internalized street, which terminates in a dramatic and emblematic *finale*, marked horizontally by a circular window that further signifies and dignifies industry by offering a framed glimpse of the production line at work, and vertically by a circular stairway that spirals upward within a double-height lobby capped by a tilted prismatic skylight.

Materials and construction systems

Combining handicraft with mechanized construction, and a partially steel skeletal structure with a mostly-conventional concrete block infill system, this project tests the limits of the local construction industry, creating a structure that is partly high-tech and partly low-tech. It incorporates building systems that represent "local versions" of modern production and construction technologies, expressed in a synthesis of the architecture of compression (stone masses) and that of tension (steel and glass structures).

The making of every square meter of this project had to be extensively thought through and carefully managed to achieve a high level of craftsmanship and a quality of construction unusual in local industrial buildings. The administration building's front façade incorporates structural glazing, and its reflective façade of greenish glass combined with golden frames tends to intensify the effect of the lush green landscape. The back of this building, like the front of the outer building, is clad with local roughly-textured stone of light brownish tone. The interior surfaces are clad with silver composite aluminum panels, dark brown oak woodwork, and natural granite. Muted chocolate brown and golden paint dominate the carefully-devised color scheme, especially in the administration building.

The main production building is encased in a sliding stone skin. The exterior of this hall presents a hybrid of natural and industrial materials producing a textural variety that contrasts the rough with the smooth, achieved through a rich and varied palette of materials that combines greenish reflective glass with silvery and golden aluminum frames, beige local stone, gray ceramic tiles, and metallic lining. The ceramic and metallic skin forms the building's visual foil, and the juxtapositioning of ceramic and metallic veneers with local stone helps combine an intended rusticity with a high-tech industrial aesthetic.

The interior flooring features imported granite and local marble for offices, and local ceramic tiles for the production hall. The exterior floor paving mostly consists of stamped colored concrete. Special attention was paid to the electro-mechanical systems, insulation, and sanitary works to enhance sustainability and environmental performance, following strict measures imposed by the manufacturers of the line of production.

The JG BLDG

The JG BLDG is a relatively low-cost four-story single building constructed on a 2,000-square-meter plot with a total built area of around 4,000 square meters. It includes storage space, showrooms, and offices for the local J.G. Company, which trades in lumber and related products.

Conceptually, this building carries on a number of the same themes developed in the Chocolate Factory, but with stronger overtones, not only formally, but, more importantly, on the socio-cultural level. This project is not an isolated object, but one that engages with and is entangled in the surrounding urban fabric and social tissues. As such, this building has aimed at providing the residents of the surrounding low-income area with a work of signature design that functions as a source of civic pride with which they can identify. In addition, it is intended as a positive impetus and catalyst for urban regeneration and development—which is desperately needed in such rundown areas—by providing a positive and motivating example in a strategic location, at a major traffic intersection.

Physically and tectonically, the JG BLDG is a complex of layered and peeled skins of artificial stone cladding, tile veneering, glass curtain walls, and structural glazing. Formally, it is composed of a semi-cylindrical segment fronting the street, anchored at its corner and positioned like a hinging pivot that acts as a center of horizontal and vertical motion for a series of interlocked and interpenetrating cubes. These cubes house offices and showrooms that simultaneously rotate in plan and in section. They project out of the cylindrical segment—which houses the main administrative offices—forming a series of square concentric enframements around them. The overall form reads architecturally as an intricate, complex, and interconnected single construct of wedged, squeezed, and rotated hard-edged forms. On the urban level, it reads as a place of interface, convergence, and divergence in relation to the conflicting and inflecting surrounding urban conditions, converging and diverging, as well as meeting and colliding in one construct. It therefore represents an urban and architectural hybrid that functions on both the micro (architectural) and the macro (urban) scales.

An overview of the development of industrial architecture in Malaysia

Casey Tan Kok Chaon

Malaysia was dramatically transformed from an agrarian economy at independence in 1957 through a rapid process of industrialization. Since the late 1990s, another transformation has taken place as the economy has shifted from industry to the services and knowledge-based sectors. The success of Malaysia's economic transformations has been brought about through an implementation of various government-sponsored economic policies that have included the First Malaya Plan (1956-1960) and the Second Malaya Plan (1961-1965), the New Economic Policy (1971-1990), the First Malaysia Plan (1966-1970) through the Ninth Malaysia Plan (2006-2010), the First Industrial Master Plan (1986-1995) through the Third Industrial Master Plan (2006-2015), and Vision 2020.

Pre-independence (before 1957): The emergence of the tin, rubber, and palm-oil industries

The Malay Peninsula, and indeed Southeast Asia in general, has been a trade center for centuries. Various items ranging from porcelain to spices were actively traded there even before the rise of Malacca and later Singapore as major trading centers beginning in the fifteenth century. In the case of Malacca, the Malacca Sultanate controlled the Straits of Malacca from its founding in 1402 to the 1511 invasion by Portugal. During that period, all trade through the Straits, especially spices from the Celebes and the Moluccas, moved under its protection and through its markets. As for Singapore, the British East India Company, led by Sir Stamford Raffles, established a trading post on the island in 1819, which was used as a port along the spice route.

In the 17th century, large deposits of tin were discovered in several Malay states. Later on, as the British started to take over as administrators of Malaya, they introduced rubber and palm-oil trees for commercial purposes, and, over time, Malaya became the world's largest producer of tin, rubber, and palm-oil. These three commodities, along with other raw materials, firmly set Malaysia's economic tempo well into the mid-20th century.

Tin

In the 1850s, large-scale tin mining began to take place in the peninsular states of Perak and Selangor, both of which had rich deposits of that material. Tin had a major impact on the nation. It significantly influenced demographic patterns, resulting in the migration of Chinese populations, mainly from southern China, during the mid-19th century to work in the tin mines. It also contributed to the development of the current capital, Kuala Lumpur, which had been a small swampy village up to that point. When the world's tin market collapsed in 1985, causing the industry to decline sharply, Malaysia had been the world's largest tin producer for over a century.

Fig. 1: **This 4,500-ton giant tin dredge started operation in 1938 and is the last to survive of 352 dredges that had functioned in Malaysia. It once belonged to the Southern Malayan Tin Dredging company, but is now only a reminder of a time when Malaysia was the world's greatest tin producer.**

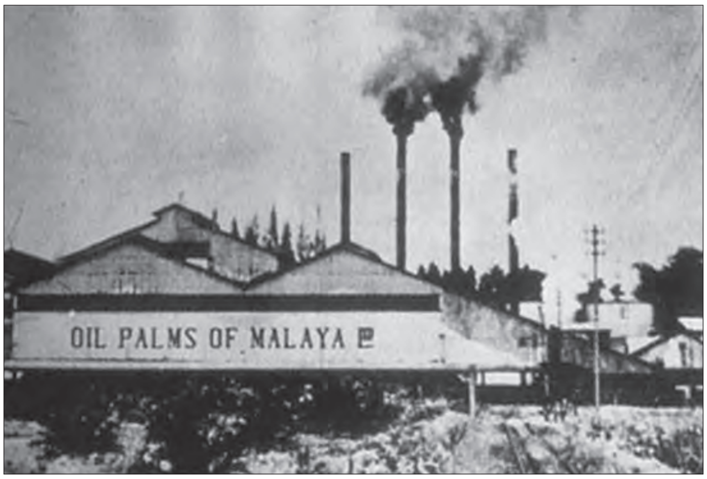


Fig. 2: **The first palm-oil mill in Malaya was in the Tennamarain Estate in Selangor, c. 1920.**

The 'palong' method of tin mining included a timber structure and a tin dredge, resembling a floating factory. Huge volumes of tin-bearing soil would be scooped out and transported to the cleaning plant at the upper part of the dredge (fig. 1). The first tin dredge was introduced to Malaysia in the Kinta Valley tin mine in 1913.

Between 1885 and 1895, railway lines were constructed to link tin mines directly to coastal ports. The first railway from Taiping to Port Weld (now Kuala Sepetang) was opened in 1885, and the second, from Kuala Lumpur to Klang, in 1886.

Rubber

From an initial small number of trees planted in Kuala Kangsar in Perak in 1877, Malaysia soon become the world's largest producer of natural rubber. For decades, rubber was its main source of export revenue. The invention of pneumatic tires in 1888 and the subsequent spread of the motorcar and aircraft industries in the early-20th century led to the rapid rise of rubber as a major world commodity. From the 1910s, Peninsular Malaysia had become the world's largest producer of rubber, and the impact of the industry spread far beyond the economic level. The labor-intensive nature of the industry led to the influx of migrant labor from India, which peaked from 1910 to 1920. In fact, the bungalow house type was introduced at that time to Malaysia as this was the first structure to be built after a jungle would be cleared for rubber plantation—to house workers and managers. A common feature of these bungalows was *attap* (thatched) roofs constructed on masonry posts.

Palm-oil

First introduced to Malaysia from West Africa in 1870, the palm-oil tree was initially regarded as nothing more than an ornamental plant of little commercial value. However, Malaysia today is the world's largest producer and exporter of palm-oil, accounting for 45% of world output and 51% of world exports in 2005. In addition to its export in crude form, palm-oil, like rubber before it, has successfully generated numerous downstream activities, including processing, refining, research and development, as well as end-product manufacturing. The first palm-oil mill in Malaya was built at Tennamarain Estate in Selangor around 1920 (fig. 2). Since then, areas planted with palm-oil trees were rapidly expanded, from 409 hectares in 1923 to about 54,633 hectares in 1960.

During the early days of the industry, operations tended to be set up in locations that had easy access to raw materials, labor, basic utilities, and transportation infrastructure. A lack of planning coordination often meant that industrial activities infringed on residential and natural areas.

The early processing and staff-accommodation buildings were primarily timber structures, built off the ground using the post-and-beam method. Their walls were usually made of timber, although bamboo was used in certain areas. The roofing was *attap* and was lashed to the roof structure in overlapping horizontal layers.

In the 19th century, Chinese immigrants from the southern coastal areas of China brought with them both construction know-how as well as new methods of construction that were adapted to the local climate and context. The use of brick-tiled roofs replaced the timber and thatched hut (fig. 3). In addition, the British brought in corrugated galvanized iron covered by a protective coating of zinc, which, along with corrugated asbestos-cement sheets, became the most common material for roofing in Malaysia's buildings.

Post-independence (after 1957): Establishing an industrial base

In the post-independence years, tin deposits were gradually depleted, and the country lost its position as the world's leading natural rubber producer to Indonesia. Moreover, increasing competition came from synthetic rubber, and world natural-rubber market prices were frequently destabilized by periodic releases from the United States of its rubber stockpile.

Efforts were therefore made to diversify Malaysia's economic base. These included adopting an import-substitution industrialization policy, but rubber and tin remained the twin pillars of the economy. Under the First Malaya Plan (1956-1960) and the Second Malaya Plan (1961-1965), considerable funds were provided for infrastructure, particularly for developing road and electricity networks. The government also emphasized socio-economic development. In addition to policies geared towards economic growth, such as diversifying the nation's economic base, there was a parallel emphasis on promoting the integration of the country's different ethnic groups and the separate states that had been federated into Malaysia.

Malaysia's first industrial estate was built soon after independence, in the township of Petaling Jaya, close to Kuala Lumpur, following the passage of the Pioneer Industries Ordinance in 1958, which offered incentives for industrial investment. The Petaling Jaya Authority leased out 121.4 hectares of former rubber plantation land that was subdivided into industrial lots. The project was an immediate success, with all the lots taken up and eighty factories operating by 1960.

The architectural language adopted for the majority of industrial buildings in Petaling Jaya was a modernist one, with the structural system often forming an integral part of the building's architectonic expression. Examples are the Nestlé Factory (1962), the Century Battery Factory (1962; fig. 4), the Guinness Brewery (1965), and the Colgate-Palmolive Factory (1965), all designed by BEP Architects. The design briefs of the day demanded large, uninterrupted workspaces free of columns for the production and storage areas. The Century Battery Factory accordingly has a reinforced folded-plate concrete roof covering 1,300 square meters of column-free internal space and was one of the first to provide such

Fig. 3: **The first shop houses in Market Square, Kuala Lumpur, c. 1884, were constructed using brick walls and concrete roof tiles by a Chinese 'Kapitan' (head of Chinese community), Yap Ah Loy.**

Fig. 4: **Petaling Jaya, Century Battery Factory, BEP Architects, 1962.**

uninterrupted space in Malaysia. The Colgate-Palmolive Factory also provides a column-free internal space, covered by a barrel-vaulted roof.

The 1970s: The introduction of heavy industries

During the 1970s, Malaysia followed in the footsteps of the original four Asian Tigers (Hong Kong, Singapore, South Korea, and Taiwan) and committed itself to making a transition from mining and agriculture to manufacturing. Through Japanese investment, heavy industries flourished, and, in a matter of years, exports became the country's primary growth engine.

Following the civil race-related disturbances of May 13, 1969, the 1970s saw a thorough reassessment of the country's economic, political, and social frameworks. Unemployment rates were high and rubber production had fallen. It was in this context that the New Economic Policy, an affirmative-action program aimed at correcting inherent socio-economic imbalances and, in particular, improving living standards for the indigenous *Bumiputra* populations, was introduced by the government.

An important milestone in Malaysia's industrial development was the founding in 1974 of the national petroleum corporation, Petronas, which was vested with ownership and control of the nation's petroleum resources, and was responsible for developing its petroleum industry. The company first exported crude oil in 1975, and moved to expand its operations by opening service stations, the first of which appeared in Kuala Lumpur in 1981. The petroleum industry has emerged as a major contributor to Malaysia's economic growth and industrialization, and acts as a main conduit for foreign direct investment as well as a source of foreign exchange earnings and job creation.

Towards the end of the 1960s, industrial policies shifted from import substitution to export orientation. A major initiative of Malaysia's early export-oriented industrial regime was the passage of the Free Trade Zone Act in 1971 and the subsequent opening up of free-trade zones, which today are known as free industrial zones.

A number of industrial estates, both free-trade zones and privately-developed compounds, were built at that time. In the state of Penang, for example, the Penang Development Corporation played an important role in planning and developing Penang's industrial parks, including the Prai Industrial Park and the Bayan Lepas Industrial Park. The Prai Industrial Park was established in 1971, with a total area of 935 hectares, part of which is devoted to heavy industry. The Bayan Lepas Industrial Park was established in 1972, with a total area of 520 hectares. Both function as the main production centers for multi-national companies operating in the country's northern region, and currently host about 200 factories.

Factory construction increased rapidly in the 1970s and 1980s following the boom in manufacturing, but few industrial buildings from the period stand out for their architectural merit. Most were designed primarily as simple shelters for machinery. As shall be seen below, it was not until the 1990s that architects began to play a greater role designing industrial buildings, giving factories more definitive images, creating buildings that responded more directly to the demands and desires of clients, and contributing to developing a sense of well-being among the factory workforce.

During this period, factory building, particularly in the cities of Petaling Jaya and Shah Alam in Selangor, as well as in the state of Penang, took place on a continuous basis, with most of the commissions given to engineers. Many of the buildings were metal-clad sheds with metal roofs that could be constructed in short periods of time. Examples include the 1971 Carlsberg Brewery in Shah Alam by Steen Sehested & Partners, the firm founded by the Danish engineer Steen Sehested, and currently known as Sepakat Setia Perunding (Sdn) Bhd.

An important industrial facility from the early 1970s is the Panasonic (formally Matsushita) Factory in Selangor, which is Malaysia's first air conditioner manufacturing company (fig. 5). It was established in 1972 to make window-type air conditioners, and provides an early example of Japanese industrial investment in Malaysia. The ultra-modern factory occupies a site of about 200,000 square meters, with the majority of its machinery and equipment brought in from Japan. It provides one of the early examples of a typical factory arrangement that features administration and office blocks in the front, with double or triple-height production spaces attached behind them.

The 1980s: The beginning of foreign direct investment

In the early 1980s, as with other countries producing primary commodities, Malaysia experienced slow growth as a result of a deeper-than-expected slowdown in industrial economies. Moreover, a major global recession hit in 1985-1986. Around this time, the government began to promulgate policies to commercialize, corporatize, and privatize state-owned entities. The Industrial Master Plan was put in place in 1986, and Malaysia's economic development since then has been rapid enough to propel the country into the ranks of newly-industrialized economies. The prime engine of growth has been the manufacturing sector. By 2005, it accounted for 31.4% of Malaysia's Gross Domestic Product (GDP), 28.7 % of employment, and 80.5% of total exports, which reached RM (Ringgit Malaysia) 430 billion ($120 billion).

In the early 1980s, measures also were taken to widen and deepen the country's industrial base through developing import-substituting heavy industries, resulting in the 1983 'National Car' project, Proton. More on Proton's industrial activities will be provided below.

The 1980s witnessed the migration of industrial investment from the North Pacific Basin (Japan, Taiwan, and Korea) to the south due to the availability of cheap labor and ready infrastructure. Japanese corporations brought with them their own teams of consultants as well as factory plans and contractors. The resulting Japanese industrial architecture is recognizably modern and usually immaculately finished with stark rectilinear lines, but these buildings remain no more than utilitarian sheds of predetermined form that house machinery and warehousing facilities.

An example of these factories is the 1986 Printmesh Factory at the Prai Free Trade Zone by the Malay architectural firm Architect Ketika (fig. 6). The design features a three-story office block in front and a single-story triple-height production block behind. The planning is strictly functional for factory usage and highly economical in terms of construction costs.

Fig. 5: **Selangor, Panasonic (formerly Matsushita) Factory, 1970s.**

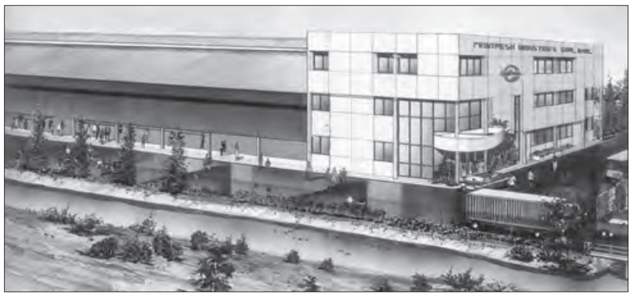


Fig. 6: **Prai Free Zone, Penang Printmesh Factory, Architect Ketika, 1986.**

The 1990s: Establishing a knowledge-based economy

In 1991, the government brought forth two key policies, the National Development Policy and Vision 2020, to shape the future of the country's economy. According to these policies, Malaysia aimed at proceeding to build a strong and equitable economy, and achieving a fully-developed nation status by 2020.

By 1995, manufacturing had grown to 26.4% of GDP while agriculture had declined to 12.9%. The services sector, however, had grown to accommodate 48% of GDP. During this period, Islamic banking also emerged as the country's second banking system.

In the mid 1990s, Malaysia began facing competition from other emerging economies, particularly China, which offered cheaper labor and had abundant natural resources. The Asian financial crisis of 1997 created additional challenges, and according to the World Competitiveness Report, Malaysia's international competitiveness slipped in the global ranking during that period, from 9th in 1997 to 17th in 1998 and 16th in 1999.

The government's response to this setback was to develop a new strategy that would ensure the nation's transformation into a knowledge-based society, consistent with Vision 2020. Creating a knowledge-based economy would entail focusing on knowledge-based activities, including high-tech industries and biotechnology. Special emphasis was placed on information and communication technology-related (ICT) initiatives to ensure that Malaysia remained competitive in the digital age.

The Kulim Hi-Tech Park (KHTP), officially opened in 1996, is the first high-technology industrial park in Malaysia (fig. 7). The Park is situated in Kulim, Kedah Darul Aman, in the northwest of peninsular Malaysia and comprises a total land area of approximately 1,620 hectares.

A primary aim of the Kulim Hi-Tech Park is to propel the country towards realizing the goals of Vision 2020. The park is envisioned by KHTP to be the 'Science City of The Future,' an integrated science park targeting technology-related industries primarily in the fields of advanced electronics, mechanical electronics, telecommunications, semiconductors, optoelectronics, biotechnology, advanced materials, as well as research and development.

With the drive towards high-tech industries taking place since the mid 1990s, the concept of specialized industrial estates was extended to technology parks. A key function of technology parks is to provide the physical infrastructure required for high-tech industries to operate. Technology parks

Fig. 7: **Kedah Darul Aman, Kulim, Kulim Hi-Tech Park (KHTP), 1996.**

Fig. 8: **Tanjung Malim, Perak, Proton City, 1996.**

place special emphasis on creating environments conducive to innovation, the dissemination of ideas, and the development of the most critical resource in high-tech activities: human capital.

Tagged as the "City of the Future," Proton City is a new township with industrial, commercial, and residential activities spread over 1,620 hectares (fig. 8). It is located about five kilometers to the north of Tanjung Malim in Perak and houses the state-of-the-art RM1.8 billion ($500 million) Proton car assembly plant as well as various manufacturers involved in developing automobile-related technologies.

To be fully developed by 2020, Proton City aims to become home to Malaysia's automobile industry. Undertaken by the Proton City Development Corporation, a joint venture between the Malaysian heavy-industry company DRB-Hicom and Proton, it was initiated in 1996 with an initial investment of RM2.5 billion ($700 million), and the construction of the Proton plant, which has a workforce of more than 2,000, most of whom are expected to live in the area. When Proton City is fully developed, it will have a population of about 240,000 residents.

The next phase of development at Proton City will include the construction of 81 factory lots for Proton's vendors. It also will include public amenities such as schools, a mosque, a park, a recreational club, a man-made ten-hectare wetlands area with a large lake, water storage towers, an air-quality control station, a fire-station, and a power station.

The 1996 Technology Park Malaysia in Bukit Jalil, just outside Kuala Lumpur, is Malaysia's most advanced and comprehensive center for research and development for knowledge-based industries. The 324-hectare parkland development is planned as a 'park-like' setting office environment for high-tech and knowledge-based companies to conduct research and development. All the buildings in the park have been thoughtfully sited to create and enhance the "buildings in the park and park in the buildings" concept whereby landscaping is not only used to mediate between internal and external spaces, but also to create a green consciousness.

Established in 1996, the Multimedia Super Corridor (MSC) developmental concept was planned to create a 'multimedia utopia' for the conceptualization, design, testing, production, and distribution of advanced ICT applications. MSC serves as a crucial foundation for knowledge-driven growth in the information age and for implementing the National Information Technology Agenda (NITA), which the government developed in 1996 to provide the foundation and framework for ICT utilization. Their goal is to transform Malaysia into an "information society, then a knowledge society, and finally a values-based knowledge society" by 2020, in line with former Prime Minister Mahathir bin Mohamad's Vision 2020. NITA also aims at attracting international companies to Malaysia to become part of the MSC concept.

Cyberjaya is a new planned township with a science park as its core that forms a key part of the MSC. It is located in the district of Sepang in Selangor, situated about fifty kilometers to the south of Kuala Lumpur. This town aspires to be known as the Silicon Valley of Malaysia. The official opening ceremony for Cyberjaya was held in May 1997, presided by Mahathir bin Mohamad.

As mentioned above, a new industrial architecture emerged in the 1990s that has been transforming places of production from the utilitarian sheds that covered the industrial landscape to more sophisticated arrangements where each building is a manifestation of desires, ideas, and definitive images. The late-1990s George Kent Technology Centre in Cyberjaya by GDP Architects, and the 2005 Penang Vitrox

Factory by KCYS Architects in Puchong, Selangor are two examples that reject the idea of the place of industrial production as a utilitarian shed covering machinery and storage space, and instead treat it as a work of architecture.

The George Kent Technology Centre in Selangor is designed to project the image of a progressive and dynamic company (fig. 9). These aims are promoted by using strong colors and specially-designed building structures. The main factory bay, which is 60 meters wide and 240 meters long, is designed for the production, testing, and storage of brass-forged products. The building envelope is formed using vertical truss structures for the external wall cladding, which in turn are tied to the main portal frames.

The Vitrox Corporation is an innovative IT corporation in Penang's Silicon Valley (fig. 10). The design concept for its headquarters was formulated to synchronize with the client's industry—a business that provides customized computer solutions, and accordingly stresses the notions of efficiency, flexibility, and cybernetics. The challenge has been to develop a design that transfers a typical factory into an office environment, creates a comfortable setting for the workers, and also expresses the corporation's core business in technology.

Besides the production area, where optical equipment is manufactured, the complex also includes a cafeteria, a gymnasium, accommodations, and a nursery. A careful manipula-

Fig. 9: **Cyberjaya, Sepang, Selangor, George Kent Technology Centre, GDP Architects, late 1990s.**

Fig. 10: **Penang, Vitrox Corporation, KCYS Architects, 2002.**

Fig. 11: **Bukat Jalil, Technology Park Malaysia, Malaysian Institute of Microelectronics and Semiconductors (MIMOS), Ruslan Khalid Associates, 1997.**

Fig. 12: **Cyberjaya, InventQjaya Headquarters, SNO Architects, 2004.**

Fig. 13: **Technology Park Malaysia (TPM), Enterprise 4, DBA Akitek, 1998.**

tion of the design concept has created a community within, providing a comfortable environment for those working in it, and a building that is more than merely an ordinary factory devoted to production.

The complex for MIMOS (Malaysian Institute of Microelectronics and Semiconductors), located in Technology Park Malaysia and designed by Ruslan Khalid Associates, is planned to provide a relaxed and friendly atmosphere, and also to create a working environment that is conducive to intellectual development and innovative thinking (fig. 11). In line with this approach, a *Surau*, where Muslim staff can perform their daily prayers, and a crèche for employee children were provided. The materials used for the complex are mostly reinforced concrete, with brick infill walls and partitions. The choice of aluminium cladding as well as glass and roof coverings aim at reflecting MIMOS's image as an efficient, modern, and high-tech corporation devoted to research and development.

The 2000s onwards: The emphasis on environmental sustainability

Since the 1990s, Malaysia began emphasizing the growth of export-oriented, high-value-added, high-tech industries by utilizing domestic research and development. Several important programs and policies have been implemented to propel Malaysia in that direction, emphasizing ICT and biotechnology. Globalization, competitiveness, and tight labor markets have further highlighted the urgent need for strengthening the nation's technological base.

The K-Economy Master Plan, unveiled in 2002, is based on the assumption that the move from high-volume to high-value production can be achieved in every aspect of product development and production, including research and development. In line with governmental policies, incentives, and grants, the Multmedia Super Corridor created in 2005 over 27,000 new job opportunities, with total investments amounting to RM5.11 billion ($1.54 billion) and export sales accounting for RM 1.57 billion ($440 million).

An example of this investment is the InventQjaya Headquarters in Cyberjaya by SNO Architects. It is envisaged as an internationally-acclaimed 'world-class' scientific research and development center equipped with the latest laboratory facilities with the aim of developing new inventions related to IT for local and foreign markets (fig. 12). The building adopts a futuristic concept that projects the notion of technological and scientific advancement with industrial underpinnings. The end result is an innovative use of steel integrated with other building materials in the overall façade treatment.

Another example is Enterprise 4 in Technology Park Malaysia (TPM) by DBA Akitek (fig. 13). This complex is designed to house tenants conducting research and development in ICT and Biotechnology, and conforms to TPM's original master plan concept of 'buildings in the park and park in the buildings.'

Establishing Malaysia as a "Global Halal Hub" has been an aim of the Malaysian Government, resulting in an initiative launched in 2006. The term *halal* here refers not only to food produced in accordance with Islamic law, but extends to include non-food areas such as personal care and cosmetics products, pharmaceuticals, various consumer goods, finance, and general services. In this regard, the establishment of the Halal Industry Development Corporation (HDC) reflects Malaysia's serious pursuit of this objective. HDC has been tasked with further boosting the *halal* agenda in terms of standards development, branding enhancement, as well as commercial and industry development.

Under the Ninth Malaysia Plan (9MP), a total of RM112 million ($31.3 million) has been allocated for developing the *halal* food industry. Infrastructure development for "*halal* parks" is largely complete.

Since the late 1990s, when Malaysia was dragged into the economic turmoil of the Asia-wide currency crisis, the country has not re-attained its previous levels of growth. High growth rates have moved on to other emerging Asian countries such as China and India. The crisis gave the country a reality check, and Malaysian architects have found themselves working in a more competitive and also globalized environment characterized by shared global architectural tastes.

As international interests have shifted significantly towards a new awareness of climate change and environmental sustainability, Malaysian architects have responded accordingly. Sustainable development and green building concepts have begun to provide the theme or focus for industrial development, with an emphasis on green building accreditation through standards such as the Green Mark from Singapore, LEED from the United States Green Building Council, and the Malaysian Green Building Index (GBI).

An example is the proposed Ascendas IT Park in Cyberjaya by RSP Akitek, which provides research and office space for multi-national IT companies (fig. 14). The structure em-

Fig. 14: Cyberjaya, proposed design for the Ascendas IT Park, RSP Akitek.

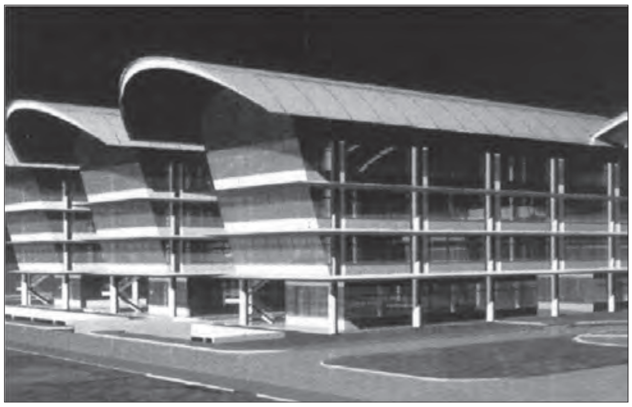


Fig. 15: Cyberjava, Ericsson Corporate Center, Hijjas Kasturi Associates, 2006.

phasizes sustainable design criteria to ensure an appropriate response to tropical climatic environments. Green features include underground tanks for the reuse of rain water; solar panels that generate electricity, especially for external lighting and water heating; the use of environmentally-friendly materials such as non-toxic paint; and the incorporation of energy-saving features such as natural day-lighting via skylights and sunshade deflection.

Another example is the new Ericsson Corporate Centre in Cyberjaya by Hijjas Kasturi Associates (fig. 15). The building is intended as a catalyst for sustainable design development in Cyberjaya through the use of highly-efficient, passive sustainable design solutions and technologically-advanced active design features. It is intended for the production of various hardware items for computers and telecommunications equipment, and also to provide services, including customer care and technology consulting.

Finally, the proposed Hovid Factory in the state of Ipoh,

Fig. 16: **Ipoh, Perak, proposed design for the Hovid Factory, KCYS Architects.**

Perak by KCYS Architects is a biotechnology factory producing local herbal products including medicines and beverages that also houses research and development facilities (fig. 16). The proposed building is an energy-efficient, eco-friendly factory design that aims at achieving the Green Mark Platinum rating and Malaysia's new GBI certification. As with the Ascendas IT Park, its green features also include the reuse of rain water, incorporating solar panels to provide electricity, using environmentally-friendly materials, and integrating energy-saving features in the design such as natural daylighting via skylights and sunshade deflection.

The evolution of industrial architecture in Iran

Faryar Javaherian

Introduction

"Industrial Architecture" is an endangered species on the road to perdition. This is not only because the meaning of industry has changed so much during the course of the last three decades, which have brought about the age of digitalization, but also because industrial building as a genre never amounted to much. James Stirling is reported to have said that there are only two kinds of architecture: good and bad. Mohammad Beheshti, the head of the Cultural Heritage Organization of Iran during the Khatami presidency (1997-2005), and one of the few luminaries of the Islamic Republic of Iran, said the same thing, but slightly differently: "Architecture has two modes of being, one is construction, which produces functional buildings, and the other is real Architecture, which is concerned with art and higher purposes."[1] Invariably, industrial architecture in Iran has mostly ended up in the "bad construction" category.

Industrial building is intimately intertwined with capitalism. Consequently, industrial buildings are most often built as inexpensive utilitarian sheds to help maximize profits from the manufacturing process. The widespread integration of industrial design in the industrial production process only dates back to the last two decades. In the past, manufacturers did not usually give much attention to the aesthetics of the goods produced, and even less to the aesthetics of the place of production. One rare exception is the German company, AEG, which hired Peter Behrens as architect and artistic consultant at the beginning of the 20th century. Behrens is an important figure in the history of Modern architecture who mentored three of the most seminal architects of the 20th century: Walter Gropius, Mies van der Rohe, and Le Corbusier. Architectural historian Stanford Anderson devoted a substantial monograph to Behrens' work, which explores his abilities not only in the design of industrial architecture, but also in many other architectural domains.[2] For example, Albert Speer, Hitler's architect and the Third Reich's Minister of Armaments and War Production, hired Behrens during the 1930s to design vast governmental monuments in Berlin. Behrens in fact was a Nazi party affiliate and an ardent German nationalist.

Another fervent Nazi sympathizer, albeit in Iran, was Reza Khan (1878-1944), the stable-boy Cossack soldier who rose through the ranks to become the Shah of Iran and establish the Pahlavi dynasty in 1925 (fig. 1). Reza Shah was enamored of German precision and discipline, as well as overall achievement in various fields, particularly industry. With German help, he jumpstarted Iran's industrialization as part of an overall program of modernization. This brief chronolog-

1 Comments made at a presentation for a seminar entitled "Architecture and Cinema" that took place at the University of Tehran in June 2003.

2 Stanford Anderson, *Peter Behrens and a New Architecture for the Twentieth Century* (Cambridge, Mass.: MIT Press, 1999).

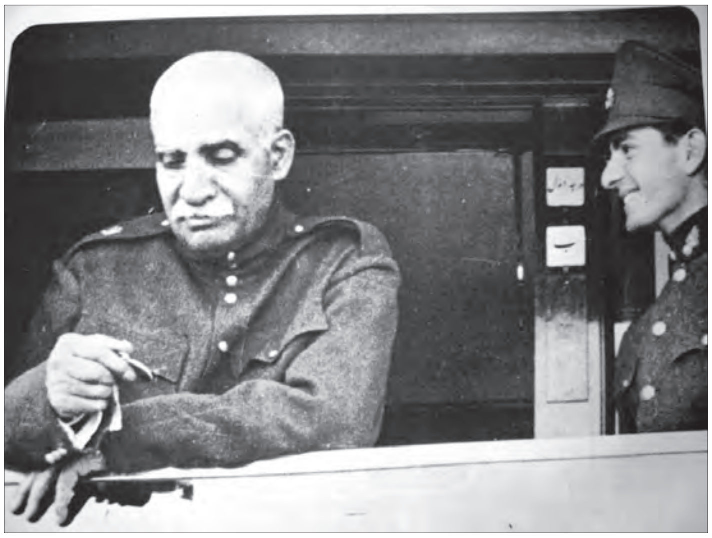


Fig. 1: **Reza Shah, checking the exactitude of a train departure, and his son Mohammad Reza Shah.**

ical presentation of the industrial architecture of Iran will accordingly emphasize the architecture of his rule, but also will provide a cursory review of the periods leading to and extending from it.

The Qajar period (1794–1925)

With the founding of the Qajar dynasty at the end of the 18th century, the industrialization process was launched in Iran. Because of the more or less continuous state of warfare with neighboring states in which the Qajars found themselves, they deemed it necessary to build factories that served the needs of their armies. A good part of this industrialization process took place in the city of Tabriz, which was the residence of the Qajar crown-prince and also Iran's second largest city, while the newly-proclaimed capital, Tehran, was still a town of only 25,000 inhabitants. Many of Iran's earliest modern industrial undertakings appeared in Tabriz, beginning with the country's first printing press with movable type in 1811.[3]

Agha Mohammad Khan, the founder of the Qajar dynasty, chose Tehran as his capital in 1795. But various Qajar princes exercised considerable control over other provinces and often had as much power as the king himself. For instance, Crown Prince Abbas Mirza (1789-1833) invited French engineers to build artillery and gun-powder factories, known as *ghourkhanehs*, in Tehran, next to the royal palace complex, the Arg. Records indicate that a French engineer named Fabvier built a *ghourkhaneh* in Isfahan. He was part of the French mission led by General Claude-Mathieu de Gardane that was sent to train the Persian army in 1807-1808.[4] Other *ghourkhanehs* were built around the same time in Mashhad and Shiraz, which unfortunately are not documented. Many also were built in Tehran, and these are fairly well illustrated (figs. 2 & 3).[5]

Iran's first sugar refinery was built under the Qajar ruler Mohammad Shah in 1845 in Kahrizak, a suburb of Tehran (figs. 4 & 5), and the first felt factory was completed at that time in the northeastern city of Khoy using Russian machinery.[6]

A turning point in Qajar industrialization took place during the prime ministry of Mirza Taghi Khan Amir Kabir, which covered the first three years of Naser al-Din Shah's long 51-year rule (1848-1896), ending with Amir Kabir's dismissal and subsequent murder by Naser al-Din. Amir Kabir initiated the mining of coal and metals, bringing in English and Prussian engineers and technicians, while sending Iranians to Russia to specialize in engineering. He initiated a process through which machinery was imported on an extensive scale and numerous factories were constructed; and this process was continued throughout Naser al-Din's reign. The list of factories built across the country during this period includes two sugar refineries in Babol; glass factories in Tehran, Qom, and Isfahan; porcelain factories in Tehran and Qom; the paper factory in Tehran known as the Amiri Factory; a printing press in Tehran; textile factories in Kashan and the Tehran suburb of Shemiran; a carriage factory in Tehran; and numerous *ghourkhanehs.* Moreover, Napoleon III sent the machinery for three metallurgic foundries as a gift for Naser al-Din's 1860 crowning (he organized a coronation ceremony during every year of his rule).[7]

In addition, the Belgians built a coin mint, or *zarrabkhaneh*, in Tehran.[8] Iran's first gas-lamp factory was built in Tehran in 1879 but was soon eclipsed by an electric-lamp

3 Samad Sardarinia, *Tabriz Shahr-e Avvalinha* [Tabriz, City of Firsts] (Tabriz: Akhtar Press, 2007), p. 28.

4 See, Hossein Mahboudi-Ardakani, *Tarikh-e Moassessat-e Tamadoni-e Jadid,* [History of New Civil Institutions] vol. 1 (Tehran: Tehran University Press, 1991).

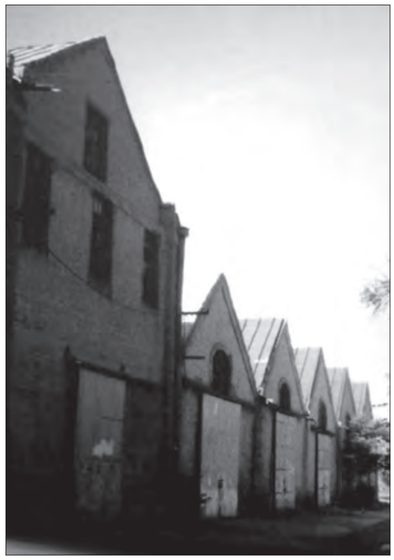
5 Although efforts have been made to identify full documentary data regarding the names of architects or dates of construction for the projects presented in this study, such data is not always available.

6 Mahboudi-Ardakani, *Tarikh-e Moassessat-e Tamadoni-e Jadid*, pp. 91 & 341.

7 Sardarinia, *Tabriz Shahr-e Avvalinha*, p. 47.

8 Abdolazim Rezai, *Tarikh-e Siassi va Ejtemai-e Iran* [The Socio-political History of Iran] (Tehran: Elm Press, 1977), p. 999.

Figs. 2 & 3: **Tehran, Artillery and Gun-powder Factories (*ghourkhaneh*), early 19th century.**



Figs. 4 & 5: **Kahrizak, Sugar Refinery, 1845.**

factory. The Qajar prince Amin al-Dowleh built the country's first electrical power plant in Tehran in 1882 to serve the royal complex of Kakh-e Golestan, soon after such plants first appeared in the United States. A plant serving all of Tehran was built in 1885, and another one was built in Mashhad in 1901 to illuminate the shrine of Imam Reza, Iran's most important center of pilgrimage.[9] The first match factory was also built during the reign of Naser al-Din Shah, this time by Prussian engineers.[10]

These factories present an important architectural corpus, if not heritage. Unfortunately, most of them could not compete with foreign manufacturers and they went bankrupt, one by one. Their buildings became derelict and the majority of them disappeared. One of the rare examples to have survived is the sock factory that the Prussians built in Beryanak outside Tehran in 1917. This factory continued to be operational until the recent war with Iraq (1980-1988), and was renovated in 1997 into the Natural Museum of Wildlife (fig. 6).

The industrial architecture of the Qajar period generally conformed to the traditions of Persian architecture prevalent at the time. There is little innovation to be found. Instead, the *ostad-memars* (master builders) who built the factories adapted the traditional typologies of central court, *iwan* (vaulted space that is enclosed on three sides and open on the fourth), arcade, and *shabestan* (underground space) as

9 Mahboudi-Ardakani, *Tarikh-e Moassessat-e Tamadoni-e Jadid*, p. 348.
10 *Ibid.*, p. 41.

Fig. 6: **Beryanak, Sock Factory, 1917; the factory was renovated into the Natural Museum of Wildlife in 1997.**

much as possible to these totally new functions. This changed completely with the advent of Reza Shah in 1925.

The First Pahlavi period (1925-1941)

Although Reza Shah's rule only lasted sixteen years, the degree of industrialization he accomplished for Iran is truly impressive. He built over 270 factories and made the country seventy percent self-sufficient in terms of industrial production. He was more interested in the physical aspects of modernization than its philosophical ones. He wanted to bring to Iran items such as planes, trains, and cars—or what on a certain level may be considered gadgets—but he also wanted Iran to have other symbols of modernity, whether city planning, architecture, universities, or factories. In this context, Reza Shah looked to Germany as a model and worked on strengthening ties between the two countries. He was convinced that the Germans were the best at just about everything and thus invited German professionals to carry out his ambitious plans for Iran. Because the Germans were at the avant-garde of industrial architecture in the West, they had a great deal to offer in terms of realizing Shah Reza's industrial ambitions. Besides factories, the Germans also built Iran's railroad lines, bridges, and most of its road network.

The influence of German architecture on Iran's industrial architecture of that period cannot be stressed enough. For example, a good number of Isfahan's factories built during the 1930s were by two German engineers identified as Nieminger and Schunemal. They collaborated with traditional Iranian *ostad-memars*, two of whom are known to us: Ostad Motamedi and Ostad Maheronaghsh.[11]

One of the factories to have been constructed in Isfahan during that period is the Risbaf Spinning Factory. The influence of contemporary European architecture on this building is clear and strong. Its main entrance bears a heavy debt to Peter Wilhelm Jensen Klint's Grundtvig Church in Copenhagen (1921-1940; fig. 7), and its massing to Hans Poelzig's Grosse Schauspielhaus (Great Theater) in Berlin (1919; fig. 8). It also has some resemblance to Tony Garnier's Halle Tony Garnier in Lyon (1905-1924; fig. 9), which was originally designed as a slaughterhouse. Although a modern factory showing strong Western influences, it is interesting to note that the factory's *ostad-memar* incorporated the detail of "the jug of water of life," which often adorns mosques, into the corners of its cooling tower. The building was among Isfahan's most prominent landmarks during the First Pahlavi era (fig. 10).

These Isfahan factories as well as a few other industrial constructions were the subject of an exhibition for the opening of the Tehran Museum of Contemporary Art in 1977 (fig. 11).[12] The best documentation available on these factories from the First Pahlavi era is for the tobacco factory in Isfahan, the Dokhaniat, which Reza Shah inaugurated with great pomp in 1927 (figs. 12-17). These factories were considered the pride of the nation and were therefore situated in prime locations in their cities. In Isfahan, most of them, including the Dokhaniat, were located along the Zayendehroud River.[13]

Another factory located along the Zayendehroud River is the Zayendehroud Textile Factory, which was Isfahan's most extensive industrial complex. It unfortunately has recently succumbed to the greed of the speculators to make way for an apartment complex (figs. 18 & 19).

An additional factory in Isfahan dating from this period is a 1937 wool factory, the Karkhaneh-ye Pashm. Its architecture reflects a Qajar residential vocabulary more than that of

11 *Ibid.*, pp. 91 & 341.

12 *The Architecture of the Early Iranian Factories*, exhibition catalogue (Tehran: Tehran Museum of Contemporary Art, 1977). Nasrin Faghih curated the exhibition, and I was the assistant curator. I was responsible for selecting the factories, drafting their elevations, designing the presentation of the plates in one gallery, and preparing the layout of the catalogue. The catalogue was printed by the Hamdami Editions printing house, which the architect Laleh Bakhtiar owned.

13 Architect Iraj Kalantari carried out a study of five of these factories after the Zayendehroud Textile Factory was demolished in an effort to have them registered as historical heritage buildings worthy of being renovated to accommodate new uses. In addition to the Zayendehroud factory, these are the Risbaf, wool, tobacco, and Bagh-e Borj factories.


Fig. 7: **Pair of images comparing the main entrance of the Risbaf Spinning Factory in Isfahan, c. 1935, to Grundtvig Church in Copenhagen, by Peter Wilhelm Jensen Klint, 1921–1940.**

the newly emerging industrial architecture (figs. 20 & 21). It also is speculated that Ahmad Hossein Adle, an avid antique collector and art connoisseur who was the Managing Director of the Risbaf Spinning Factory, the Director of the Industrial Syndicates of Isfahan, and later a Minister under Reza Shah, might have influenced the design of the wool factory's entrance hall and director's office.

The textile factory of Shahreza, a small town located about sixty kilometers outside Isfahan, was built between 1930 and 1938. It is typical of that period, and is one of its most beautiful examples (figs. 22 & 23). The word "Maheronaghsh," which is the name of one of the two *ostad-me-*

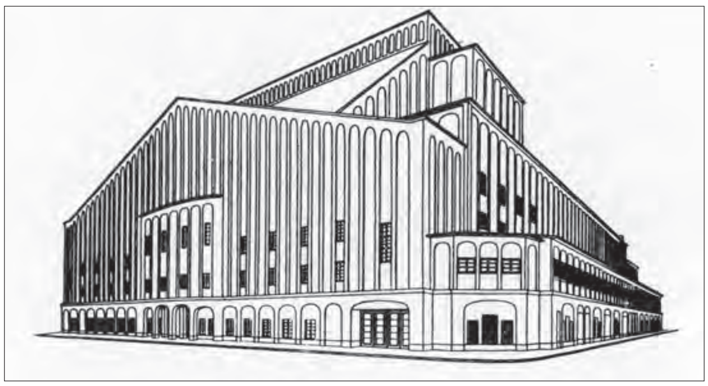


Fig. 8: **Berlin, Grosse Schauspielhaus (Great Theater), Hans Poelzig, 1919.**


Fig. 9: **Pair of images comparing the Risbaf Spinning Factory to the Halle Tony Garnier, Lyon, 1905–1924, by Tony Garnier.**

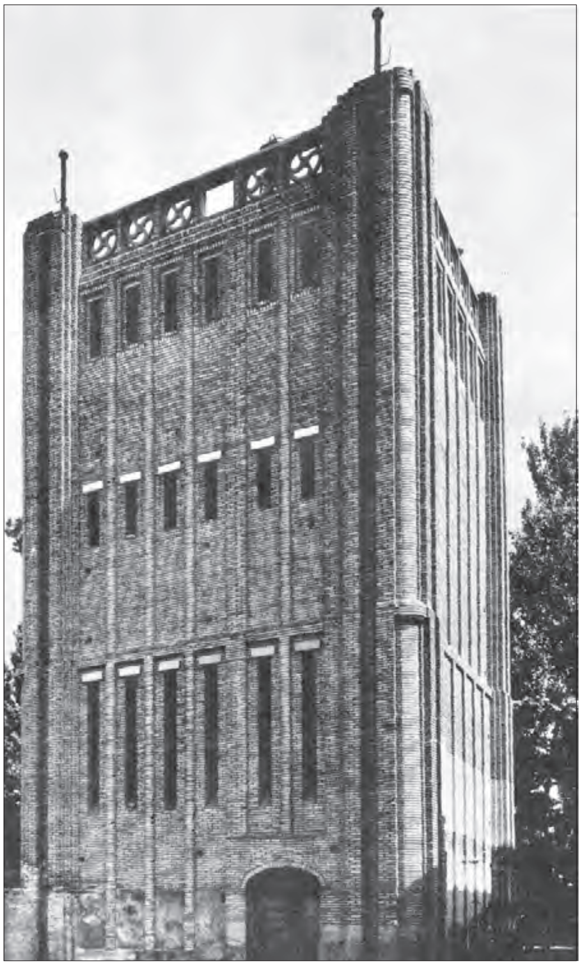


Fig. 10: **Risbaf Spinning Factory, cooling tower.**

mars who worked with German engineers on the design of numerous factories in Isfahan, is inscribed on one of its corners. The German engineers usually designed the factory's skeletal structure and workspaces, while the Iranian *ostad-memars* were responsible for filling in the façades as well as designing the cooling towers, offices, and all non-industrial spaces.

Two textile factories in the city of Yazd are also worth mentioning. Both incorporate the same traditional architectural vocabularies prevalent in the city. For example, the cooling tower of the Eghbal Textile Factory is reminiscent of the wind towers of Yazd, but its mud domes are perforated with square windows (instead of the traditional Yazdi circular windows) to provide light and ventilation (fig. 24). In contrast to the building's traditionalist exterior, the interior is defined by steel trusses covering expansive spaces to accommodate modern machinery (fig. 25). The second textile factory is the 1934 Harati Factory, which was built by a Zoroastrian family and is very similar to the Great Adorian (fire temple) of Yazd, built in 1935 (fig. 26). It incorporates exquisite details as evident in its column capitals (fig. 27).

In Tabriz, the most prominent factory of the Reza Shah period is the 1932 Khosravi Leather Factory, a huge compound with four very tall chimneys that served as landmarks in the city for a long time (figs. 28 & 29).

All the factories so far reviewed were clad with a brick

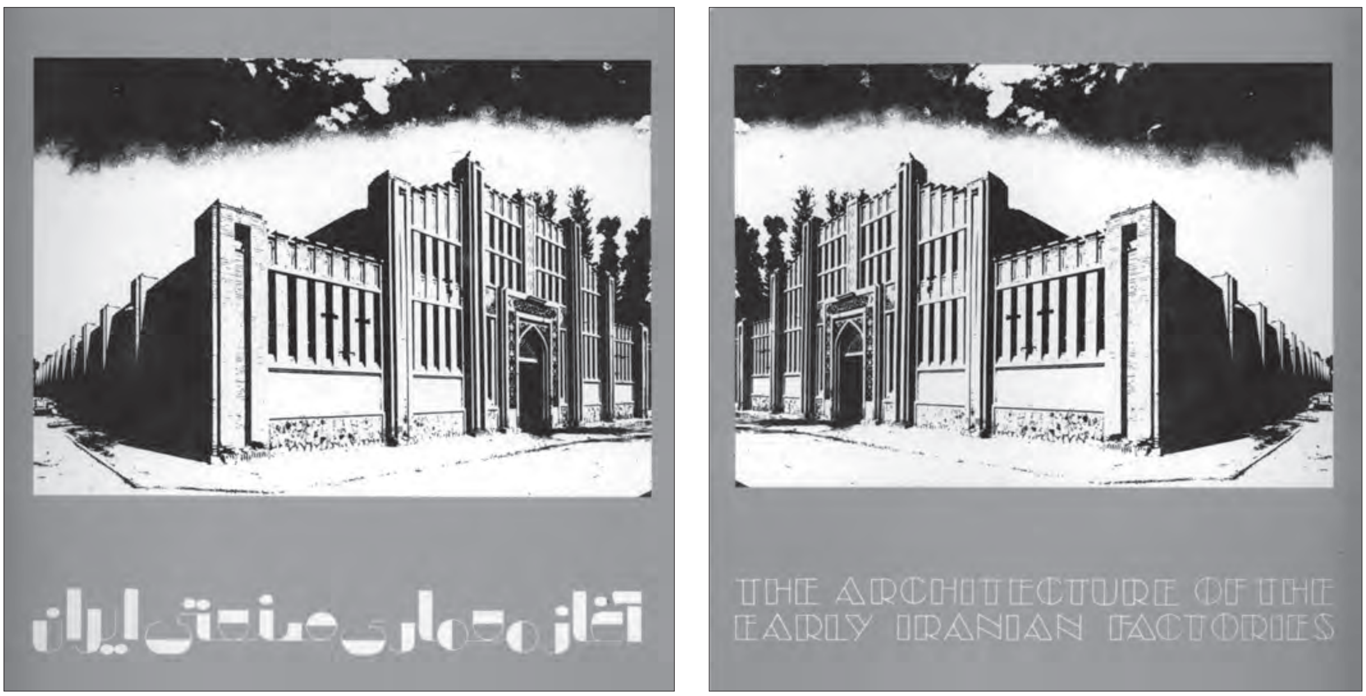


Fig. 11: **Cover of the *The Architecture of the Early Iranian Factories* exhibition catalogue.**

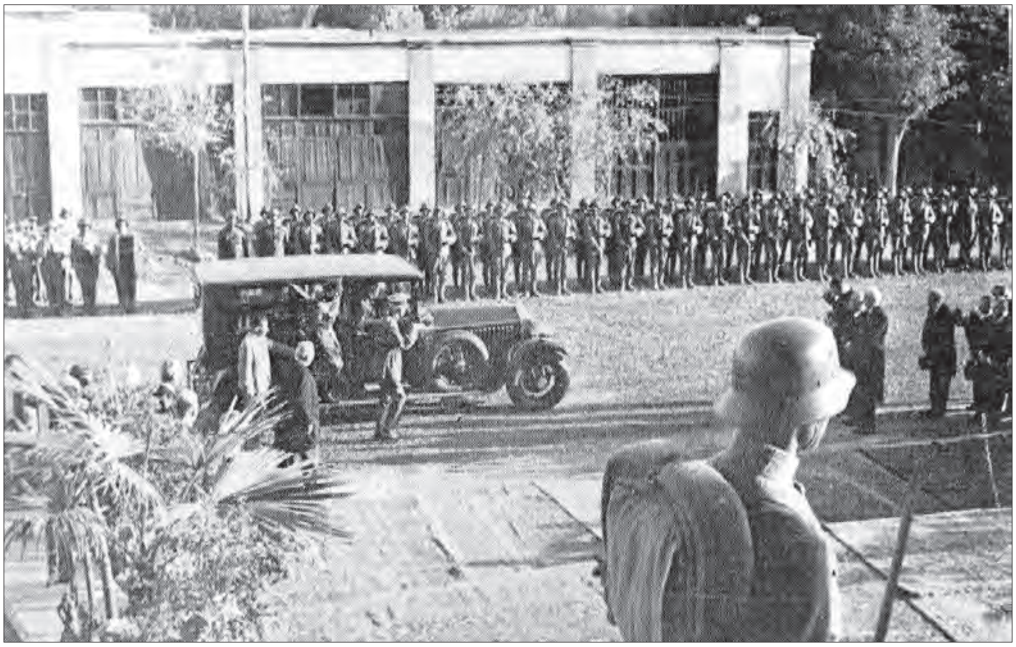
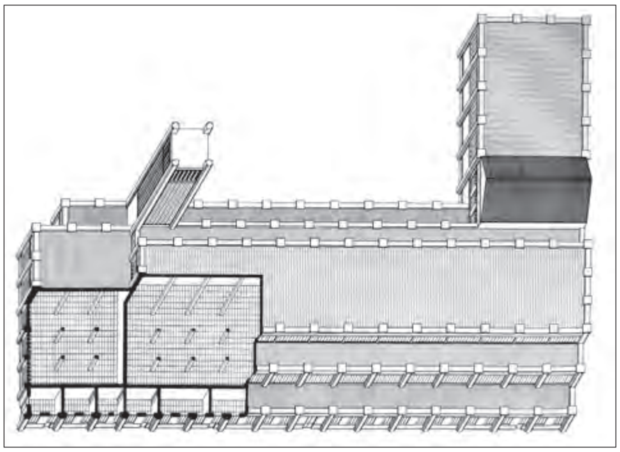
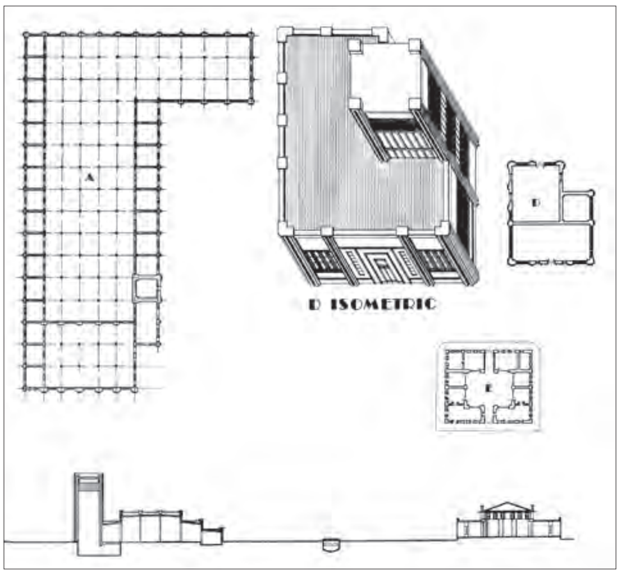
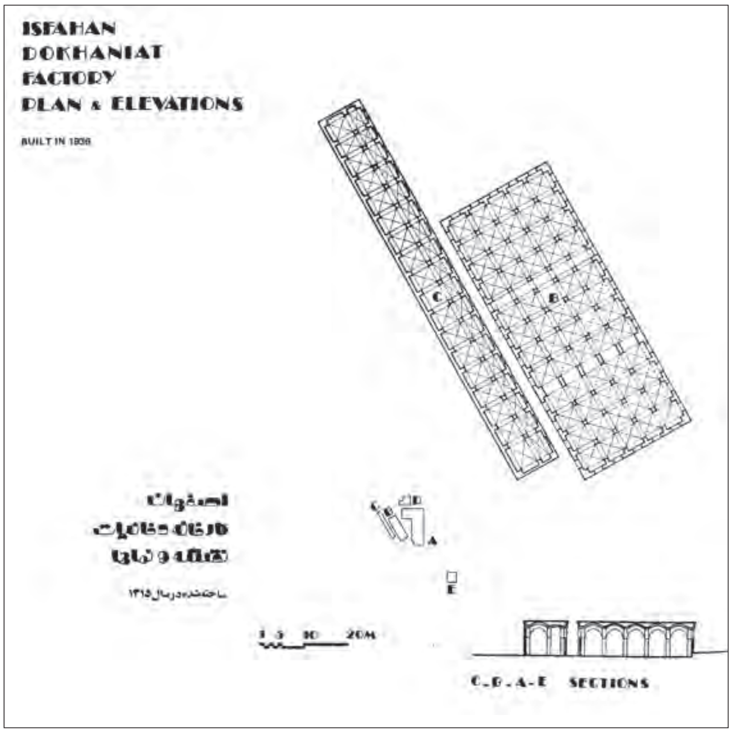


Fig. 12: Inauguration of the tobacco factory (Dokhaniat) in Isfahan in 1927.







Figs. 13–15: Dokhaniat, architectural drawings.

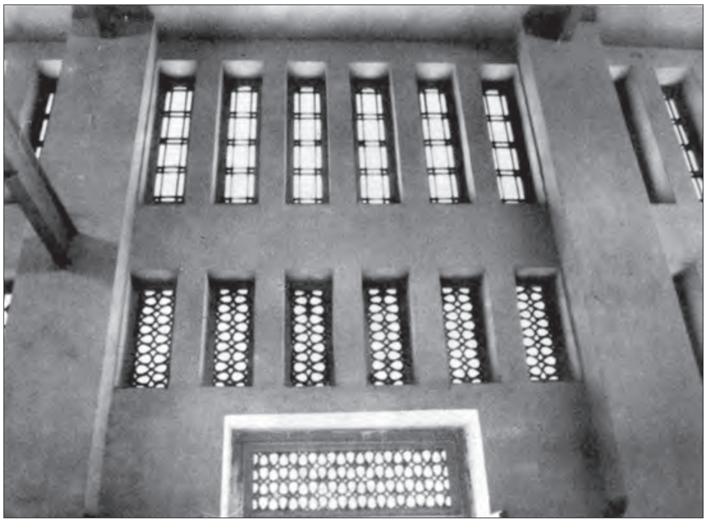


Fig. 16: **Dokhaniat, interior view.**

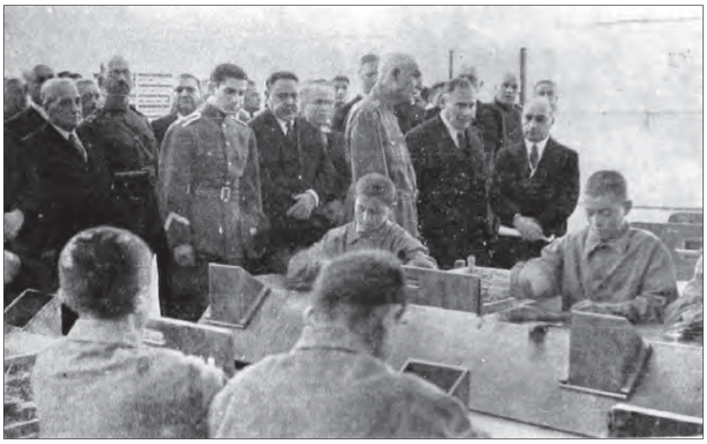


Fig. 17: **Reza Shah inaugurating the Dokhaniat in 1927.**

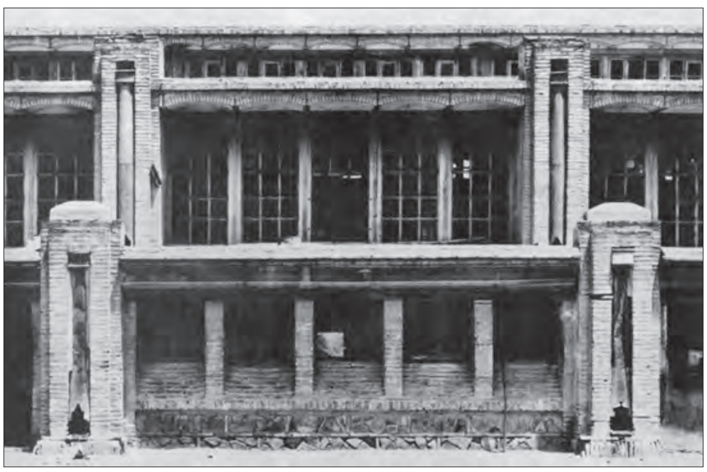


Fig. 18: **Isfahan, Zayendehroud Textile Factory, c. 1935.**

skin. The *ostad-memars* went to great lengths to express their craftsmanship, creating a continuum with traditional architecture even though something totally different took place on the inside. While the main construction material in cities such as Isfahan and Yazd is brick, there historically have been very few brick kilns along the Caspian coast, and cement and concrete are much better adapted to the humid climate of the Caspian Sea. The Harirbafi Factory in the city of Chalous accordingly has a cement skin and a vocabulary that is rather reminiscent of contemporaneous German architecture rather than local traditions (figs. 30 & 31). This silk factory was inaugurated in 1937 and had 1,600 workers, most of whom were women and children. Child labor, unfortunately, was very common in these factories.

Also worth mentioning is the Karkhaneh-ye Cimen, or cement factory in Rey, located to the south of Tehran (fig. 32), which the Germans built in 1933. In addition, work on the oil refinery at Abadan, located at the southern extremity of the country's border with Iraq, was begun during the First Pahlavi period and continued under the Second Pahlavi period.

Before ending the discussion of the Reza Shah period, mention should be made of Nikolai Markoff, a personal friend of Reza Shah who had served with him in the Cossack brigade. Markoff was one of the most prolific designers of industrial buildings in Iran. He trained at the Academy of Art and Architecture in the Imperial College of Saint Petersburg,

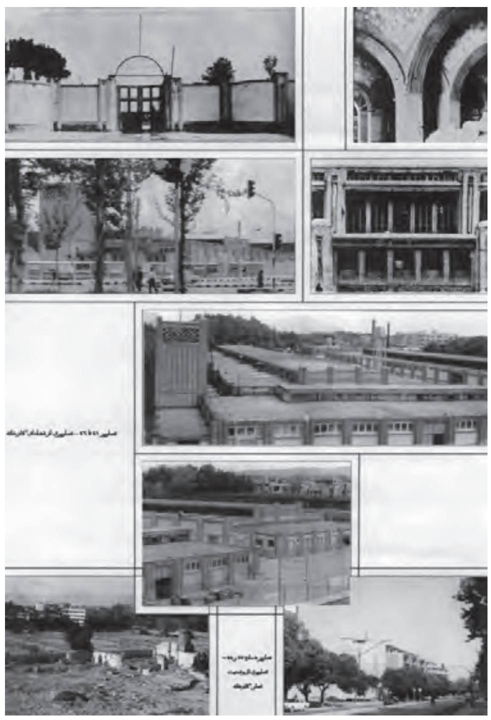
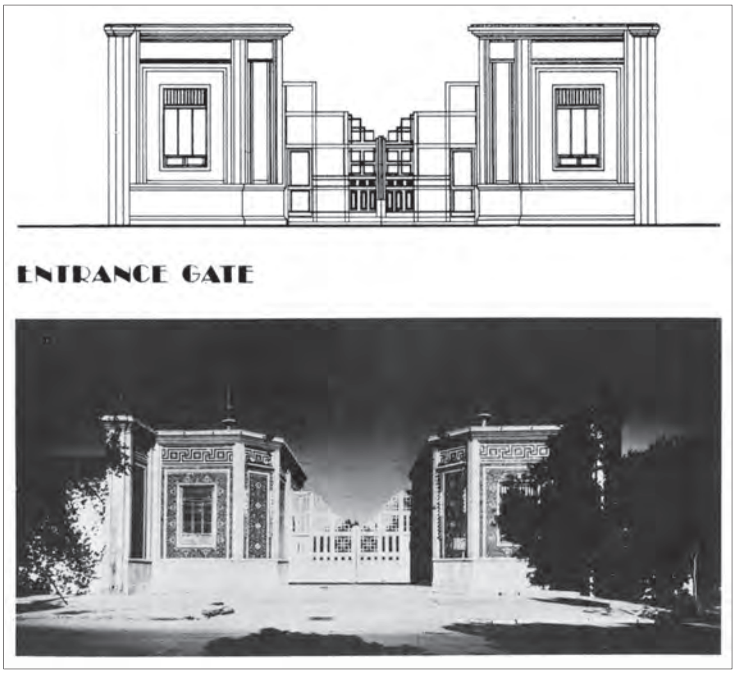
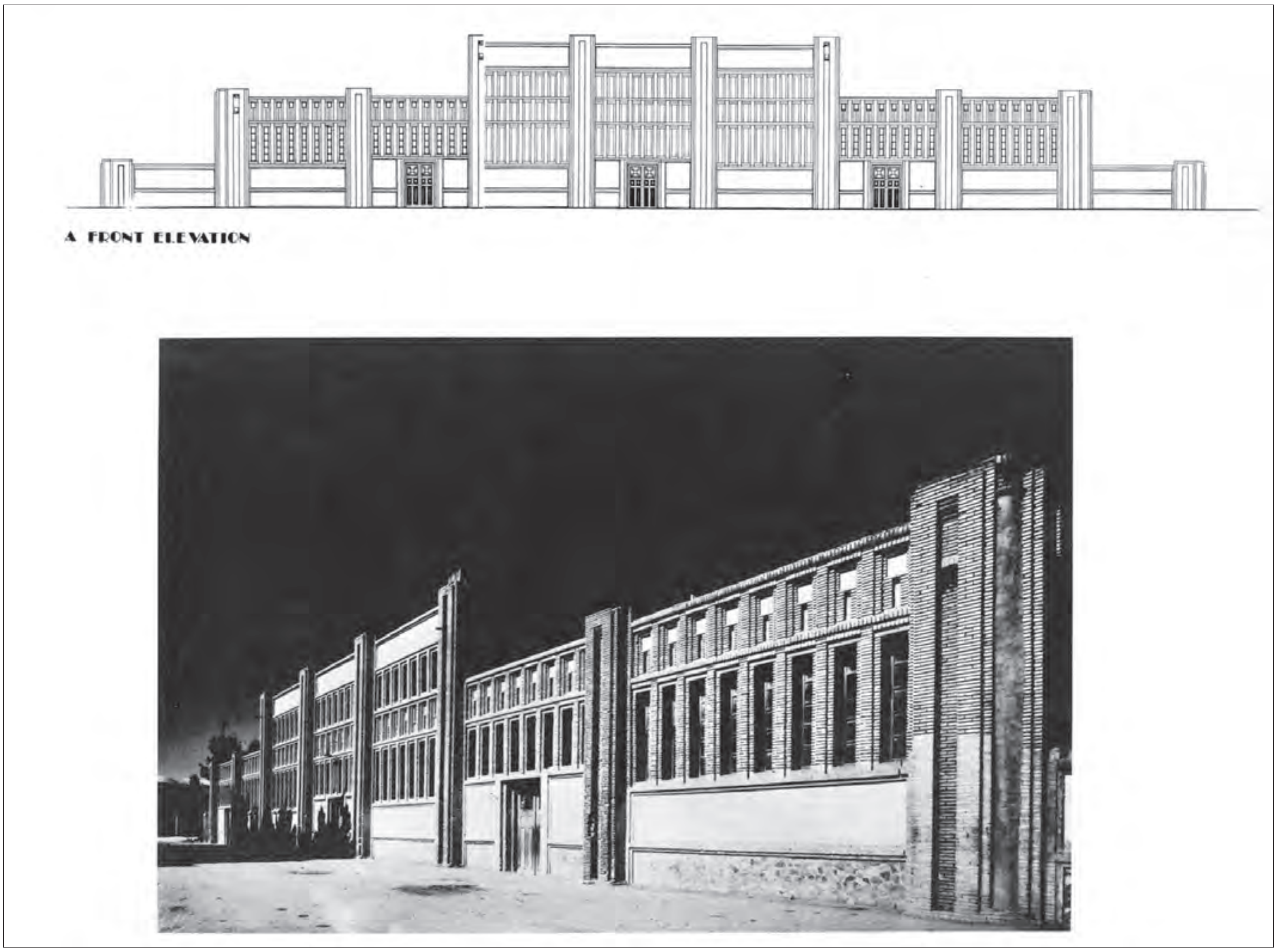


Fig. 19: **Zayendehroud Textile Factory, various views.**

Figs. 20 & 21: **Isfahan, Wool Factory, 1937.**





Figs. 22 & 23: **Shahreza, Textile Factory, 1930–1938.**

Fig. 24: **Yazd, Ehgbal Textile Factory, c. 1935.**

Fig. 25: **Eghbal Textile Factory, interior view.**

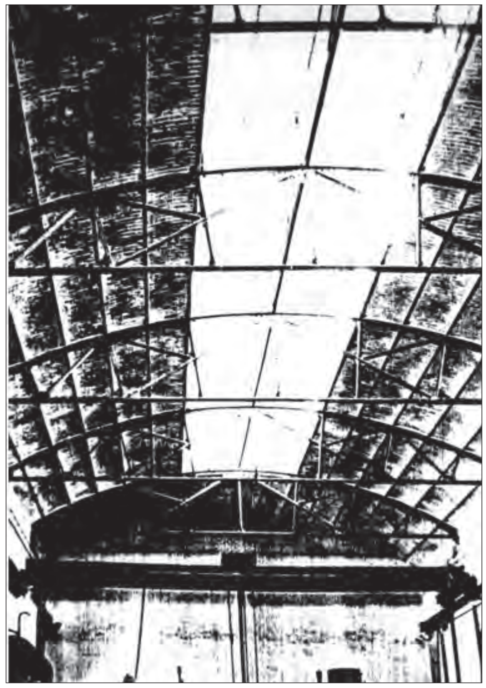
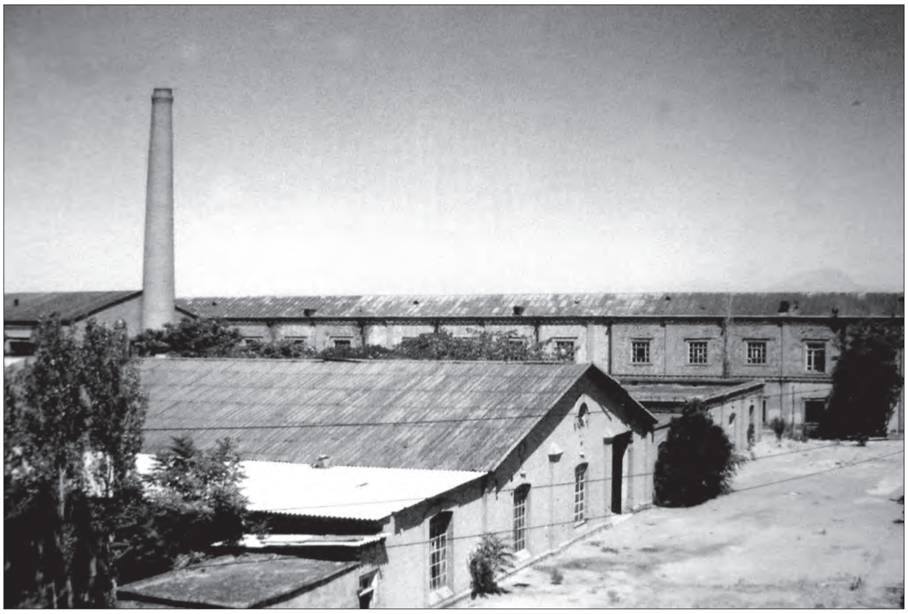
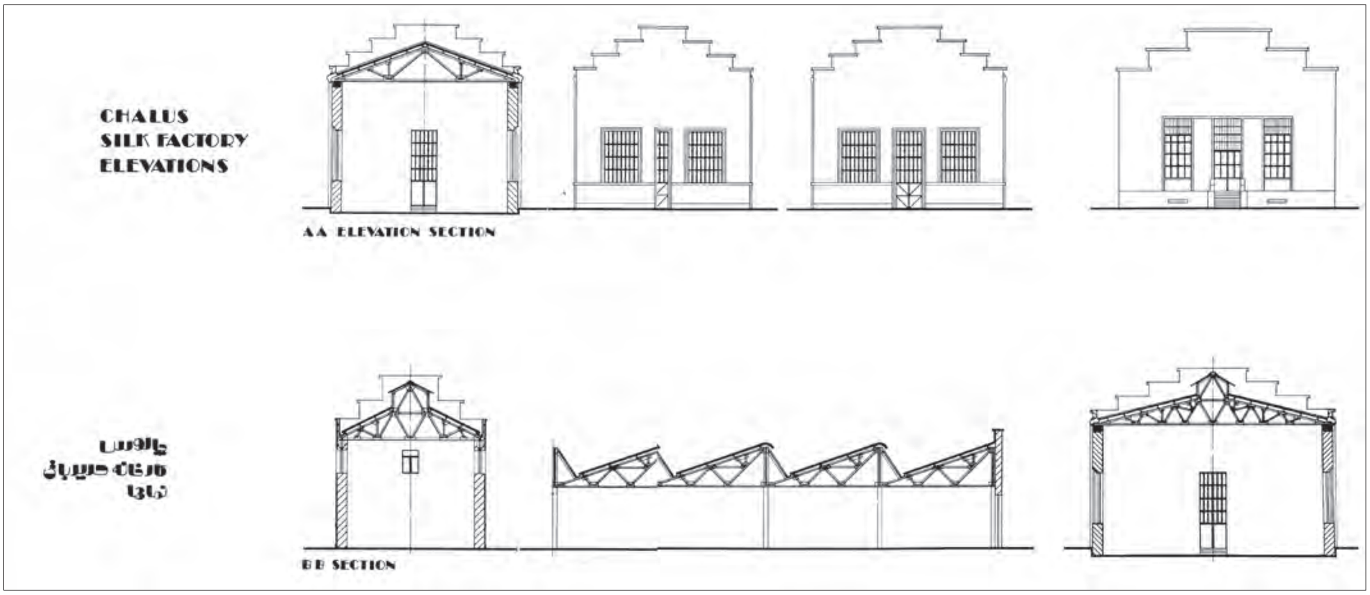


Fig. 26: **Back Left: Yazd, Great Adorian (Fire Temple), 1935.**
Back Right: Yazd, Harati Textile Factory, 1934.

Fig. 27: **Harati Textile Factory, column detail.**




Figs. 28 & 29: **Tabriz, Khosravi Leather Factory, 1932.**



Figs. 30 & 31: **Chalous, Silk Factory, 1937.**

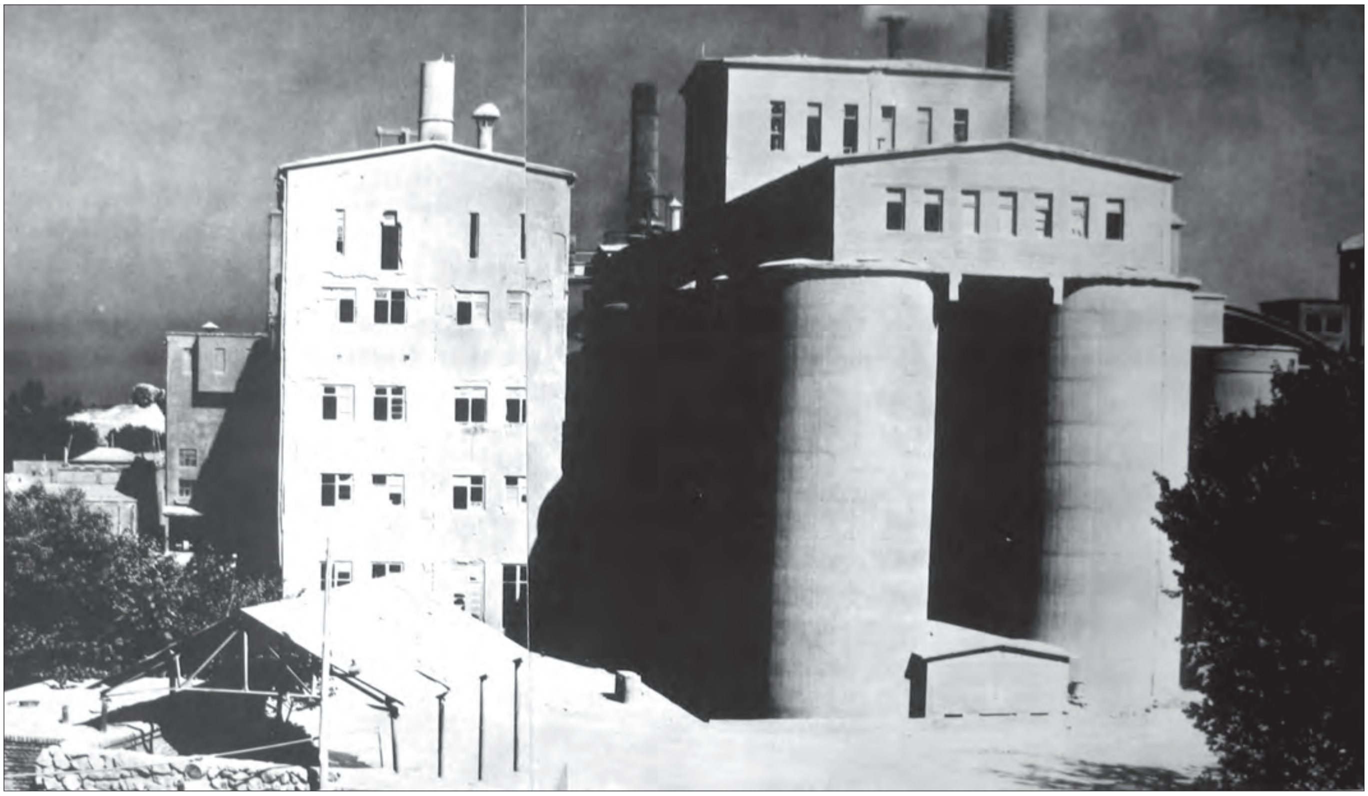


Fig. 32: **Rey, Cement Factory, 1933.**

graduating in 1910. He came to Iran in 1915 to serve in the Cossack army and stayed after the Russian revolution until he died in 1957. In Iran, he had an active teaching career and a flourishing architectural practice. His industrial buildings include two sugar refineries built in locations close to Tehran— one in Karaj, built in 1933 (fig. 33), and the other in Varamin, built in 1935 (figs. 34 & 35); and a 1934 pharmaceutical factory in Hesarak, a far suburb of Tehran.

One of the few renovations and re-utilizations of factories from the First Pahlavi era involves the 1938 Gheysarieh Spinning Factory in Qom. In 1995, the Qom municipality renovated it to serve as the city's television and radio station (fig. 36).

Before moving on to the industrial architecture of the Second Pahlavi period, two points should be made about the architecture of the First Pahlavi period. The first is that it is characterized by the evolution of hybrid architectural solutions that evolved through combining Western functionalism and Iranian traditional architectural detailing, although this hybridization never reached the level of total integration. The second is that Reza Shah's industrialization programs were much more successful than those of the Qajars. He had a comprehensive vision for Iran's industrialization, and, until the advent of the Second World War, also had full support for this vision from the British, Russians, and, most importantly, the Germans. Most of the First Pahlavi era factories, however, eventually became derelict. This was less the result of architectural obsolescence or competition from foreign products, and more the result of changing methods of industrial production in the West as well as in Iran. As industrial machinery became smaller, those large spaces became increasingly inefficient.

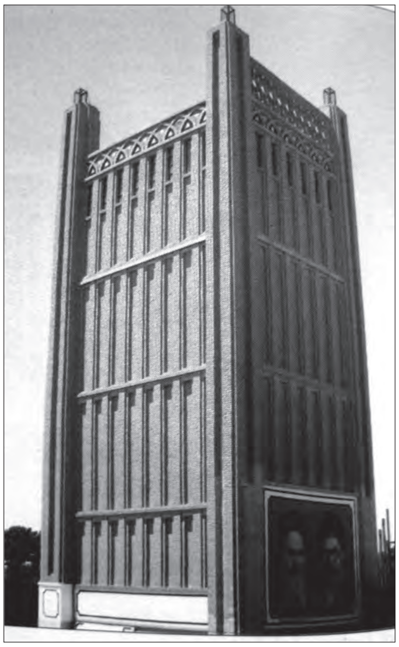
The Second Pahlavi period (1941-1979)

Because of Reza Shah's sympathy to the Germans, the English and Russians forced him to abdicate in 1941, during the early years of the Second World War, in favor of his 22-year-old son, Mohammad Reza Shah. With that, the Second Pahlavi period was initiated. It generally seems that architecture became increasingly functionalist throughout the world following the war, being reduced to meeting minimal utilitarian standards to accommodate the urgency of rebuilding. Industrial architecture in Iran followed the same pattern. Kamran Afshar-Naderi has re-

Fig. 33: **Karaj, Sugar Refinery, Nikolai Markoff, 1933.**

Fig. 34: **Varamin, Sugar Refinery, Nikolai Markoff, 1935.**

Fig. 35: **Veramin Sugar Refinery, façade detail.**



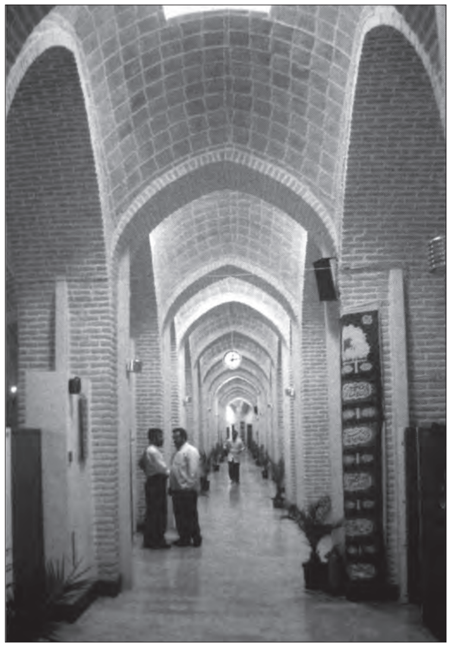


Fig. 36: **Qom, the 1938 Gheysarieh Spinning Factory after being converted into the city's radio and television station in 1995.**

ferred to the industrial architecture of Iran from that period as "Rationalist," but I do not believe it even deserves this terminology. Many factories were constructed during this period, including the steel mills of Isfahan as well as the Bushehr nuclear plant, which the Russians built. None really are worth mentioning from an architectural point of view, except perhaps the 1940s Abjosazi Brewery in Tehran (fig. 37), which Seyyed Hamid Nourkeyhani renovated in 1993 into the Komeil Cultural Center (fig. 38). Nourkeyhani had previously worked with Kamran Diba, one of the period's most prominent architects.

The Islamic Republic period (1979-present)

I would refer to the architecture of the Islamic Republic as "charette architecture" because it is very hastily designed and even more hastily built. At the same time, Iran is undergoing a process that may be identified as the "glorification of the ugly" since the main decision-makers in all realms affecting the architectural and urban landscape have a pronounced kitsch taste. For examples of this one only needs to look at the plastic trees and stucco animal statues that adorn city squares!

Several industrial towns have been built or completed since the Islamic Republic was founded thirty years ago. One example is Poolad Shahr, near Isfahan, where the main steel mills were constructed by the Russians during the Second Pahlavi era, with the work completed under the Islamic Republic. There also is Parand Industrial City near Tehran as well as numerous other industrial zones that have emerged around Tehran. But the country's main industrial efforts have been concentrated in Assalouyeh, where Iran's oil and gas industries are being relocated, replacing Abadan, which was destroyed extensively during the Iran-Iraq war (fig. 39).

The architecture of these industrial complexes is less than mediocre, but there are exceptions. One example is the Gas Company headquarters in Shiraz, designed by Mehrdad Iravanian in 2001. Although an office building rather than an industrial one, it projects a "High-Tech" "industrial architecture" aesthetic and makes no pretense at linking to traditional architectural vocabularies (fig. 40). Moreover, the two projects that won first and second place for the 2007 Memar Award (organized by the Iranian architectural magazine *Memar*) surprisingly were factories. The second-place prize was awarded to the Ehsan Poud Textile Factory in Ehsan Poud (fig. 41), located along the Tehran-Qom Highway. The project was designed by three architects barely in their thirties, Abbas Rihi Fard, Kamran Heyrati, and Houman Balazadeh. If it were not for the 120-meter-long canopy, reminiscent of Zaha Hadid's work and gratuitously hanging there for decoration, this project would have won the first-place prize, which went to Bahram Kalantari and Kourosh Dabagh for the Peykar Bonyan Wood Paneling Factory in Parand Industrial City (fig. 42). The simplicity of the Peykar Bonyan scheme, the Mondrian-inspired façade, as well as the glass bridge joining the factory and administrative building, all make this complex the most appealing contemporary work of public architecture in the Islamic Republic of Iran.

At the beginning of the Islamic Revolution, all factories were nationalized, and no new factories were built until after the war with Iraq ended in 1988. The production of industrial architecture generally remained under government control until the Khatami presidency, when the government encouraged the creation of private banks and industries, and a

Fig. 37: **Tehran, Abjosazi Brewing Factory, c. 1945.**

Fig. 38: **Abjosazi Brewing Factory after its conversion into the Komeil Cultural Center by Seyyed Hamid Nourkeyhani in 1993.**

Fig. 39: **Bandar Abbas, Bandar Abbas Refinery, layout of pipe racks.**

Fig. 40: **Shiraz, Gas Company Headquarters, Mehrdad Iravanian, 2001.**

Fig. 41: **Ehsan Poud, Ehsan Poud Textile Factory, Abbas Riahi Fard, Kamran Heyrati, and Houman Balazadeh, 2007.**

Fig. 42: **Parand Industrial City, Peykar Bonyan Wood Paneling Factory, Bahram Kalantari and Kourosh Dabagh, 2007.**

few private factories slowly have begun to be built. At the same time, a new generation of young architects have emerged who are active Internet users and are fully computer literate. For them, the issue of integrating Iranian traditional architecture into their designs is irrelevant. Although the regime's main aim is to revive "Islamic Architecture" in all architectural endeavors, the industrial architecture produced for the private sector generally has not complied.

Concluding remarks

The industrial architecture of the Qajars and the First Pahlavi era, when Iranian master builders and European engineers collaborated, never resulted in an integrated and homogenous architecture because these two groups did not share a common knowledge base. The large industrial spaces of production were defined by the steel structure and by the technical know-how of Western engineers. The appearance of the buildings, however, was the result of the work of Iranian craftsmen, and an Iranian identity consequently was bestowed on the buildings of those two periods. During much of the Second Pahlavi period, no attempt was made to give any Iranian "flavor" to industrial buildings. This began to change in the 1970s, primarily under the influence of Mohammad Reza Shah's wife, Farah Diba. She initiated efforts that placed great value on Iran's cultural heritage, and with that, the idea of returning to Iran's pre-Islamic and Islamic architectural heritage achieved considerable acceptance. This trend has been continued by the Islamic regime, which stresses Iran's Islamic heritage, but the results have been mediocre for most building types. The factories recently built in the country provide one exception to this trend.

The evolution of the industrial architecture of Iran has not been a continuous process. A prerequisite for such continuity is political stability, a phenomenon that has eluded many parts of the Middle East during the course of the last century. We instead are presented with a disrupted process: sparkles of industrialization are undertaken through individual efforts but are later abandoned. There are several reasons for this disruption. Each new regime has had a tendency to deny the accomplishments of previous ones. Each has been keen on creating its own works, relegating what came before it to the historical dustbin and stressing that its own accomplishments supersede those of its predecessors.

Iranian culture is prone to stifling its geniuses—referred to in Persian as *nokhbeh koshi*—and petty rivalries often ended up aborting their accomplishments. Some of them even lost their lives, as was the case with Amir Kabir, the Qajar Naser al-Din's prime minister.

Moreover, little value is given in Iranian society to maintaining, preserving, and restoring past monuments. On the contrary, there is a propensity to destroy the old and value the newly built. Iranians have a rather disrespectful attitude towards their inherited patrimony. For instance, as soon as the father of a family dies, the paternal house is often sold or torn down. Historical continuity in architecture is difficult to maintain under this state of mind.

Finally, achieving sustainable economic development has not received much emphasis in Iran's political history, especially since the pumping of oil began in the early 20th century. Subsequent governments have spent generously on building anew even though many older facilities should and could have been kept up and updated. Oil money has always been there to pay the bill for new construction, denying, as a result, any sense of architectural continuity and evolution.

Industrial architecture in Muslim countries will achieve a coherent synthesis between Western technological know-how and indigenous architectural practices when architects have mastered a profound knowledge of Western architecture as well as a thorough knowledge of their own local architecture. Iran unfortunately has been isolated from the rest of the world during the last thirty years. Moreover, young Iranian architects have only been able to obtain a superficial knowledge of Western architecture, mostly through magazines and the Internet. Efforts are being made to carry out in-depth studies of Iran's architectural past, but even in this field, we have often relied on Western scholars. Only recently have a few Iranian scholars started attempting to fill in the vast lacunas in our architectural history.

Industrial architecture in Egypt from Muhammad 'Ali to Sadat: A field survey

RALPH BODENSTEIN

Egypt is one of the first countries in the Middle East to develop modern industries on a large scale. The process started in the early-19th century under the rule of Muhammad 'Ali Pasha (r. 1805-1848), and Egypt remains today a country with an important and diversified industrial sector. It therefore should not come as a surprise that Egypt, like other countries with a long history of industrial development, has a rich and fascinating heritage of industrial architecture. In contrast with other industrial countries, especially in Western Europe or North America, however, this architecture has not been subject to historical documentation and research in any focused or comprehensive manner. Neither has it found much interest among architectural historians or among heritage activists, let alone the public. As of recent years, however, a few master's and doctoral theses coming out of departments of archaeology in Egyptian universities have included industrial architecture of the 19th century. This is largely due to a changing and expanding understanding of al-Athar al-Islamiyya (usually translated as "Islamic archaeology," but meaning the history of Islamic Art and Architecture) to also include the material culture of the 19th century, or at least the Muhammad 'Ali era, within the context of an older and still vibrant nationalist narrative that celebrates him as the founder of modern Egypt. Still, not much thought has been given to the conservation or reuse of industrial buildings of the 19th and 20th centuries (again with the exception of some remnants from the Muhammad 'Ali period), and they are disappearing in increasing numbers.

While there are numerous publications dealing with Egypt's economic history and industrial development, the only published book on its industrial architecture so far is Mohamed Scharabi's *Industrie und Industriebau in Ägypten. Eine Einführung in die Geschichte der Industrie im Nahen Osten* [Industry and Industrial Architecture in Egypt. An Introduction to the History of Industry in the Middle East] (Tübingen: Wasmuth, 1992). Scharabi is better known for his seminal books *Kairo. Stadt und Architektur im Zeitalter des europäischen Kolonialismus* (Tübingen: Wasmuth, 1989), and *Der*

Fig. 1: **Cairo, Citadel Arsenal, c. 1815 and later; aerial view from the southwest c. 1930 showing gun foundry at center bottom.**

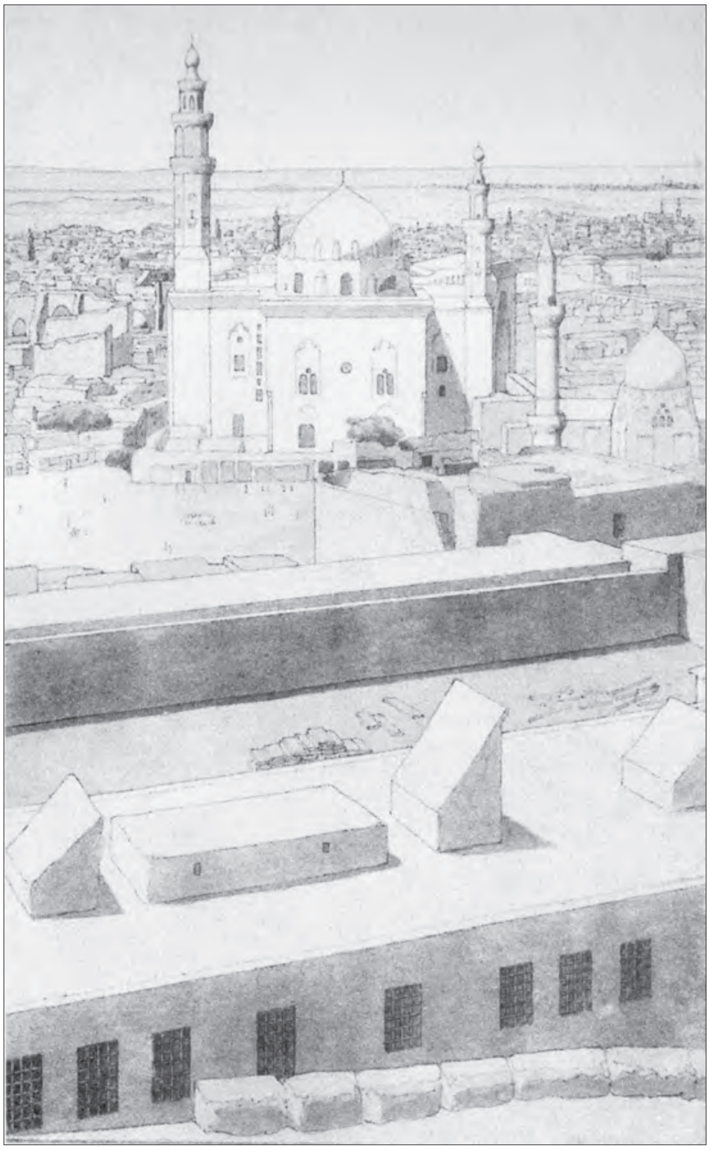


Fig. 2: **Citadel Arsenal, drawing from 1825 to 1828 by E.W. Lane showing the roofs with the Sultan Hasan Mosque in the background.**

Bazar. Das traditionelle Stadtzentrum im Nahen Osten und seine Handelseinrichtungen (Tübingen: Wasmuth, 1985). With his publications on Cairo and on Egyptian industry, Scharabi is a pioneer in the study of the Middle East's architectural and urban history in the period of modernization. Although his voluminous book on Cairo has become a reference work in the field (despite its disadvantage of being in German) and has found a number of successors, his small booklet on industry is much less known, even though it remains the only monograph available on the subject. Consisting of about 100 pages, including 34 pages of text and more than fifty pages with maps and photos, it is clear that the book treats the subject on a more modest scale than the title would suggest. The text focuses chiefly on Muhammad 'Ali's industrial projects in Egypt, and combines the descriptions of contemporary observers with a critical evaluation of the process of industrialization until the 1840s, its social and economic implications, the role of Europeans in this process, and the failure of the industrial project from the 1840s onward. For the most part, the book is a history of industrialization, not of industrial architecture as such—the reason being, as Scharabi himself explains, that hardly any industrial buildings from that period have survived. Scharabi adds some brief and general paragraphs on developments from the later part of the 19th century and from the 20th century, including photographs of industrial buildings and maps showing the spatial distribution of industries, with an almost exclusive focus on Cairo. Regarding the later period, however, the visual material is addressed only sparingly. Altogether, Scharabi's interest is less in documenting, describing, and analyzing industrial architecture, than in critiquing the negative effects of foreign experts, models, and imported ideologies (Muhammad 'Ali's mercantilism, British colonialism, the Soviet-supported socialism of the Nasser period, and the United States-aided liberal economic policies of the Sadat era), all of which he judges unsuitable and detrimental within the Egyptian context.

This essay draws on Scharabi's foundational study in various ways, but takes a different approach: instead of starting out from written sources, it begins with field exploration and site visits in an effort to move forward with the much-required work of documenting industrial architecture in Egypt.[1] Based on this approach, I have attempted to give a rough outline of the development of industrial architecture in Egypt during the past two hundred years, starting with the reign of Muhammad 'Ali Pasha and ending in the second half of the 20th century, with the periods of Gamal Abdel Nasser and Anwar el-Sadat. The central questions that this article tries to answer are very basic: What did factories, or industrial buildings more generally, look like in the different periods under

1 The field research for this study was conducted in cooperation with Ahmad el-Bindari, photographer and researcher at the Center for Documentation of Cultural and Natural Heritage (CULTNAT). His profound knowledge of 19th and 20th century architecture in Egypt, and his unfailing help in providing contacts and information, in applying for access permissions, and in visiting and photographing buildings were essential for making this survey possible. I owe him a great debt of gratitude. Special thanks are also due to Adham Nadim of the Industrial Modernization Center for his crucial support. The research begun for this article will be continued and expanded under the auspices of the German Archaeological Institute in Cairo.

study? What were their main architectural characteristics, and how did they develop? I chose to do this by presenting, in more or less chronological order, a selection of buildings and complexes, which at the present stage of research I would consider as representative, or at least illustrative, of the industrial architecture of the different periods. I have attempted to include especially-important factories, identified through literature and word-of-mouth, but inevitably, the selection is strongly determined by the possibilities and limitations under which this study was carried out. Its constraints include the rather short period between April and June of 2009 during which it was conducted, as well as by a certain factor of coincidence relating to what we found and could access during the survey.

Geographically, the examples come from Cairo, the Delta, and Alexandria, thus widening the scope of Scharabi's work considerably by including Egypt's most important industrial cities and regions. The middle and upper Nile valley were not included, as the sites there are more scattered and too distant from Cairo to be addressed within the time constraints of this study. Also, since access to industrial compounds and buildings often requires official permissions, a considerable number of interesting cases could not be visited and photographed. Hopefully they will be accessible in the near future and thus allow for further expansion of this research.

Chronologically, the examples were chosen to cover the period from around 1820 to the 1970s, but due to the regrettable disappearance of many, if not most, structures from the 19th century (the reasons for which I will address), the bulk of the buildings presented date from the end of the 19th century onward. Buildings belonging to the cotton and textile industries are clearly dominant. This is to be expected given the long-standing historical importance of this sector, especially in Lower Egypt. The buildings presented also include those that extend beyond the factory in the narrow sense of the word: waterworks, power stations, railway buildings, and the corollary buildings of factory complexes, such as administration, repair and maintenance, housing, medical care, training, and leisure facilities, all of which form an integral part of Egypt's rich heritage of industrial architecture.

The Muhammad 'Ali period: The pioneering years

Egypt's first wave of industrialization can be dated from the mid 1810s until the late 1830s. It was initially geared to support Muhammad 'Ali's ambitions to build up a modern army, but by the 1820s, it began to serve the more general aim of reducing dependence on imported manufactured goods.[2] His general policy was to seize direct control of Egypt's resources in order to secure his rule against the threat of local power groups and the interference of his suzerain, the Sultan in İstanbul. Accordingly, Muhammad 'Ali began to monopolize urban textile production, shutting down smaller workshops and forcing the craftsmen to work in his own factories. He expanded his monopoly over production and trade in rural areas, as well as over the sugar industry and large parts of the building industry.[3] He simultaneously engaged in a swift factory-building effort, with substantial help from foreign specialists and advisers whom he engaged from France, Italy, and elsewhere. His first factories included an arsenal for ship building and metal manufacturing opened in 1810 in Bulaq, Cairo's port suburb on the Nile; a textile factory for silk spinning and weaving, established in 1816 in the al-Khurunfush quarter inside the old city of Cairo; and a second arsenal for manufacturing weapons and military equipment, established around 1815 in the citadel of Cairo. Additional textile factories as well as bleaching and print works were soon set up in Cairo and elsewhere, among them a cotton-spinning and weaving mill in Bulaq called "Fabriqat Malta," because of the Maltese origin of many of its specialist workers.[4] During this period, the term *fabriqa*, along with the Arabic terms *masna'* and *ma'mal*, became common in Egypt to denote modern factories, and continued to be used in the 20th century. Following the successful introduction of long-fiber "Jumel" cotton in 1820, Muhammad 'Ali ordered the construction of fourteen more cotton factories in the Delta between 1821 and 1826, and nine in Upper Egypt in 1827-1828.[5] Other textile manufactures were set up for wool, silk, linen, and felt—among them the linen factory and the famed tarbush (fez) factory in Fuwwa, built in 1824. Both belong to the very few factory buildings of that period of which remnants still survive today. In the 1830s, there were around forty textile factories in Egypt—at a time, as Scharabi points out, when Prussia had only one.[6] The two other important types of state factories to be built under Muhammad 'Ali were plants for processing agricultural produce (including at least three sugar

2 Roger Owen, *The Middle East in the World Economy, 1800-1914* (London: I.B. Tauris, 1981), p. 69.

3 Scharabi, *Industrie und Industriebau*, p. 22.

4 The most exhaustive enumeration of factories established under Muhammad 'Ali can be found in 'Abd al-Rahman al-Rafi'i, *'Asr Muhammad 'Ali* [The Age of Muhammad 'Ali] (Cairo: al-Hay'a al-Misriyya al-'Amma lil-Kitab, 2000 (1930)), chapters 11 & 13.

5 Owen, *Middle East*, p. 70.

6 Scharabi, *Industrie und Industriebau*, p. 31.

Fig. 3: Citadel Arsenal, view of the southern section showing the 1820s gun foundry with upper-floor additions from the later 19th century.

refineries, nine indigo works, rice mills, and tanneries), as well as arsenals and powder factories.[7] Beyond those mentioned above in Bulaq and in the Cairo Citadel, two more arsenals were built in Rosetta and in Alexandria. The Alexandria arsenal was set up by the French engineer de Cerisy between 1829 and 1831, and run under the supervision of de Cerisy and the local ship-building master al-Hajj 'Umar. It was large even by international standards as it comprised fifteen workshops and employed 4,000 workers by the late 1830s, when it had already produced 22 naval vessels including nine large warships with over 100 guns.[8] Powder factories and saltpeter works were built from the late 1810s onwards in several locations in and around Cairo and in Middle and Upper Egypt with the participation of Monsieur Baffi, a chemical engineer from Rome, and his aide, the young French architect Pascal Coste—who was initially hired for this purpose and later moved on to gain fame through other works entrusted to him by Muhammad 'Ali.[9]

From contemporary descriptions and the available literature, we learn much about the equipment, the workforce, and the working conditions in Muhammad 'Ali's factories. Of the 30,000 to 70,000 workers who, according to various estimates, worked there in the heyday of the 1830s, some were women and children (like elsewhere in newly-industrializing countries), and many were forced labor (unlike most other industrializing countries).[10] Work conditions were often bad; sickness, injuries, deaths, and even cases of self-mutilation among workers are reported, as well as fires that frequently destroyed factories partly or completely.[11] The predominant use of animal and human power to drive the machinery rather than steam engines (not more than seven or eight in the 1830s) has also been observed. This has led Roger Owen to question how far Muhammad 'Ali's program of factory construction can really be characterized as industrialization, and if—had circumstances allowed—it really could have kept up with England and France on the path of early-19th -century industrialization, as Egyptian nationalist historiography would have it.[12] Although it is true that from the 1820s on, machines were increasingly constructed locally by Egyptian carpenters, smiths, and turners (following the imported models and under the supervision of foreign experts), some basic ingredients of successful industrialization were missing and—in spite of numerous efforts—could not be provided locally in a sustained manner. Owen has pointed out the "enormous problems faced by the ruler of a small country with a narrow local market, no coal, wood or workable iron, and none of the accumulated technical or entrepreneurial resources of Western Europe."[13] Add to this the difficult task of administering such a complex and dynamic system that in Egypt was solely initiated and run by the government; the resulting widespread mismanagement; the bad and often wasteful use of

Fig. 4: **Citadel Arsenal, gun foundry gate, 1820s.**

Fig. 5: **Citadel Arsenal, gun foundry, workshop hall with stone arcades.**

7 Owen, *Middle East*, p. 71.

8 *Ibid.*, p. 71; and al-Rafi'i, *'Asr Muhammad 'Ali*, pp. 370-379.

9 Pascal Coste, *Mémoires d'un artiste. Notes et souvenirs de voyages (1817-1877)*, 2 vols. (Marseille: Typographie et Lithographie Cayer et Cie, 1878).

10 The numbers vary considerably according to the sources. See, e.g., Owen, *Middle East*, p. 71; and Scharabi, *Industrie und Industriebau*, p. 28.

11 Scharabi, *Industrie und Industriebau*, p. 22.

12 Owen, *Middle East*, p. 72.

13 *Ibid.*, p. 72.

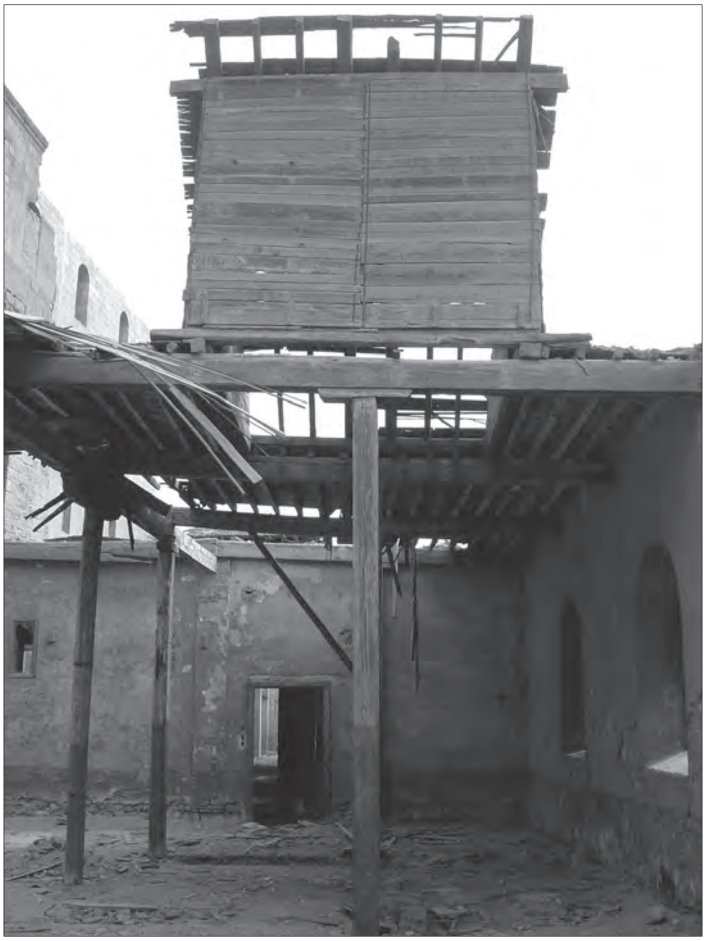


Fig. 6: **Citadel Arsenal, workshop hall next to the gun foundry, view of timber roof with *malqaf*.**

human and material resources; and the quick decay of the machinery.

As Owen has argued, the eventual failure of Muhammad 'Ali's industrial scheme, which lead to the closure of most factories either in the late years of his rule or during the reign of his successor 'Abbas Pasha (r. 1848-1854), should not be attributed solely to foreign interference, whether the Anglo-Turkish commercial convention of 1838 (which banned all monopolies and preserved a low tariff of 5 per cent on Ottoman imports) or the 1839 Treaty of London (which cut down the size of the Egyptian army and thus removed a central raison-d'être for the industrialization scheme). It also has to be seen within the context of inherent structural problems, the international economic crisis of 1836-1837, and a process of policy change, administrative decentralization, and economic retrenchment that took place in Egypt in the late 1830s.[14]

14 *Ibid.*, pp. 72-76.

Be this as it may, the abandonment, demolition, or sell-off of Muhammad 'Ali's factories between the 1830s and the 1850s is a major reason why so little of the building stock has survived. Yet, some remnants still bear witness to that period of industrialization.

The one factory complex that can still give a fairly good idea of its original architecture is the arsenal on Cairo's Citadel (figs. 1-11). It is a large complex located along the western side of the Citadel, stretching from the area underneath Burj al-Rafraf and Qasr al-Ablaq, i.e. the present site of the Muhammad 'Ali Mosque, northwards to the Bab al-'Azab area. While the production of arms and military equipment on the Citadel must have begun earlier, at least since 1806, the construction of the arsenal (called *dar al-sina'a* or *tarsana*, in Arabic and Turkish respectively) was definitely in progress by 1817.[15] The gun foundry, a centerpiece of the complex, is dated 1820 by an inscription panel formerly located above the gate.[16] Set up under the supervision of the French mechanic Gonon and the Turkish artillery officer Ibrahim Adham Bey, the establishment comprised "a foundry, machinery for boring cannon, reverberating furnaces, and various other useful works," and employed 600 workers.[17] In 1824, a large fire and the explosion of a powder magazine in the Citadel reportedly destroyed considerable parts of the complex, in addition to claiming about 4,000 lives and destroying around fifty adjacent houses. In the following years, the arsenal was repaired and enlarged. Next to the foundry, large workshops were built for producing rifles, swords and lances, copper plates (used for building warships), powder boxes, and other military equipment, employing about 900 workers at the height of production during the 1830s.[18]

Due to the reduction and partial suspension of weapon production in the 1840s, as well as the later reuse of the arsenal buildings (by the British army between 1882 and 1946, and subsequently by the Egyptian army until 1984), many of its extant buildings were subject to alterations, and additions. At present, the original shape and function of many of

15 From that year onward, the arsenal on the Citadel is repeatedly mentioned by Coste, *Mémoires*, vol. 1, pp. 13, 15, 25 & 28.

16 See Khalid 'Azab, *Dar al-Saltana fi Misr: al-'Imara wa'l-Tahawwulat al-Siyasiyya* [Dar al-Saltana in Egypt: Architecture and Political Transformations] (Cairo: al-Majlis al-A'la lil-Thaqafa, 2007), p. 155.

17 James Bell, *A System of Geography, popular and scientific, or a physical, political, and statistical account of the world and its various divisions*, vol. III (Glasgow: Archibald Fullarton and Co., 1832), p. 338, fn. 15; see also Felix Mengin, *Histoire de l'Egypte sous le gouvernement de Mohammed-Aly*, 2 vols. (Paris: Arthus Bertrand, 1823), vol. 2, p. 379; and al-Rafi'i, *'Asr Muhammad 'Ali*, pp. 341-342.

18 al-Rafi'i, *'Asr Muhammad 'Ali*, pp. 341-342.

its parts remain unclear.[19] The general layout, however, can still be discerned: a sequence of broad straight thoroughfares is lined on both sides by single-story buildings with high limestone walls and arched gates. Some buildings have segmentally or round-arched windows on the ground-floor level; others only have small rectangular windows in the upper parts of the wall. In the arsenal's southern sections, these buildings are primarily large halls, covered with flat roofs in wooden girder-and-beam construction carried on wood posts, stone pillars, or stone arcades (figs. 5-7). When necessary, the long spans of the girders are supported by systems of wood props. The roof skin is made of wood paneling covered with a smooth layer of mud. Light and ventilation are provided through the roof by regularly-distributed wind catchers—the typical Egyptian *malqaf*, or sloped wooden constructions with openings facing north. The original appearance of these buildings is blurred by later alterations. Some roofs are recognizably renewed: skylights with glazed windows replaced some of the earlier *malqafs* later in the 19th century; windows, doors, and gates have been altered or added; whole stretches of walls seem to have been rebuilt; and a metal roof in steel-truss construction has been built over the southern end of the central thoroughfare during the British occupation of the site.[20] But the architectural remains, together with a drawing by Edward William Lane from the late 1820s (fig. 2) and various 19th-century photographs of the Citadel, the Sultan Hasan mosque, and the Rumayla area (in all of which the arsenal buildings appear) give a fairly good idea of the early appearance of these large factory halls with their flat roofs interrupted by numerous *malqafs*.

Besides the halls, a second building type is found within the arsenal complex: courtyard buildings with rectangular courtyards enclosed by plain stone arcades that carry flat wooden roofs, again supported by wooden props, a technique they have in common with the halls (fig. 9). Lined up along the rear side of the galleries are rooms, opening onto galleries through arched gates topped by small square windows.[21] As an architectural solution for spaces of production, this courtyard type can be seen as a continuation and adaptation of the older local forms of the commercial *khan* and *wikala*

Fig. 7: **Citadel Arsenal, workshop hall facing the gun foundry, view of timber roof on stone pillars.**

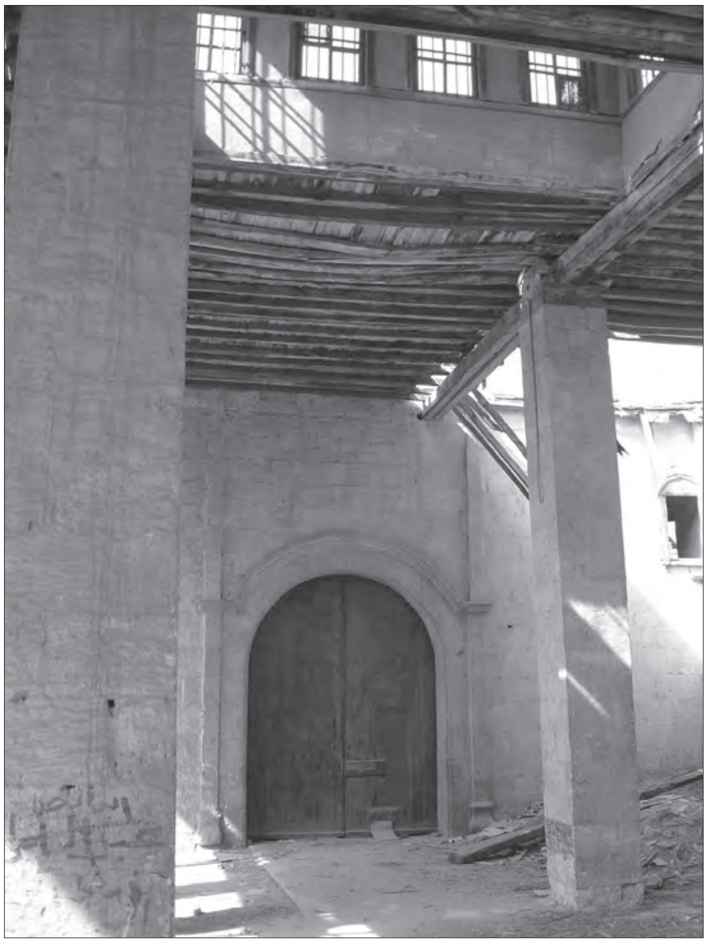


Fig. 8: **Citadel Arsenal, central section, view of a workshop hall with an interior gate built in the *Rumi* style.**

19 See, 'Azab, *Dar al-Saltana*, p. 155.

20 Detailed documentation and an architectural-archaeological study are certainly desirable to gain a better understanding of the development of this complex.

21 Again, other types of openings found here, like rectangular doors and large rectangular windows, indicate alterations dating from the late-19th and early-20th centuries.

Fig. 9: **Citadel Arsenal, northern section, view of a workshop of the courtyard type.**

building types, reduced to a simple single-story structure. The halls, by contrast, are early witnesses to an effort to create large covered spaces with a minimum of posts or pillars. Here too we can observe a partial adoption of techniques that had already been in use for another building type that incorporated large halls: mosques.

Although this was a factory for casting and working iron and other metals, its construction did not incorporate any structural iron elements. As we shall see, iron columns and beams did not come into use in Egypt before the late-19th century. This is interesting because Muhammad 'Ali had modern machinery imported from England and France, and he imported marble from Italy and wood from the Balkans and Anatolia for other building projects such as his palaces. Using imported materials was therefore an easily-available option. Also, employing technicians, builders, and artisans from outside Egypt was becoming increasingly common, at least for building projects commissioned under the patronage of Muhammad 'Ali and his entourage. In particular, the important role of "Rumi" master builders and craftsmen (often misleadingly referred to as "Greeks" in European sources) is well known.[22] The Pasha's factories were erected at a time when the building trade in Egypt had already become a fairly "international" business involving builders from various origins and backgrounds, and factory architecture must be seen in this context. This is illustrated by an account that Pascal Coste provided. As mentioned above, Muhammad 'Ali initially hired him in 1817 to plan and build a saltpeter factory in Badrashin under the directorship of the Italian chemist M. Baffi. Here, Coste employed local masons and Cairene plasterers. He went on to plan and build a powder factory on the island of Rawda at Fustat in Cairo, where the masonry was executed by "Arab workers" supervised by an "Arab," and the mechanical work, woodwork, and carpentry work was done by "Greeks, Italians, and Maltese" under the supervision of a "Greek."[23]

However, for the arsenal—as for most other factories—we have no sources (yet) to inform us who actually designed and constructed the buildings. It is questionable whether the above-mentioned Frenchman Gonon, identified as a mechanic from Lyon by Coste, or the Turkish artillery officer Edhem Bey, played any prominent role in this—except maybe in the general spatial organization in so far as it related to the production process. But we can draw some conclusions from the architecture of the arsenal buildings themselves. For example, the overall structural set-up of walls and roofs, as described above, shows that the materials used were essentially limited to what was locally available or—in the case of wood beams and panels—available through regular import. The basic layout of halls and courtyard structures and their building techniques drew on established traditions mastered by local masons and local or Rumi carpenters.[24] That there indeed was close cooperation between local and Rumi builders is clearly discernible in the architectural style and decoration of the arsenal buildings, which have a number of features in common with the few other identified remains of industrial buildings of the period.

Their overall external appearance is plain and austere, with long stretches of walls articulated only by slim cornices, by regularly-spaced windows in the upper parts, and some-

22 See, e.g., Gaston Wiet, *Mohammed Ali et les beaux-arts* (Cairo: Dar al-Ma'arif, 1950), passim. While in 19th century Arabic sources by authors like al-Jabarti and 'Ali Mubarak, the meaning of the term Rumi is clearly used as referring to Bilad al-Rum, i.e. the Ottoman core provinces, it has often been misinterpreted, especially in architecture-historical literature, as meaning either Greek (from Greece) or Roman (from Italy), or even European.

23 Coste, *Mémoires*, vol. 1, pp. 17 & 25.

24 There is one notable exception, which is the chimney of the gun foundry. During my research, I found that it is built of special refractory bricks bearing stamps of the brickworks of A. Bald in Alloa, Scotland, which allows the dating of their production to the 1820s or shortly thereafter. As the chimney has a shape very similar to chimneys in that same Scottish region, it is possible that Scottish or other foreign masons were involved in its construction. Further research on this subject is still underway. In this context, I would like to thank Veronica Fraser of the Royal Commission on the Ancient and Historical Monuments of Scotland for her generous help in providing information on Bald's brickworks in Alloa.

Fig. 10: Citadel Arsenal, southern section, neo-Classical gate added in the 1860s or 1870s.

Fig. 11: Citadel Arsenal, northern section, a hybrid neo-Classical gate with Castle-Style crenellations, probably dating from the 1850s or 1860s.

Fig. 12: Fuwwa, Linen Factory, 1824; main gate.

Fig. 13: Fuwwa, Tarbush Factory, 1824; main gate.

Fig. 14: Tarbush Factory, interior gate.

Fig. 15: Alexandria, gate of an unidentified factory from the Muhammad 'Ali period, c. 1820s or 1830s.

Fig. 16: **Rosetta, gate of a textile factory from the Muhammad 'Ali period, c. 1820s or 1830s.**

times by larger arched windows on the ground-floor level. More elaborate stone decoration is used for the gates (figs. 4, 8 & 12-16). Here, we find round or segmental arches with molded archivolts framed by slim pilasters and curved cornices, which are characteristic of the so-called Rumi style—i.e. the local variation of Ottoman baroque produced by Rumi builders and favored by Muhammad 'Ali and his family for their palaces. Yet, within the Rumi-style framework of the gates, we also find arches with lobed and zigzag moldings, and bands with arabesque carvings characteristic of the so-called 'Abd al-Rahman Katkhuda style—a richly decorative style fashionable in Cairo around the mid-18th century.[25] The use of such decoration for monumental factory gates built as late as the mid 1820s (e.g., the tarbush factory in Fuwwa from 1824, and a factory of yet unclear function on the Mahmudiyya Canal in Alexandria) provides evidence of the influential role of local stone masons in the architecture of Muhammad 'Ali's factories. It also indicates a longer survival of local artistic traditions under Muhammad 'Ali—even in building projects under his patronage—than has hitherto been acknowledged. The Pasha evidently did not always see expressions of local Egyptian culture as an obstacle to his modernization program, as has been argued.[26] At least in the case of his factories, which were important material expressions of this modernization program, he sometimes integrated them prominently.

Judging from the surviving remains, it is clear that Muhammad 'Ali's factories were not conceived as mere utilitarian buildings, but also as architectural monuments built to impress and to visually communicate the Pasha's ambitions. This architectural quality was acknowledged even by otherwise rather critical observers of the time. For example, the Englishman James St. John, who traveled throughout Egypt in the early 1830s and had already witnessed and commented upon the failure of many of the Pasha's industrial endeavors, mentions a second gun foundry in Cairo (besides the one in the Citadel) that he qualified as being "at appearance, the finest in the world."[27] He also expressed his admiration for the size, the identical plans, the architecture, and the siting of cotton mills he saw on his way to Upper Egypt:

> They are constructed with rubble and mortar, and covered externally with stucco. For the small number of machines they contain, they are much more spacious than necessary. The apartments, which are flagged with stone, are extremely lofty, and the doors and windows proportionably large. All the bullock-mills, along the front of the buildings, are enclosed in large towers, adorned with bow windows, balconies, and balustrades. Spacious flights of stone steps ascend to the second story, and the entrance is generally shaded by a light wooden trellis-work. All these buildings are erected in the finest situations.[28]

25 See, Doris Behrens-Abouseif, "The 'Abd al-Rahman Katkhuda Style in 18th c. Cairo," *Annales Islamologiques*, 26 (1992), pp. 117-126.

26 For the argument that Muhammad 'Ali discarded the indigenous style, see Doris Behrens-Abouseif, "The Visual Transformation of Egypt During the Reign of Muhammad 'Ali," in Doris Behrens-Abouseif and Stephen Vernoit (eds.), *Islamic Art in the 19th Century: Tradition, Innovation, and Eclecticism* (Leiden: Brill, 2005), pp. 115 & 117-118.

27 James Augustus St. John, *Egypt and Mohammed Ali*, 2 vols. (London: Longman, 1834), vol. 2, p. 424; and Scharabi, *Industrie und Industriebau*, p. 26.

28 St. John, *Egypt and Mohammed-Ali*, vol. 2, p. 417. The term "apartments" was misinterpreted by Scharabi as referring to residential spaces—which would have been the earliest evidence for such functions being included in factory spaces (see, Scharabi, *Industrie und Industriebau*, p. 25). However, it is clear from the context that the term is used in the sense of compartments within the production space. This does not preclude the possibility that there were rooms with administrative or residential functions.

This account provides important evidence of the existence of buildings with towers and a second story, and of the use of architectural decoration in prominent parts of those buildings other than gates, thus underlining their intended visual and monumental function. Also, the intricate connection between the productive and the monumental nature of the structure can be observed from the siting of at least some factories, which provides for a striking effect that can still be experienced today in Fuwwa or Alexandria. They were built along the Nile or a canal for the obvious reason of providing direct access to river transport; but at the same time, they prominently presented their main façades, along with their monumental gates, to the waterfront.

However, as evinced by many other cases that have not survived, but that are documented in historical accounts and maps, factories were often located away from the river, on the outskirts of cities, or even within dense urban fabrics.[29] Research into a possible relationship between the location and function of factories from the Muhammad ʿAli period is still a desideratum.

The 1850s to the 1880s: Downsizing and restructuring

The period following the rule of Muhammad ʿAli until the revolution of 1919 is sometimes depicted —especially in Egyptian nationalist historiography—as one of de-industrialization and stagnation. The reality, however, is more complex. The gradual abandonment and closing down of factories that began during Muhammad ʿAli's reign and continued during the rule of his successor ʿAbbas Pasha was far-reaching, yet incomplete. Alfred von Kremer, writing in the early 1860s, during the rule of Saʿid Pasha (r. 1854-1863), listed a number of active industries: silk and cotton weaving, indigo dying, copper manufacturing, leather tanning and shoe production in Cairo, and wool weaving in Fayyum. He confirms, however, that the state-run factories had been all but closed down, including some that had actually been founded only recently by Saʿid Pasha, pointing to an attempted revival.[30]

Fig. 17: **Alexandria, Minat al-Basal District, port and warehouse-related building, c. mid-19th century.**

Fig. 18: **Alexandria, Minat al-Basal District, gatehouse of a warehouse complex, c. 1860s or 1870s.**

Saʿid Pasha's policy included asset-stripping and demolition of existing factories, or alternatively their sale or lease to private persons and enterprises. But he also reactivated factories that had been closed by his predecessor ʿAbbas Pasha, among them the tarbush factory in Fuwwa and sugar factories in Bani Suwayf, and he introduced factories for pressing cotton-seed oil, used for soap and candle production. Because of the Egyptian involvement in the Crimean War (1853-1856), the arms industry was revived and arsenals were reactivated, with gun, rifle, and saber production in Cairo, and shipbuilding in Alexandria. Industrial ambitions were very much alive during this period, as highlighted by the fact

29 Regarding the location of factories, see the maps in Mercedes Volait, *Architectes et architectures de l'Egypte moderne, 1830-1950: Genèse et essor d'une expertise locale* [Architects and Architectures of Modern Egypt, 1830-1950: Formation and Rise of a Local Expertise] (Paris: Maisonneuve et Larose, 2005), pp. 128-142; and Scharabi, *Industrie und Industriebau*, pp. 23-24.

30 Scharabi, *Industrie und Industriebau* , p. 35; Alfred von Kremer, *Aegypten. Forschungen über Land und Volk während eines zehnjährigen Aufenthalts* [Egypt. Studies on the Country and the People during a Ten-Year Stay], 2 vols. (Leipzig: Brockhaus, 1863), vol. 2, pp. 215-216.

Fig. 19: **Fuwwa, ginning mill next to the Tarbush Factory, probably 1850s-1860s; two-story building at the eastern end of the complex.**

Fig. 20: **Ginning mill next to the Tarbush Factory, eastern main facade of the truss-roofed workshop building.**

that the stamp "*Suni'a fi Misr*" ("Made in Egypt") was introduced for the first time in 1856 to mark all military equipment.[31] At the same time, railway construction began in Egypt, with the appendant station and workshop buildings. The Alexandria - Cairo line was built between 1854 and 1856, and the network was steadily expanded to cover most of the Delta, extending as far south as Asyut by the 1870s.[32]

The introduction of railway transportation to the country opened up new locations for industrial activities. In Alexandria, a freight railway was built in the 1850s to serve the western port. Together with the adjacent Mahmudiyya Canal already built under Muhammad 'Ali, it triggered extensive industrial development in this area.[33]

Another step of far-reaching importance during Sa'id's rule was the abolition of Muhammad 'Ali's government monopoly system and the opening-up of production and trade to foreign investors. This led to an influx of foreign businessmen and "adventurers," who established themselves in Alexandria and along the Nile up to Cairo, founding companies mainly for the exploitation of Egypt's agricultural products for industries in Europe—chiefly, of course, cotton.[34] Numerous mechanized cotton ginning mills were set up beginning in the mid 1850s, reaching eighty by 1863. In fact, cotton ginning has been identified as the most important industrial activity under Sa'id Pasha.[35] The development of Egypt's agro-industries continued under the rule of Khedive Isma'il (r. 1863-1879), now with a renewed and intensified involvement of the ruler himself as a quasi-"private" investor through *al-Da'ira al-Saniyya*, the administration of vice-regal properties. Cotton production and processing remained an important focus of European and Khedival investment. This was driven by the cotton boom resulting from the disruption of cotton supplies from the United States following the outbreak of the American Civil War, and growing further after a short-lived decline that followed the end of the war.[36] The other quickly-growing industry was sugar production, which remained limited to cane pressing and molasses production until the 1880s, with *al-Da'ira al-Saniyya* being the largest producer. The construction by *al-Da'ira al-Saniyya* of light railways serving agricultural areas further buttressed these developments.

Other industries that thrived under Isma'il were—again—arms factories and plants for military supplies, including two broadcloth weaving mills in Bulaq and Shubra, and factories catering to the needs of a growing administration, such as, the paper factory in Bulaq. The Khedive also established a brick factory in Qalyub, as well as a glass factory and a leather tannery in Alexandria. Moreover, there were smaller pri-

31 See, Zayn al-'Abidin Shams al-Din Nagm, *Misr fi 'Ahday 'Abbas wa Sa'id* [Egypt During the Reigns of 'Abbas and Sa'id] (Cairo: Dar al-Shuruq, 2007), pp. 155-157. This publication contains a concise overview of the industrial activities of the period.

32 For a detailed timeline of railway construction in Egypt, see al-Rafi'i, '*Asr Muhammad 'Ali*, pp. 16-18.

33 Marc Crinson, *Empire Building. Orientalism and Victorian Architecture* (London: Routledge, 1996), p. 171.

34 Nagm, *Misr*, pp. 152-153.

35 Owen, *Middle East*, p. 138; Nagm, *Misr*, p. 153.

36 Owen, *Middle East*, p. 135.

vately-owned factories that produced food, household items and other equipment, in addition to steam-driven flour mills.[37]

From this certainly incomplete list, it is clear that there was considerable construction activity for industrial buildings between the 1850s and the 1880s. Also, in contrast to the earlier part of the 19th century, industrial buildings of the modern factory sector were not only built by the ruler or the state, but by private entrepreneurs and investors as well. It is certainly true—as Scharabi observed—that most of the private enterprises were family-sized ones. This also meant that the bulk of factories and workshops were probably small and not necessarily durable, agglomerating in urban industrial neighborhoods—as with Bulaq and Sabtiyya in Cairo—in a spatially only loosely-definable way that may still be observed today.[38] But as the examples of mechanized ginning mills or steam-powered flour mills show, there also were privately-owned factory buildings of a more substantial size. At any rate, this period witnessed an important shift in the patronage of industrial architecture in Egypt, and the role of private enterprise in producing this architecture was to increase further, until the advent of nationalization under Gamal Abdel Nasser in 1956. Moreover, until the 1920s, these investors were mostly foreigners, or non-Egyptian "local foreigners," whose transnational backgrounds and networks contributed to the formation of a more international or "globalized" architectural language of industrial buildings in Egypt.

In general, the second half of the 19th century was a transformative period for Egyptian architecture, whether in terms of architectural styles or construction techniques. Stylistically, an increasing taste for historicist and eclectic styles of European inspiration may be observed, promoted by European architects hired by the ruler's family, local foreigners, and members of the local Egyptian and Turkish elites. In terms of construction techniques, iron, and later steel construction began to appear, yet at first only sporadically. In palace architecture, this is evident in the Gezira Palace with its famous cast-iron colonnades in Moorish style designed by Karl von Diebitsch in 1863-1864. In bridge construction, examples include the railway bridges across the Nile at Banha and Kafr al-Zayyat built by Robert Stephenson in 1854; the Qasr al-Nil bridge in Cairo built by Linant de Bellefonds and the French company Five-Lilles between 1869 and 1871; and its counterpart, the Pont des Anglais, built immediately afterwards by the British engineering firm Shaw and Thomson. There also are extravaganzas such as the miniature suspended bridge built by the prolific Gustave Eiffel between 1873 and 1875 across a pond in the Giza palace gardens (now the Giza Zoological Gardens).[39] By and large, the material and know-how for these metal structures were imported from abroad, and it is important to note that while prefabricated elements like iron railings, balcony balustrades, and window grills became widely fashionable in domestic architecture, the use of iron and steel for structural purposes (especially floor, ceiling, and roof construction) remained exceptional until the last decade of the 19th century, even though it was technically possible beginning in the mid-19th century.[40] This wide range between what was feasible and what was commonly applied in construction is an important characteristic of this period in Egypt, and accounts for the increasing variety and contrast in its architecture. It also poses the question of how far industrial architecture in Egypt made use of new construction techniques.

As for industrial buildings from the 1850s to the 1880s, very few seem to have survived. It is possible, however, that among the many old ginning mills in the Delta and the equally-numerous old cane-pressing works in Upper Egypt that have not been visited yet, some still preserve remnants of their founding years. But we should not hope for much. The oldest sugar refinery of this period, built in al-Hawamdiyya, to the south of Cairo in 1881 (fig. 21), is today a vast complex of 20th century structures with no visible traces of its original 19th century buildings. Where factories continued to operate, technical upgrading and modernization have taken their toll

37 *Ibid.*, p. 151; 'Abd al-Rahman al-Rafi'i, *'Asr Isma'il* [The Age of Isma'il], 2 vols. (Cairo: al-Hay'a al-Misriyya al-'Amma lil-Kitab, 2000 (1932)), vol. 1, p. 253, and vol. 2, pp. 13-15; and Scharabi, *Industrie und Industriebau*, pp. 36-37.

38 Scharabi, *Industrie und Industriebau*, p. 36.

39 For a good overview of these developments, see, Ghislaine Alleaume and Mercedes Volait, "The Age of Transition: The Nineteenth and Twentieth Centuries," in André Raymond (ed.), *The Glory of Cairo: An Illustrated History* (Cairo: AUC Press, 2002), pp. 361-464, esp. 370-393; for the bridges, see also, Samir Raafat, "A Bridge Misunderstood," *Egyptian Mail*, Saturday, April 29, 1995.

40 In his treatise on construction in Egypt from 1875, Edouard Mariette mentions timber-iron and iron floor construction, but states that timber construction was the most widespread. He also indicates that imported prefabricated iron elements were available in the market, but that special iron elements were hardly used except in industrial buildings. In addition, he cites two ironworks (at the railroad workshops in Bulaq and at the Engineering and Cotton Machinery Company in Alexandria) that could produce such special elements on demand. See, Edouard Mariette, *Traité pratique et raisonné de la construction en Égypte* [Practical and Critical Treatise on Construction in Egypt] (Alexandria: Imprimerie française A. Mourès, 1875), pp. 110 & 363. From my own research on 19th-century architecture, it is clear that floors incorporating jack arch construction (i.e., flat brick vaults built between small steel girders) became more common only in the 1890s.

Fig. 21: **al-Hawamdiyya, Sugar Refinery, originally founded in 1881; view of the northeastern section showing buildings dating from the early to the later 20th century.**

on the building stock, and where factories were abandoned, they usually either collapsed or fell victim to redevelopment. But there are a few structures that can help us obtain a preliminary idea about this period's industrial architecture.

One is a peculiar building located in the Minat al-Basal district of Alexandria, right next to the so-called Old Bridge across the Mahmudiyya Canal, close to where the canal connects to the western port (fig. 17). This was an area where industrial and port-related activities had already begun to develop during the time of Muhammad 'Ali. The building is a rectangular, flat-roofed two-story block with a ground floor built of limestone ashlar. The upper floor is of plastered brick construction with horizontal timber beams integrated into the masonry. All ceilings are of timber construction. We are therefore dealing with long-established materials and techniques. The peculiarity of the building derives from its arcaded façades. The eastern and main façade, which runs along the street and the canal, as well as the narrow southern façade are both composed of a double-story arcade of round arches with profiled archivolts and imposts on square pillars. The façades are further decorated with neo-Renaissance elements such as rustication work on the corners, a string course on the first-floor level, and a cornice with concave moldings, all worked in white limestone. Joints in the masonry indicate that the arches were originally open, but were later walled up, and some were equipped with gates or windows (based on constructional features, this appears to have taken place in the later 19th century). Behind the arcades on both floors are rooms with doors leading into the rear parts of the building, which currently are not accessible.

The date and the function of the building remain unclear at this point. Construction techniques and decoration allow a dating to some time between the first half and the third quarter of the 19th century. Important additional clues are provided by a map of Alexandria drawn by Charles Muller in 1855. It shows extensive building activity in this area—including a shape that could be the building—and summarily identifies structures as "magasins," i.e., warehouses.[41] It is very possible that this building is the last remnant of these warehouses, and this could explain its unique arcaded architecture as a kind of *khan* turned "inside out." Stylistically, the original arcades with their combination of limestone and brick show intriguing similarities to 18th-century İstanbuli *khan*s like the Büyük Taş Han – a feature that may indicate the participation of Rumi builders, and would either support a dating to the first half of the 19th century, or give evidence of a survival and innovative adaptation of *khan* architecture into the mid-19th century. Further research into this structure would be very desirable, as it is presently abandoned, is for sale, and might disappear very soon.

An adjacent gate house, located at the southwestern corner of the *khan* building, might also have belonged to the same former warehouse complex (fig. 18).[42] The stylistic features of this two-story building suggest a dating to the 1860s or 1870s. The rusticated ashlar masonry, the round-arched gate and windows, the pilasters, architrave, and cornice, and the plastered upper story with rectangular windows and a curved pediment framing a stucco rosette combine Ottoman Baroque, neo-Renaissance, and Classicist elements, and fit into the general stylistic trends familiar to palace architecture in Egypt of the 1860s and 1870s. Surviving factory gates of a similar style can be found in the Citadel arsenal of Cairo (figs. 10 & 11), combining Classicist pilasters and architraves with Baroque cartouches and Castle-Style crenellations, and are clearly identifiable as renovations and additions dating to the rule of Sa'id and Isma'il.[43] Here again, as in Muhammad 'Ali's time, we see a continued pattern of giving industrial buildings a monumental allure. Whether this warehouse gate

41 See the reproduction of the map in Robert Ilbert, *Alexandrie 1830-1930*, 2 vols. (Cairo: IFAO, 1996), vol. 2, p. 776.

42 At present, the building is not accessible. It belongs to the neighboring complex of the Société Générale de Pressage et de Dépôts, built in 1956, replacing older structures.

43 Additions and renovations in the Citadel arsenal dating to the period of Khedive Isma'il have also been identified during research conducted by Professor Hussam Isma'il, architectural historian at 'Ayn Shams University. I would like to thank him for sharing his results with me.

in Alexandria was built by a private-sector patron or not cannot be determined yet.

A third structure that most probably dates from the 1850s to the 1880s is a factory building in Fuwwa (figs. 19 & 20), located along the western bank of the Nile, on a plot right next to the tarbush factory (figs. 13 & 14). It is a small, abandoned complex consisting of a courtyard enclosed by a lofty workshop building on the west, and a small two-story building on the east, as well as some smaller auxiliary buildings. The exclusive use of burnt-brick masonry with beams, lintels, and ceilings of timber without any iron elements would—at the present state of research—suggest a date of construction definitely before the 1890s, and possibly as early as the 1850s or 1860s.[44] The complex, registered as a monument in the late 1990s, has actually been identified as a ginning mill. It is said to date to the Muhammad 'Ali period—which, however, would seem too early for a ginning mill.[45]

From a typological point of view, the factory hall in the west is the most interesting. Among the buildings surveyed, this is the earliest example of a long rectangular hall with gable walls, a double-pitched roof in truss construction, and a monitor (clerestory). The external walls have a height equivalent to two stories and are built in plastered brick masonry. The façades feature relatively large round-arch windows, and an oculus window with geometric wooden tracery decorates the gable wall. The truss roof is of timber construction and spans the width of the building. The roof is presently covered with corrugated metal sheets, but the original roof cover must have been different (probably wooden paneling). Thus, the building combines long-established "low-tech" building materials and techniques with the newly-imported system of the truss roof to produce a large single-floor hall with a single aisle and large clearance, uninterrupted by pillars or posts. As a building type, the truss-roofed hall was already well-known earlier on in the 19th century in Europe and the United States, and by the end of the 19th century it had demonstrably become a common form of factory halls—and particularly of ginning mills—in Egypt. If, as it appears, the truss-roofed hall in Fuwwa dates from the 1850s or 1860s, then this would provide precious evidence for its use in Egypt at this relatively early date.

As a preliminary conclusion, I would therefore claim that between the 1850s and the 1880s, industrial architecture in Egypt began to gradually adapt European building forms, construction techniques, and architectural styles. Local conditions, dependency on local construction workers, and the limited availability or high costs associated with modern building materials like iron and steel made this an uneven process, and resulted in the continued application of older established building techniques, in selective combination with new ones. Thus, new construction techniques were applied in wood, whereas the use of metal elements appears to have remained exceptional. To date, no industrial buildings before the 1890s could be identified that used any of the modern metal construction techniques that were—at least theoretically—available. Considering the limited evidence, however, and with further buildings still to be explored, this initial conclusion might need to be revised.

The 1890s until the First World War: Monumentality at work

In contrast to the previous periods, the two decades before the First World War have left behind an important number of industrial buildings. The architecture of these buildings also became much more closely connected to global developments of industrial architecture, the background of which can only be outlined very roughly here. Generally, as Roger Owen has shown, Egyptian industry developed only slowly during this period. The British-controlled administration, established with the British occupation of 1882, is known to have focused on developing the agricultural sector. Industrial investment was limited to the agro-industries that processed cotton and sugar to be exported as raw materials for industries in Britain and elsewhere. Developing local industrial production was of secondary importance, at best. Whether the British administration under Lord Cromer deliberately obstructed industrial development in Egypt to protect British interests is a controversial issue marked by inconsistencies in the administration's own politics.[46] What is defi-

44 The interior of the factory hall is not accessible, as all doors and windows have been walled up. It cannot yet be ascertained whether this hall incorporates metal construction elements. All the accessible parts of the complex, however, do not show any use of metal elements, and in the one annex where steel girders are found, they are clearly later additions.

45 Khalid 'Azab, "Athar madinatay Fuwwa wa-Rashid fi 'asr Muhammad 'Ali," in Ra'uf 'Abbas (ed.), *Islah am tahdith? Misr fi 'asr Muhammad 'Ali* [Reform or Modernization? Egypt in the Age of Muhammad 'Ali] (Cairo: al-Majlis al-A'la lil-Thaqafa 2000), pp. 573-596, here p. 577. Dating such a ginning mill to the Muhammad 'Ali period does not seem accurate, because mechanized ginning (which required this type of long halls to set up the roller gins in rows) was not introduced until the mid-1850s. More research into this building and its original interior layout is needed before any definitive conclusions may be made.

46 For a discussion of this issue, see, Roger Owen, "Lord Cromer and the Devel-

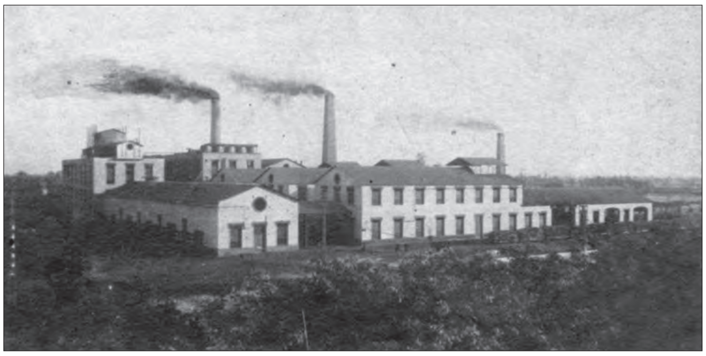


Fig. 22: **Nag' Hammadi, Sugar Factory, 1897; photo from a c. 1899 postcard.**

nite is that the British regime increased cotton and sugar-export production, as well as capital accumulation and the commercialization of land.

However, there was a considerable increase in investment in business and industries by foreigners as well as locals, at least until the Egyptian financial crisis of 1907. This led to establishing new firms and to a process of capital concentration in the hands of what Robert Vitalis has called "landlord-capitalists." These included locals and local foreigners with large agricultural holdings who, often in partnership with foreign capital and business partners, began to invest not only in cotton and sugar processing, but also in import-substitution manufacturing, transport infrastructure, urban services, land development, and banking.[47] The families that took center stage in this period were to play an important role in Egypt's industrial development until the nationalization of the late 1950s. Egyptian Jewish families like Suarès, Cattaoui, Menasce, and Rolo, and Alexandrian Greek families like Salvago, Choremi, and Benaki formed investor coalitions such as the Suarès group and the Salvago group that were involved in almost every major capitalist enterprise in Egypt during that period.[48]

A prominent example of capital concentration at that time is the creation of the giant Société Générale des Sucreries et de la Raffinerie d'Égypte in 1897. Sugar refining was developed through a small number of newly-founded private companies, with the first refinery plant built by the Suarès group in al-Hawamdiyya south of Cairo in 1881. The merger of this enterprise with another Suarès-controlled French-Egyptian sugar company led to the creation of the Société Générale des Sucreries et de la Raffinerie d'Égypte, at the time Egypt's largest industrial concern. They built a new plant in Nag' Hammadi in Upper Egypt in 1898. Also, at the turn of the century and in partnership with the international financier Ernest Cassel, they took over Egypt's remaining nine cane-processing factories as well as sugar estates and a network of light agricultural railways from *al-Da'ira al-Saniyya*.[49] At the present stage of research, not much can be said about the architecture of the sugar refineries that the Société Générale built. The refinery in al-Hawamdiyya still operates today, but could not be accessed. From external observation, however it is clear that the plant has been thoroughly modernized and expanded, and that the original buildings from 1881 have almost certainly disappeared (fig. 21). Of the refinery in Nag' Hammadi, there is at least a turn-of-the-century photograph (used for an early touristic post-card!) that shows the original 1897 factory complex as a vast plot with a regular arrangement of long single-story and two-story halls with relatively large rectangular windows, gable walls, and double-pitched roofs (probably in truss-construction) (fig. 22).[50] In the background are a number of higher blocks with flat roofs and three high chimneys. The architecture is plain and utilitarian, and an example of what may be referred to as late-19th-century "international industrial style." Yet, as we shall see, this plain utilitarian style was not the only one in Egypt at that time.

A wide variety of modern industries developed during this period. In addition to sugar and cotton, there were tobacco and cigarettes, cement and building materials, food products, oil and soap, clothing and textiles, fertilizers, and even mining. With the exception of the export-centered cotton, sugar, and tobacco industries, these industries catered to a growing local Egyptian market.[51] As a result, a considerable number of new factories, and especially larger industrial establishments, were built during this period. The buildings themselves became larger and technically more advanced, allowing them to survive later technical adjustments, which is certainly one reason why many of them still exist today.

The examples presented here show this to be the heyday of the artful application of historicist styles for industrial ar-

opment of Egyptian Industry," *Middle East Studies* 2:4 (July 1966), pp. 293-301; and Owen, *Middle East*, pp. 220-226.

47 Robert Vitalis, *When Capitalists Collide. Business Conflict and the End of Empire in Egypt* (Berkeley: University of California Press, 1995), chapter 1.2.

48 Vitalis, *When Capitalists Collide*, chapter 1.2.

49 *Ibid.*; Owen, *Middle East*, p. 238; and Owen, "Lord Cromer," p. 293.

50 These buildings are very similar to some of the buildings at the al-Hawamdiyya plant. It would therefore appear that the oldest extant buildings at the al-Hawamdiyya plant date from the same period as the Nag' Hammadi plant.

51 Owen, *Middle East*, p. 236.

Fig. 23: **al-Qanatir al-Khayriyya, Salvago Ginning Mill, gate and towers, Antonio Lasciac, 1895.**

Fig. 24: **Salvago Ginning Mill, director's house, Antonio Lasciac, 1895.**

Fig. 25: **Salvago Ginning Mill, guesthouse, after 1895.**

Fig. 26: **al-Qanatir al-Khayriyya, eastern gate tower of the Delta Barrage, 1862.**

Fig. 27: **Salvago Ginning Mill, main ginning hall with workshop block, c. 1890.**

Fig. 28: **Salvago Ginning Mill, main ginning hall, interior view; the main floor has been removed, rendering the substructure that used to support it visible.**

chitecture in Egypt. It was also during this period that professional architects began to play a more prominent role in designing industrial buildings. Moreover, these buildings, built for powerful capitalist investors and corporations, give evidence of the rise of what I would call "corporate monumental architecture." Such use of monumental architecture by private enterprises constituted a novel and even revolutionary phenomenon, for until then, monumental architecture had been the prerogative of the rulers and the state. These structures are a visual manifestation of the new power and self-confidence of private capital in Egypt.

The buildings of the Salvago ginning mill, a large plant built in the late-19th century by the Salvago Group at the Delta Barrages (al-Qanatir al-Khayriyya) in the Qalyub district north of Cairo provide a good example of this architecture (figs. 23-30). The mill is conveniently situated on a vast rectangular plot, bound by the Nile to the west and a nearby railway line to the east, with ample open space for the storage of cotton bales. Nationalized in the late 1950s, the mill was operative until the mid 1990s, when it was closed down and subsequently stripped of most of its equipment. In the 1930s, when it was owned by the Associated Cotton Ginners of Egypt Ltd., it operated 148 roller gins, two hydraulic presses, and a steam press, and was one of the largest ginning mills in the country.[52] This was probably also true at the time when the mill was first built.

While the precise date of construction for the mill building has not yet been established, the completion of the administrative and gate buildings can be precisely dated to 1895, by means of a photograph from that year. They were designed by no one less than Antonio Lasciac, a Slovenian with Austro-Hungarian citizenship who was active in Egypt since 1883, and who served as chief architect of the Khedival palaces under 'Abbas Hilmi II from 1907 until 1914.[53]

The administrative buildings and the gate building of the Salvago ginning mill are outstanding examples of a Picturesque variation of the Castle Style. They form a loosely-connected chain of buildings along the western side of the mill complex, overlooking the Nile and the Delta Barrages. The most striking elements are the three towers of different height and shape, built in red brick with sandstone elements, all complete with a playful combination of buttresses, arched windows, crenellations, arched cornices, battlements, corner turrets, and little connecting bridges built in a neo-Gothic vocabulary. Between two of the towers, a gate with a large pointed arch, battlements, and chain slits (for a nonexistent drawbridge) once gave access to the compound. In the second row, three administrative and residential buildings feature similar neo-Gothic details in their windows, with stone mullions, blind arches and niches, battlements, and wooden verandahs. The northernmost building of the three—the guesthouse—was built later than 1895 (it is missing in the 1895 photograph), but largely follows the model of the other buildings in its decorative details (fig. 25). It is important to remark that, from what we know, this was the only building project in an industrial context that Lasciac ever designed in Egypt. His usual fields of activity were commercial and apartment buildings, villas, and palaces. Indeed, one of the buildings at the Salvago mill was a small "villa" for the director, which may have led Lasciac to accept this exceptional project (fig. 24). His choice of the Castle Style may have been extravagant, but not at all random. The towers and gate of the Salvago mill clearly echo the nearby gate towers of the Delta Barrages, which were completed in 1862 and evidently served as Lasciac's main inspiration and reference (fig. 26). As the structures are within eye-shot of each other, the effect is impressive.

Dating the remainder of the buildings within the compound is a more complex exercise. While the ginning mill building itself probably predates Lasciac's administrative buildings by a decade, there are numerous annexes and auxiliary buildings, some contemporary with the main building, others added later, during the 20th century. This composite, piecemeal construction is typical for many industrial complexes in Egypt. The main building—the initial core of the plant—deserves attention as an example of a long, single-aisle hall in plastered brick masonry with a double-pitched roof in timber-truss construction. The roof trusses are structurally reinforced by iron tie rods. Light and air are provided through segmentally-arched side windows with iron sash bars and a monitor along the roof. The building shares the characteristic features of ginning mills in Egypt: the lofty and airy ginning hall is elevated on a substructure of low parallel walls with arched openings that run the length of the build-

52 *Annuaire général de l'industrie égyptienne 1938* [General Yearbook of Egyptian Industry], 1st ed. (Alexandria: Imprimerie A. Procaccia, 1938), p. 90.

53 For a brief biography of Lasciac, see Mercedes Volait, *Architectes et architectures*, p. 434. The 1895 photograph of the Salvago mill was published in *Da Gorizia all' impero ottomano: Antonio Lasciac, architetto. Fotographie dalle collezioni Alinari* [From Gorizia to the Ottoman Empire: Antonio Lasciac, Architect. Photographs from the Alinari Collection], exhibition catalog ed. by Ezio Godoli (Florence: Fratelli Alinari, 2006), p. 62. The photos of this collection were taken purposefully to document Lasciac's buildings when they were under construction or about to be finished.

ing along the ground-floor (fig. 28). These walls served to carry the wooden main floor (which in the case of the Salvago mill has been removed), and bear the weight of the gins, which were positioned in a continuous row. The ground floor formed by this substructure also contained the seed channels (for carrying off the extracted cotton seeds coming from the gins above) and parts of the driving mechanism for the gins.[54] Other ginning mills surveyed feature the same basic layout, as with the Barakat mill in Damanhur (fig. 29). But the Salvago mill is particular in that it is actually a twin mill: the unusually long main building consists of two ginning halls with a compartment for the steam press in between.

At the western end of the hall is a four-story block with rows of segmentally-arched windows and a hip roof. All four floors, built of timber floor construction supported by cast-iron columns on the ground floor and timber posts on the upper floors, served as repair workshops. Annexes are located at the northwestern side of the ginning hall, and these still contain the steam boiler, a steam engine with an integrated electric generator (made by the Swiss company Oerlikon in 1902), and a diesel engine. The engine hall has a timber-truss roof identical to the roof of the main ginning hall, and the floors are constructed on flat brick vaults set between iron beams—providing an example of the jack arch system that became more common in Egypt at the end of the 19th century. The boiler hall is flanked by a brick chimney of decorative design, featuring a cubic base with corner pilasters and a string course in dressed stone, a long octagonal brick shaft, and a tip with broad rounded molding in dressed stone. The chimney was later reinforced with concrete bracings, which disguise its original ornamental design (fig. 30).

This and other details actually point to a number of alterations affecting the building façades. Masonry details visible at damaged spots of the plaster, and a Tuscan capital that is still visible in a hidden corner of the façade, suggest that the four-story block and possibly also the ginning halls were once externally decorated with pilasters and string courses. The present shape of the façades, with their grid of plain horizontal and vertical bands, appears to be the result of renovation work dating to the later part of the first half of the 20th century. That the main factory buildings were originally designed in a more richly-decorated historicist style is also evident from the ornamental wood-cut lambrequins that

Fig. 29: **Damanhur, Abdel-Meguid Barakat Ginning Mill, early-20th century; interior view showing the original wooden floor and roller gins of the mill, which is still in use.**

Fig. 30: **Salvago Ginning Mill, chimney with the subsequently-added concrete bracing.**

54 For an early-20th-century description of ginning mills, see Moritz Schanz, *Cotton in Egypt and the Anglo-Egyptian Sudan* (Manchester: Kessinger Publishing, 2007 (1912)), pp. 87-91.

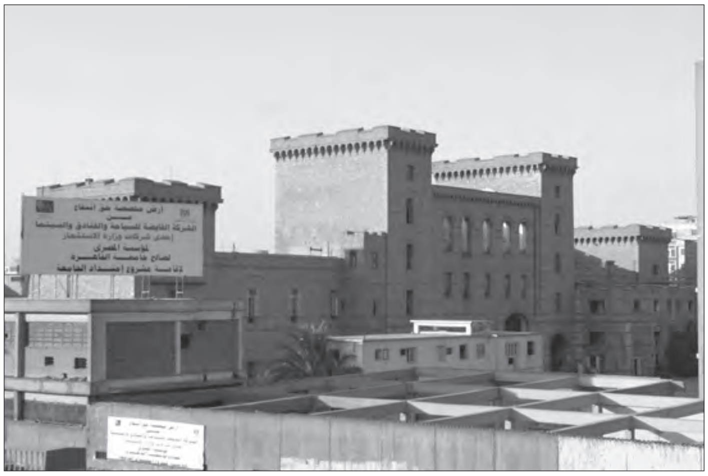


Fig. 31: **Giza, S.A. Brasserie des Pyramides Brewery (later al-Ahram Beverages Company), c. 1900.**

Fig. 32: **S. A. Brasserie des Pyramides Brewery, view of western annex and central block.**

have survived along the edges of the monitor roofs. Although not totally evident from what survives today, it still is clear that Salvago and his architect originally devised a factory that was not just a utilitarian structure, but also a symbol of wealth and power. Whether these buildings were also designed by Lasciac remains to be determined.[55]

As the above description shows, the Salvago buildings made significantly more use of iron elements, e.g., iron sash bars, cast-iron columns, iron beams, and iron stairways, than earlier industrial buildings identified in this survey. This indicates that such prefabricated industrial materials—whether imported or locally produced—were gaining increasing currency in Egypt's factories at the end of the 19th century.

55 The style of the main mill buildings is not typical of Lasciac's work.

A second example of "high" industrial architecture with an even more pronounced monumental character is the al-Ahram (or the so-called Stella) brewery in the Bayn al-Sarayat neighborhood of Giza (figs. 31-33). This plant was erected at the beginning of the 20th century on a vast plot formerly occupied by the palace and gardens of Prince Hasan Pasha.[56] The founder of the plant was the Belgian-Egyptian Société anonyme Brasserie des Pyramides, established in 1898 under the directorship of Chakour Pacha, L. Carton de Wiart, Alfonso Colucci, and J. Debome, and run with mainly Belgian capital, equipment, and know-how.[57] Later transformed into the Bomonti & Pyramids Beer Company, in 1953 it was renamed al-Ahram Beverages Company, retaining the Arabic word for pyramids. Throughout this time, its most famous product was Stella beer. A holding company currently owns the plant; it is no longer in use, has been stripped of its equipment, and is awaiting an unclear fate.

Although no information about the designer of this plant has been found yet, it appears that, as was the case with the Salvago ginning mill, he was an architect. The main building of the original plant—as far as is discernible from among later additions—is a broad, almost symmetric composition of cubic masses stretching along an east-west axis. It consists of a three-story central block flanked by lower two-story blocks on either side. A pair of rectangular towers with battlements frames the central block, and two similar, but lower, towers flank the building at both ends, giving the plant a monumental fortress-like appearance. This character is enhanced by the rubble-stone masonry combined with horizontal courses of brick, the shallow arched niches articulating the façades, and the use of battlements projecting on arched corbels similar to machicolations. When viewed in combination with the superimposed rows of rectangular and arched windows in the central block, the whole building looks like a crossover between Byzantine palace and Tuscan castle architecture. In an intriguing contrast to its leisure and entertainment-related products, the plant's overall posture is serious, austere, and "self-important," especially when compared to the Picturesque Salvago factory. This ambitious gesture is

56 The palace is shown on the *Plan général de la Ville du Caire et des environs*, published by the Ministry of Public Works in 1897. The *Indicateur égyptien* of 1908 shows the brewery in this location; see *Indicateur égyptien 1908*, ed. Stefano Poffandi (Alexandria: Imprimerie générale A. Mourès & Co., 1908), p. 92.

57 *Indicateur égyptien*, p. 92. Regarding the history of the company, see Samir Raafat, "Stella's Grandpa, 1897-1947," originally published in *Egyptian Mail*, Saturday, June 14, 1997; available online at http://egy.com/historica/, accessed June 2010.

underlined by the fact that, in its early years, the brewery must have been conspicuously higher than the remaining Khedival palaces in the neighborhood. It was, and still is, a landmark building.

As the interior of the buildings could not be accessed yet, it is difficult to assess their internal constructional features and functional layout. Of great interest, however, is the reinforced-concrete floor construction of the central block's lower floors. If these are the original floors (which is very possible, but needs substantiation), then their shape and some of their exposed hoop-iron stirrups would indicate that this is one of the early examples in Egypt of concrete construction in the Hennebique system, which was patented in 1892 by François Hennibique, and is considered a precursor to the modern reinforced concrete method of construction. It also would be the earliest known example of its use in industrial architecture in Egypt.[58]

Historicist designs of high quality—probably by architects—were not limited to private-sector factories or corporate architecture. They are found as well in railway buildings and workshops such as the railway telegraph stores in Cairo's Sabtiyya district, built in the first decade of the 20th century (figs. 34-35). The buildings combine austere façades of undressed stone and brick along the street with ornamental plaster façades towards the interior of the site, especially on the northern side of the rectangular building, where the office rooms are located on two floors.[59] The remainder of this building is an early example of a large hall with a north-light roof in metal construction. This was a novel roofing type for industrial buildings in Egypt that allowed for larger covered surfaces with sufficient lighting and ventilation. Although earlier examples still need to be identified, it is clear that north-light or saw-tooth roofs were increasingly applied in numerous variations in subsequent decades.

Fig. 33: **S. A. Brasserie des Pyramides Brewery, close-up view of central-block facade.**

Another one of the many examples of historicist designs, this time in public works, is the old pump house for the Giza waterworks, reportedly built in 1896 (fig. 36). It is an elegant cubic neo-Renaissance building in red-brick masonry combined with ornamental yellow stone elements, and covered with a metal-truss roof.[60] The choice of a neo-Renaissance vocabulary was more common for residential buildings, but rather exceptional for an industrial structure, and might be

58 There are a few references to the use of the Hennebique system around the turn of the century in Cairo. The contractor Nicola Marciano, who worked with Antonio Lasciac on the construction of the palace of Prince Sa'id Halim (1896-1899), is known for being the first to build in reinforced concrete and for being the local agent for the Hennebique system. See, Marco Chiozza and Silvia Bianco, "Antonio Lasciac: Architettura e identità," in Ezio Godoli (ed.), *Da Gorizia all' impero ottomano*, p. 22. The same Marciano is said to have built the reinforced-concrete cupola of Cairo's Egyptian Museum (1896-1899); and the Hennebique system was amply used in the construction of the Heliopolis Palace Hotel (1905-1908)—a result of cooperation between the Belgian industrialist Edouard Empain, the Belgian architect Ernest Jaspar, and the construction firm Padova, Rolin & Cie. (See, Anne van Loo, "Ernest Jaspar à Héliopolis, 1905-1916," in Mercedes Volait (ed.), *Le Caire - Alexandrie: Architectures européennes, 1850-1950* (Cairo: CEDEJ/IFAO, 2004), p. 124. The spread of concrete construction was also facilitated by the gradual establishment of cement factories in Egypt, the first being the factory of the Belgian firm Société anonyme des ciments d'Égypte in Masara south of Cairo, founded in 1900. It is possible that this Belgian connection played a role in the use of reinforced concrete for the al-Ahram brewery.

59 The 1897 *Plan général de la Ville du Caire et des environs* shows an empty plot in this location. The 1914 Cairo map of the Survey Department (see, Marcel Clerget, *Le Caire: étude de géographie urbaine et d'histoire économique [Cairo: A Study of Urban Geography and Economic History]*, 2 vols. (Cairo: Schindler, 1934), vol. 1, map 4) shows the buildings and identifies them as "Telegraph stores."

60 The building is shown in the 1897 *Plan général de la Ville du Caire et des environs*. The date 1896 was given by the manager of the plant during the site visit, but still needs to be confirmed.

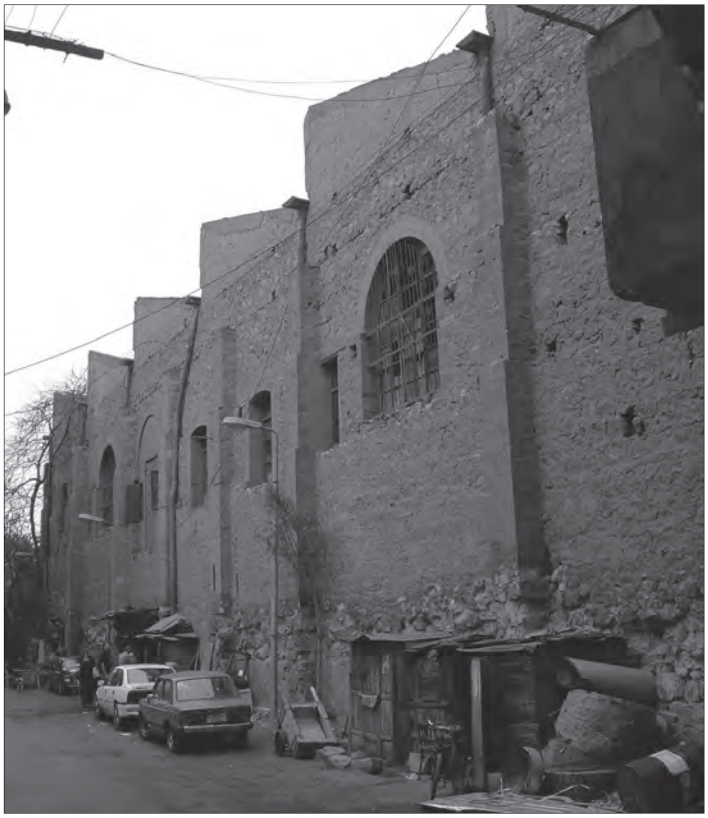


Fig. 34: **Cairo, Sabtiyya District, Railway Telegraph Stores, beginning of the 20th century; view of the western street facade.**

Fig. 35: **Railway Telegraph Stores, view of northern facade.**

connected to the water-works' proximity to the Giza palaces and gardens.

While the buildings described above may all be classified as examples of "high architecture," a leather tannery on Majra al-'Uyun Street in Cairo's 'Ayn al-Sira neighborhood provides a vernacular example of industrial architecture from this period (fig. 37). Because of the grand slaughterhouse located in the vicinity, this area became a preferred location for leather processing industries in the late-19th century. The leather tannery described here was built in 1907.[61] It is a long, relatively plain two-story building with two internally-separated blocks flanking a central gateway. The masonry technique used here—rubble-stone masonry combined with brick and / or ashlar masonry for the corners as well as for the door and window frames—is identical to that used in the al-Ahram brewery and the railway telegraph stores, and may be considered characteristic of the period. Also noteworthy is the ample use of iron double-T beams for the window lintels as well as for the jack arch floors and ceilings of most rooms. This modern technique, however, stands in peculiar contrast to another ceiling type found in the building's large upper-floor hall, where cast-iron columns carry a simple framework of double-T steel girders as a substructure for an almost "primitive" ceiling built from roughly-sawn timber joists, wooden panels, and a top layer of mud— the same materials and technique used in factories from the Muhammad 'Ali period. In contrast to the "high-architecture" buildings described above, this example illustrates the combining of advanced and rather primitive construction methods that characterized vernacular industrial buildings of the period.

Regarding vernacular forms of industrial architecture, there is a particular arrangement that became popular in Egypt from the early 20th century onward. It might be referred to as the "*'ambar* with street façade" arrangement, and combines a decorative street façade (its architectural style depending on the time of construction as well as on the preferences of the clients and builders) with a *'ambar* (the local term for a single-story workshop hall) of plain utilitarian design covered either by a truss or concrete roof. This arrangement, ubiquitous throughout the cities of Egypt, is found in various sizes, and is incorporated in a wide range of building types, whether large railway stations and warehouses, or carpenters' workshops and car garages. One of the numerous examples found through this study is the Spiro-Spathis soft-drink factory in Cairo's Bab al-Hadid district south of the Ramsis Railway Station, in what today is part of Downtown Cairo (figs. 38-39). Initially built in the first decade of the 20th century, it was reportedly purchased by the Greek entrepreneur Spiro Spathis in the 1920s, after which

61 This is according to a document shown to us by a member of the family that owns the building and who still has an office in it.

Fig. 36: **Giza, Waterworks, pump house, 1896.**

Fig. 37: **Cairo, 'Ayn al-Sira District, Leather Tannery on Majra al-'Uyun Street, 1907.**

Fig. 38: **Cairo, Bab al-Hadid District, Spiro Spathis Soft-Drinks Factory, first decade of the 20th century; view of street facade.**

Fig. 39: **Spiro Spathis Soft-Drinks Factory, interior view of the 1926 addition showing stone columns and monitor roof.**

the building was obviously altered and enlarged towards the rear.[62] The original façade is of plastered brick featuring neo-Classicist decoration, and behind it is a rectangular hall with brick walls and two rows of stone pillars carrying double-T girders as a bearing structure for what today is a flat reinforced-concrete roof with a monitor above the central aisle. The ground floor is taken up by mixing and filling machines and by storage space, while offices and laboratory rooms have been inserted as mezzanines in the front and central parts of the building.

The examples shown demonstrate that even though the period from the 1890s until the First World War is considered one of relatively slow industrial growth, industrial architecture in Egypt then experienced very important, almost revolutionary developments. These include the introduction and popularization of new materials, construction techniques, and building types that were to determine future developments for decades to come. Also important is the appearance of "high-architecture" plants, and the increasing use of industrial buildings as a conscious means of public self-representation by companies and entrepreneurs. This new effort not only found material expression in the design of the buildings, but even in the use of factory building images on postcards, as in the case of the Nag' Hammadi sugar refinery. In-

62 This chronology is based on information provided by a daughter of Spiro Spathis.

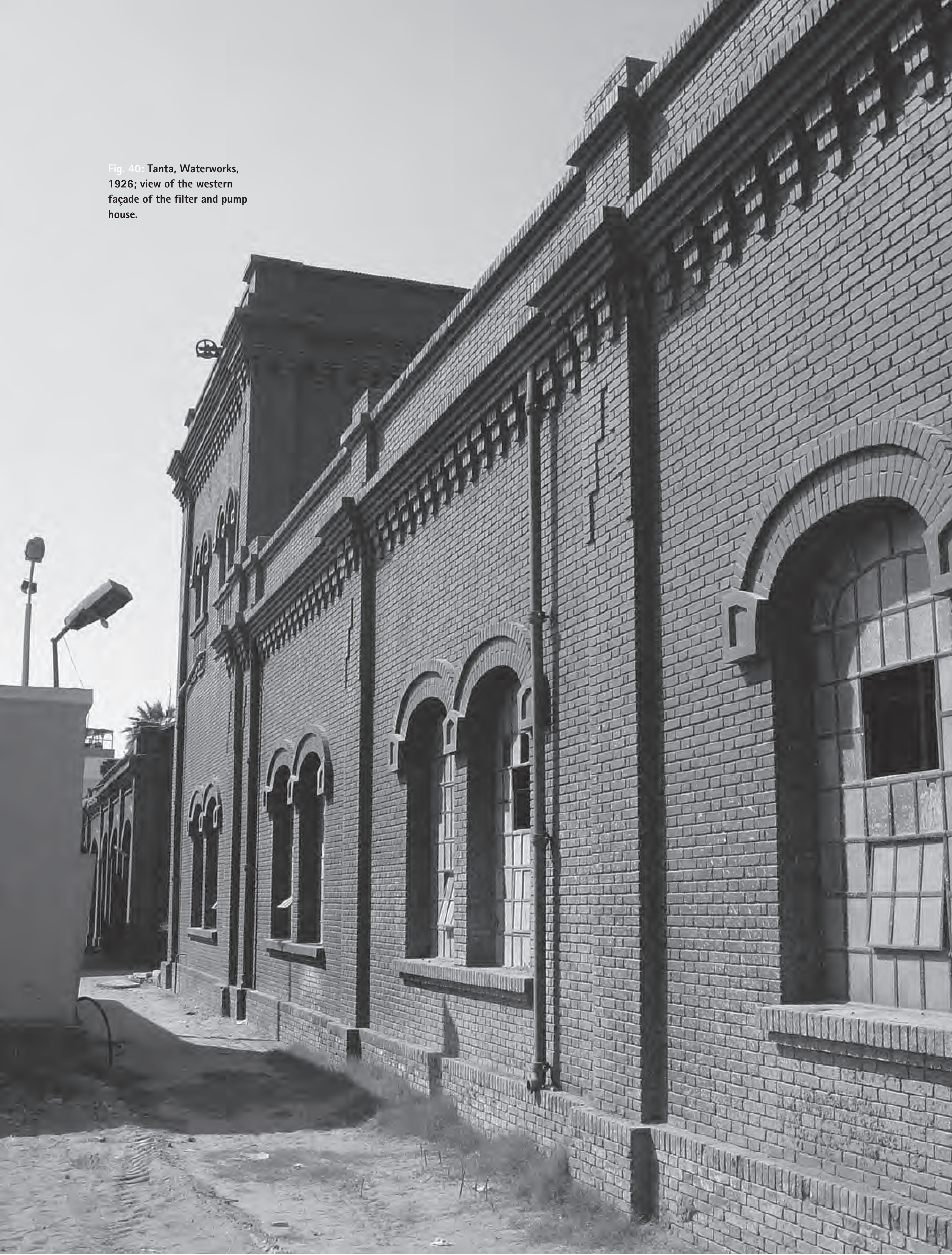


Fig. 40: Tanta, Waterworks, 1926; view of the western façade of the filter and pump house.

dustrial architecture in Egypt had moved out of the margins to take a more central and self-confident position in architectural production and public perception.

1914 to 1956: Modernism and the factory as a machine

The First World War had a stimulating effect on Egypt's industrial development. The limited availability of imports and capital from Europe, together with the increased presence of British troops, triggered a higher demand for local production. After the end of the war, the independence movement of 1919 and the British declaration of a (formally) independent Egypt in February 1922 led to the establishment of a constitutional government under the Wafd Party in 1923. The new leadership was composed not only of the administrative and professional elites formed during the period of British colonial rule, but also of wealthy landlord-capitalists of the pre-war period in addition to some newcomers who had gained their wealth only recently from wartime opportunities and were keen on investing in the industrial sector.[63]

The 1918 report of the Sidqi Commission on Commerce and Industry (initiated by two influential newcomers, the politician Isma'il Sidqi and the businessman Tal'at Harb) had for the first time identified economic and industrial development as a major element in the struggle for national reform and independence. As a result, a peculiar mixture of high-flying nationalist aspirations and straightforward business interests worked together to provide a framework of political, institutional, and financial support for the development and diversification of local industries. In 1920, Bank Misr was established under the leadership of Tal'at Harb, with the aim of raising Egyptian capital for developing Egyptian enterprises, and to curtail the dominant role of foreigners and local foreigners in banking, commerce, and industry. In 1922, a law governing industrial loans was enacted. The same year saw the foundation of the Association of Industries, later renamed the Federation of Egyptian Industries. In view of the role of nationalism in the political discourse of the day, it is important to note—as Robert Vitalis points out—that the membership of the Association comprised not only Egyptians, but equally involved "local foreigners" like Salvago and Suarès, and foreigners like Baron Empain. The Association thus served as a platform for the local oligarchy of entrepreneurs

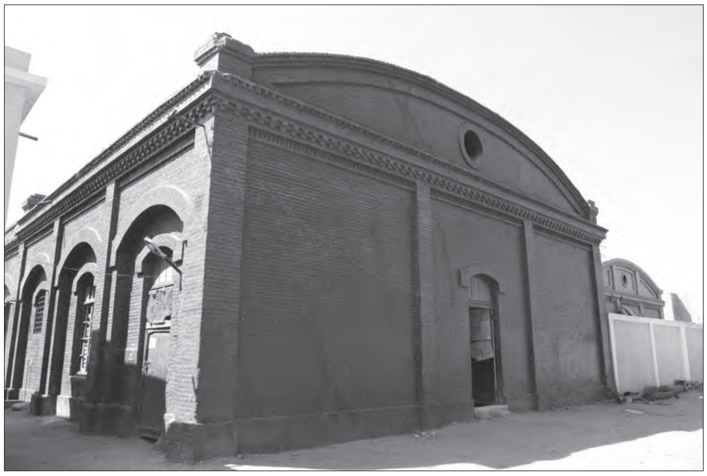


Fig. 41: **Tanta Waterworks, ice factory.**

to monitor developments, mediate tensions, encourage collaboration between competitors, preserve privileges and monopolies, and secure cooperation in the face of rising labor militancy. It is also important to note that, as a matter of course, personal business interests and recourse to foreign capital and transnational business partnerships—whether obvious or behind the scenes—continued to play a role in the industrial endeavors of both the so-called "nationalist" and the so-called "comprador" businessmen alike until the 1950s.[64] In the eyes of a contemporary Marxist observer, Tony Cliff, Egypt's industry came to be fundamentally characterized by its concentration of enterprises, a tightening mutual dependence between them, the rule of finance capital, a large share of foreign capital, and the merging of finance capital with the state.[65]

The industrial growth of the period is reflected in the size of the industrial labor force, which rose from a rather insignificant quarter of a million in 1919 to over one million in

63 P.J. Vatikiotis, *The History of Modern Egypt: From Muhammad Ali to Mubarak*, 4th rev. and enl. ed. (London: Weidenfeld & Nicolson, 1991), pp. 255-256 & 261.

64 For a critical overview of developments from this period that also discusses the controversial issue of the construed juxtaposition of Egyptian national(ist)s versus foreign capitalists, see Vitalis, *When Capitalists Collide*, esp. chapter 1.2.; and—more generally—Robert Owen and Şevket Pamuk, *Middle East Economies in the Twentieth Century* (London: I.B. Tauris, 1999), chapter I.2. Regarding the role of foreign capital, see also, Farghali Tusun Haridi, *al-Ra'smaliyya al-Ajnabiyya fi Misr (1937-1957)* [Foreign Capital in Egypt], 2 vols. (Cairo: al-Hay'a al-Misriyya al-'Amma lil-Kitab, 2002). For a contemporary official perspective, see, "Egypt's Industrial Expansion (by the Ministry of Commerce and Industry)," in Demetrius A. Zoides (ed.), *Egypt Today: Its Finance, Industry, and Commerce* (London: Bemrose, 1939), pp. 90-93.

65 Tony Cliff: "Industry and Banking in Egypt" (1946), first published in Tony Cliff, *International Struggle and the Marxist Tradition, Selected Works*, vol. 1 (London: Bookmarks, 2001), p. 1; available online at http://marxists.org/archive/cliff/works/1946/arabeast/egypt.htm, accessed June 2010.

Fig. 42: **Tanta Waterworks, ice factory, overhead view of the cylindrical "shell" roofs.**

Fig. 43: **Tanta Waterworks, interior of the filter and pump house.**

1939, and to almost two million in 1952.[66] Since many of the factories established during the period were highly mechanized, this growth must also be explained by the sheer number of new industrial establishments and the expansion of existing ones. In any case, many of the industrial buildings examined for this study date from this period. They clearly constitute the bulk of Egypt's industrial heritage, and count among them some very impressive and elegant designs.

In terms of architectural development, the period was generally marked by what Mohammad Awad has called the transition "from historicism to modernity," or as I would prefer, from historicism to modernism.[67] This may be even truer for industrial architecture than for the residential, commercial, and public buildings for which this expression was mostly intended. This survey indicates that in factory architecture, the use of historicist styles continued until the late 1920s, when it began to be replaced by pronouncedly-modernist vocabularies—including variations of the International Style, with occasional Art Deco influences that may be observed until the 1940s.

The continuation of historicist styles through the 1920s and even into the early 1930s may be illustrated by two examples. The first is the waterworks of Tanta, a city in the Gharbiyya district of the Delta (figs. 40-43). According to a surviving marble plaque, they were built in 1925 by the *muhandis* (engineer or architect) Muhammad 'Irfan Bey and the building contractor Taverna. Muhammad 'Irfan had studied in Birmingham before the war, and later taught urban planning and municipal engineering at Cairo's Polytechnic School (later incorporated into Cairo University as its Faculty of Engineering). Between 1925 and 1929, he headed the Administration of Municipalities and Local Commissions.[68] Whether he or the contractor Taverna should be considered the actual architect of the waterworks, remains unclear. The complex is mainly composed of three long buildings, two parallel to each other on the northwestern end of the plot, and one in the southeastern extension, running alongside a row of circular sedimentation tanks. All buildings are built in red-brick masonry with façades featuring decorative brick elements like pilasters, arched windows, blind arches, and projecting cornices. While the use of a historicist style was conventional then, the novelty of these buildings lies in their innovative roof construction. The two parallel halls in the northwest (one of them once was an ice factory, but the initial function of the other could not be clarified yet) are covered by long cylindrical shell roofs of reinforced concrete, with arched concrete ribs projecting on the outer and inner side of the shell, and iron tension-rods connecting the ends of the ribs in the interior of the hall. Although technically this is not truly

66 Even against the backdrop of accelerated population growth (9.7 million in 1897, 15.9 million in 1937, and over 20 million in 1957), this increase in industrial labor force remains considerable. For the numbers, see, Vatikiotis, *History of Modern Egypt*, pp. 315 & 326.

67 Mohammad Awad, "From Historicism to Modernity (the Inter-War Period, Alexandria 1918-1939): The Italian Connection," in Ezio Godoli and Milva Giacomelli (eds.), *Architetti e ingenieri italiani in Egitto dal diciannovesimo al ventunesimo secolo / Italian Architects and Engineers in Egypt from the Nineteenth to the Twenty-First Century* (Florence: Maschietto Editore, 2008), pp. 141-151.

68 On 'Irfan, see, Volait, *Architectes et architectures,* pp. 287 & 417.

a shell structure, but a barrel-vaulted roof supported by integrated concrete-and-iron trusses, this solution was nevertheless experimental within the Egyptian context, and advanced even within an international context.[69] The third building in the southeastern extension, which still serves its original function of a pump and filter-house, is structurally less extraordinary and represents standard features of the period: the two-story tower-like pump-house contains a reinforced-concrete framework of column and girder-supported slabs; the attached long and narrow filter hall has a mezzanine floor in steel-framework construction and a steel-truss pitched roof.

The second example, the generator hall in Tanta, in fact originally belonged to the city's waterworks complex described above and is located on an adjacent plot further north (fig. 44).[70] The building— which has been decommissioned—is simply referred to as *wabur al-nur*, a term that literally denotes a steam engine for electricity production, and by extension the building that houses it. With the electrification of Egyptian cities in the early 20th century, such generator halls appeared as a new building type. Examples—usually built in historicist styles—are also found in Cairo's Shubra district and in al-Mahalla al-Kubra. The generator hall of Tanta stands out among these buildings as an example of striking monumentality and beauty. Built in 1931, the rectangular hall of red brick masonry with a pitched steel-truss roof is structurally conventional. But the use of elements like the large corner pillars framing the gabled façade, the enormous brick arch with its large yet plain keystone, the "oversized" but simplified cornice with dentils and a frieze of blue ceramic tiles, or the pair of pilasters with Art Deco pinnacles that dominate the center of the western façade looking onto the main road, all produce a building that hovers between machine hall and temple architecture. It is, at the same time, reminiscent of mid-16th-century Renaissance shipyard buildings like the Medici arsenals in Pisa, and the monumental late-18th-century Classicism of a Claude-Nicolas Ledoux or Friedrich Gilly. The conspicuous use of Art Deco elements, though, announces a move towards Modernist architecture

Fig. 44: **Tanta, Generator Building, 1931.**

that was fully underway when the generator hall was built.

The identity of the architect who designed this admirable structure unfortunately has not yet been established.

A crucial factor in the development of industrial architecture during this period was the increasing involvement of professional architects. They were often Egyptians or Syrian migrants to Egypt, many of whom were trained abroad and served as vectors for the introduction and adaptation of new techniques and architectural fashions in Egypt. The growing engagement of Egyptian architects is documented by illustrated articles on factory buildings published in the Egyptian architectural journal *al-'Imara* ("Architecture"), an Arabic-language publication that first appeared in 1939.[71] The (admittedly few) factory buildings presented in this journal are all examples of Modernist and functionalist architecture which the journal emphasized, but also reflect the practical dominance of this approach over industrial architecture from the 1930s onward. The Cairo and Zürich-trained architect Sayyid Karim (a.k.a. Kurayyim, the founder and editor of *al-'Imara*), and even more so, the Cairo and Liverpool-trained 'Ali Labib Gabr, both famed architects of the Egyptian Modernist movement, must be mentioned as important contributors to Egyptian industrial architecture of the period who made ample use of the journal to publicize their work, and who as teachers at the Engineering Faculty of Cairo Univer-

69 Regarding the development of actual cylindrical shell roofs, which were first used in 1906 in Germany, and gained wider usage beginning in the late 1920s, see, Peter Morice and Hugh Tottenham, "The early development of reinforced concrete shells," in Mike Chrimes, Dawn Humm, and James Sutherland (eds.), *Historic Concrete: background to appraisal* (London: Thomas Telford, 2001), pp. 165-175, esp. pp. 170-172.

70 While the waterworks still belong to the Tanta Water Company, the generator hall is at present owned by the regional electricity company Shirkat Janub al-Delta.

71 On this journal and the background of the editors and authors—most of whom had received their training in architecture or civil engineering in Europe—see Mercedes Volait, *Architectes et architectures*, p. 295; and, by the same author, *L'architecture moderne en Égypte et la revue al-'Imâra (1939-1959)* (Cairo: CEDEJ, 1988).

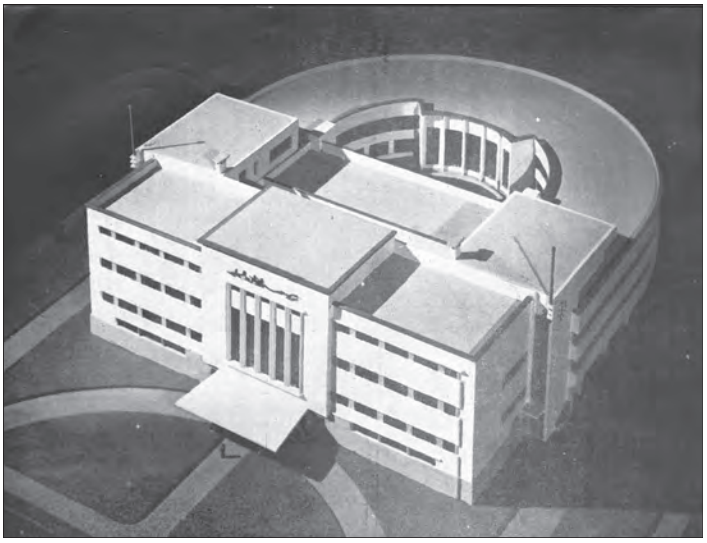


Fig. 45: **Proposed design for the Misr Factory for Tobacco and Cigarettes, Sayyid Karim, 1941.**

sity also influenced numerous future architects.[72]

As illustrated by a 1941 article by Sayyid Karim on the building he planned for the Misr Factory for Tobacco and Cigarettes (figs. 45-46), the turn to Modernism was not just one of aesthetic choices, but also of planning concepts (although it remains to be determined as to how far this was really a change in the planning process rather than a change in how this process was discursively framed). Karim's article was the journal's first to present a factory building, and therefore takes a programmatic tone. It proclaims that architects have left behind their former image of "artists" and have taken over the task of designing factories, which was hitherto the domain of engineers. "Designing a factory," he continues, "is like designing a machine," and he substantiates this by a series of plans of his tobacco factory that include flowcharts rendering the movement of raw material and products through the plant. The design anticipates future extensions in line with the processing flow, and with attention to the spatial separation of the movements of goods, workers, management staff, and visitors.[73] In addition to the explicit concern for a functional layout, the design implicitly shows other concerns. The symmetric administrative block at the front, with its elevated central part featuring a large window front with pillars resembling a portico, a flying roof over the main entrance, and a semicircular driveway in front of it, may be interpreted as a Modernist translation of the *corps de logis* of a palace—a new form of the already-observed public display of corporate power and identity. The building's pronouncedly Modernist look, with its continuous horizontal window ribbons and the semicircular workshop structure to the rear of the administrative block, communicates images of progress, of a technologically-advanced culture, and of active participation in the modern world. Finally, the inclusion of an employee clubroom on the central block's upper floor, right above the second-floor reception and exhibition space, also speaks of an interest in social reform—at least in the provision of services to employees. All these were aspects of the modern industrial identity that factory buildings in Egypt now came to represent.

In this context, it is interesting to observe that the architectural styles commonly associated with the Egyptian nationalist movement and their identity politics during this period, namely the neo-Mamluk and neo-Pharaonic styles, played no role in industrial architecture—despite the fact that industrial development was a key element in nationalist politics.[74] A tentative explanation for this apparent discrepancy might be that the Egyptian architects hired by Egyptian industrialists for building their factories had at this point already appropriated the Modernist style as their own, and considered it the most appropriate and fitting style for Egypt, especially for its factories. Even pronouncedly-nationalist businessmen like Tal'at Harb, who gave the name "Misr" (Egypt) to most of his enterprises, seem to have been in full agreement—as illustrated by the above-described Misr Factory for Tobacco and Cigarettes, or the giant Misr Spinning and Weaving Company in al-Mahallat al-Kubra, which was founded in 1927 and whose original buildings and numerous later extensions were all designed by 'Ali Labib Gabr along Modernist lines (fig. 47).

A few examples shall serve to illustrate the trends of the period. At a smaller scale, there are the extensions to the ginning mill of Abdel-Meguid ['Abd al-Majid] Barakat in the Delta city of Damanhur (figs. 29 & 48-49). They were built after the older ginning mill was purchased by Abdel-Meguid's father, Ibrahim Barakat, in 1934. Not all extensions of the period have survived (a cotton weaving mill built in 1935 was recently demolished), but what is left shows a clear taste for Modernist design. The director's villa at the western end of

72 For short biographies, see Volait, *Architectes et architectures*, p. 412 ('Ali Labib Gabr) and p. 421 (Sayyid Karim / Korayem).

73 Sayyid Karim, "Masna' Misr lil-Dukhkhan w'al-Saga'ir / Fabrique de tabak et de cigarettes Misr," *al-'Imara*, no. 1 (1941), pp. 9-16.

74 One notable exception is the waterworks in Kafr al-Zayyat belonging to the Ministry of Irrigation, which are designed in a remarkably plain and austere neo-Pharaonic style. The complex apparently dates from the first quarter of the 20th century.

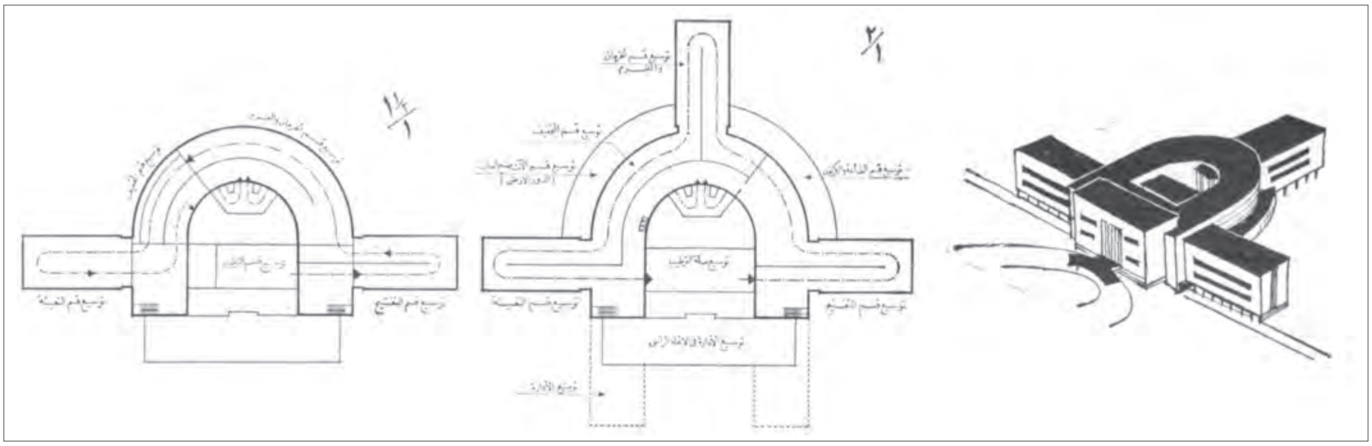


Fig. 46: **Proposed design for the Misr Factory for Tobacco and Cigarettes, drawings showing anticipated extensions.**

Fig. 47: **al-Mahalla al-Kubra, Misr Spinning and Weaving Company, 'Ali Labib Gabr, 1927 and later; bird's-eye illustration used for a 1939 advertisement.**

the plot is an Art Deco design of the mid 1930s.[75] In the mid-1940s, a Modernist, long two-story building was erected along the curve of the plot's western and northern boundaries, with shops on the ground floor (accessible from the street) and housing units for employees on the upper floor. Including a director's villa on the factory site was not unusual during this period, especially in cases where the owner lived elsewhere (Ibrahim Barakat, for instance, was a resident of Alexandria), and thus needed to be present at the factory for certain periods or seasons, and also required appropriate space for receiving business partners and clients.[76] Such villas are therefore more likely to be found in connection with factories located in areas outside the main urban centers of Cairo and Alexandria.

Housing for employees also came to be an element of increasing importance during the period. The units at the Barakat ginning mill contain a number of two- and three-room apartments with bathrooms, as well as single-room apartments with shared sanitary facilities, all accessed from an open balcony running along the length of the building. In

75 A photo from before the additions carried out in the 1930s shows a villa in this location, which was either replaced by the present building or was heavily refashioned.

76 Another contemporary example is 'Abbud Pasha's villa on the site of his Cotton Spinning and Weaving factory in Alexandria's Nuzha district (presently Shirkat Iskandariyya lil-Ghazl w'al-Nasij). 'Abbud Pasha's main residence was in Cairo's Zamalek district. At the present stage of research, it cannot be determined how far this phenomenon goes back in time. Earlier examples identified so far are the villa belonging to the Salvago ginning mill (as part of the buildings designed by Lasciac in 1895) and another small villa belonging to the ginning mill of Khalil Pasha al-Jazzar (now al-'Arabiyya Company for Cotton Ginning) in Shibin al-Kum that may be approximately dated to the turn of the century.

Fig. 48: **Damanhur, Abdel-Meguid Barakat Ginning Mill, director's villa, mid-1930s.**

Fig. 49: **Abdel-Meguid Barakat Ginning Mill, housing block for employees, mid-1940s.**

some cases, large workers' housing projects were realized in the vicinity of large factories—as for instance at Tal'at Harb's Misr Company for Spinning and Weaving in al-Mahalla al-Kubra, and 'Abbud Pasha's sugar refinery in al-Hawamdiyya. As Mercedes Volait has argued, this had to do with the urgent need to provide housing for a quickly-growing number of workers, especially in provincial cities that experienced unprecedented industrial development. But it also has to be seen within the context of the government's efforts to defuse the critical degree of worker and labor union activism, particularly in urban centers like Cairo and Alexandria. For the purpose of this containment policy, the targeted development of new industrial centers away from these two cities, and state-funded workers' and social housing projects went hand in hand—especially beginning in the late 1930s.[77]

A large-scale example of Modernist industrial architecture is the factory complex of the Filature Nationale d'Égypte in the Muharram Bey district of Alexandria (figs. 51-54). This former agricultural area in the south of the city, stretching along the southern side of the Mahmudiyya Canal, began to be developed as one of the major industrial areas of Alexandria in the early 1930s. At that time, the Filature Nationale d'Égypte (known in Arabic as al-Shirka al-Ahliyya lil-Ghazl wa'l-Nasij) was the oldest and largest integrated textile combine in Egypt, having been constituted in 1911 as the successor of the Anglo-Egyptian Spinning & Weaving Company originally founded in 1899. Its president was the ubiquitous Michel C. Salvago, a leading figure of Egypt's Greek community and head of numerous other companies. The director was the Swiss-born Linus Gasche, reputedly the foremost textile specialist in Egypt. The company's management was internationally composed.[78] The company's first factory compound was located on the northern side of the Mahmudiyya Canal in the Karmouz district, further west (fig. 50).[79] The new works in Muharram Bey were built in 1934, when the Filature Nationale entered into a joint venture with the British firm Calico Printers to form the Société Égyptienne des Industries Textiles, an integrated cotton spinning, weaving, and printing enterprise.[80]

The new complex initially contained buildings for the weaving and printing activities, an office building, a small hospital, a gatehouse, and a power station (the later extensions built in the 1960s will be addressed below). The weaving and printing workshops are three long, cubic, three-story blocks arranged in parallel rows and interconnected by "bridge-buildings" across the thoroughfare between the blocks. They are built completely in reinforced-concrete framework construction, with large continuous workshop halls on each floor, and continuous window ribbons articu-

77 For a comprehensive discussion of this issue, see Mercedes Volait, *Architectes et architectures*, pp. 333-344, esp. pp. 336-337.

78 See, *Annuaire Générale*, pp. 100 & 104-105; and Robert Tignor, "British Textile Companies and the Egyptian Economy," *Business and Economic History*, 2nd series, no. 16 (1987), p. 58.

79 This factory complex was recently demolished to make room for a residential development—a fate that threatens many factories currently being privatized and subsequently shut down.

80 Tignor, "British Textile Companies." Tignor mistakenly locates the new factory in Karmouz.

lating the plain façades. These buildings' plain utilitarian and almost monotonous appearance is counterbalanced by the administration building, which is directly attached to the factory's middle block. It is a four-story structure of basically the same design and construction technique, but stands out with its rounded corner and with its staircase and elevator-tower rising proudly over the whole complex, carrying the emblem of the company, and ending in a ribbed Art Deco pinnacle with flagpole. The offices on each floor are divided into spacious and bright open-plan offices for staff, and separate large office rooms with anterooms for managers—a pattern of "functional" segregation found in a number of other factory administration buildings of the period, and an interesting subject for further research. A novel concern for providing social services to the workforce is shown in the hospital: a smaller single-story building of very plain Art Deco design. Whether this factory complex was designed or built by British engineers, as reported by an older leading employee of the company, or in cooperation with a local architect still needs to be ascertained.

In any case, the contrast between the pronounced Modernist design of these 1934 buildings and the historicist design of the 1926 waterworks or the 1931 generator hall in Tanta vividly demonstrates the extreme shift that industrial architecture in Egypt had undergone within a few years. But if the Filature Nationale complex appears functionalist, the buildings of the following example—also located in Alexandria—pushed functionalism to its bare essence.

The Société Générale de Pressage et de Dépôts was the oldest establishment in Egypt specialized in cotton pressing and storage (figs. 55-56). Founded in 1889, the company absorbed the younger Deutsche Baumwollpresse A.G. (German Cotton Press) after the First World War to become the largest pressing company in Egypt, with its management composed mainly of British and German nationals.[81] Its main installations consist of a group of three extensive building blocks along both sides of the Mahmudiyya Canal in the Minat al-Basal district of Alexandria, close to where the canal connects to the basin of the Western Port. Two of the buildings, lining the canal's eastern side, were completed in 1936, apparently replacing older installations.[82] The third building on the western side of the canal, following the same plan and design, was erected in 1956, after the company had been na-

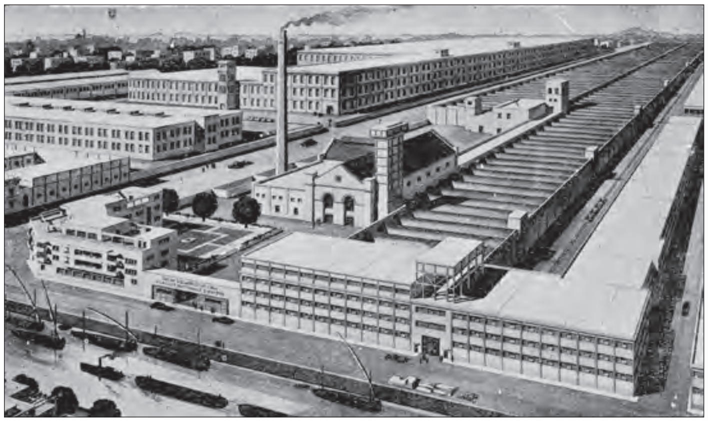


Fig. 50: **Alexandria, Karmuz District, Filature Nationale d'Égypte, old works, established in 1911, with later extensions.**

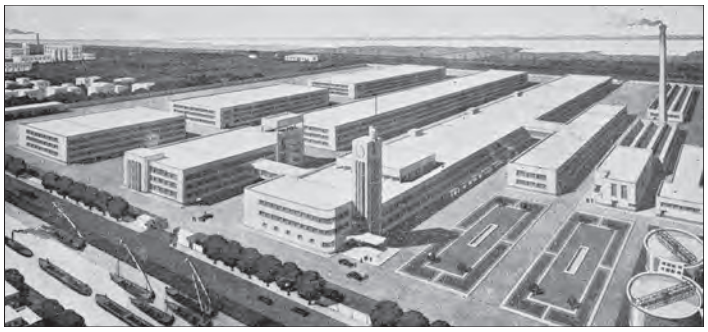


Fig. 51: **Alexandria, Muharram Bey District, Filature Nationale d'Égypte/ Société Égyptienne des Industries Textiles, new works, 1934.**

Fig. 52: **Filature Nationale d'Égypte, new works, view from the north.**

81 See, *Annuaire Générale*, pp. 94 & 95.

82 The 1938 *Annuaire Générale,* p. 95, reports that the company "finished the rebuilding of its two largest buildings two years ago."

Fig. 53: **Filature Nationale d'Égypte, new works, western factory block and office building with elevator tower.**

Fig. 54: **Filature Nationale d'Égypte, new works, interior view of factory hall.**

tionalized.[83] The buildings, which were decommissioned a few years ago, are reportedly used by other companies for various storage purposes, and therefore could not be accessed from the interior. From the exterior, however, one observes three-story blocks in concrete-frame construction, with visible columns and girders articulating the façade as a grid filled with red-brick walls. Instead of window ribbons, the complex includes evenly-spaced small transverse rectangular windows on the lower floors and upright oblong windows on the upper floor. The only elements that stand out from this grid are the characteristic loading devices of cotton pressing and storage buildings: vertical steel tracks reaching from the ground level to the loading gates of the different floors. The architecture, which is straightforward and utilitarian, and features no embellishment, is probably the work of civil engineers of British or German background. The design obviously served its purpose well, since it was replicated down to the details by the Egyptian engineers who built the third building after the company's nationalization in 1956.

In contrast to this bare plainness, the last example presented here can be seen as representing the other extreme of the bandwidth within which Modernist industrial architecture in Egypt operated during this period. It is the factory complex of the Selected Textile Industry Association (STIA), built from 1946 onward in Alexandria's Hadra district (figs. 57-61). STIA was established in 1946 under incorporation of the older Standard Egyptian Textile Industry (SETI), and was headed by the Alexandrian Greek Simon Pialopoulo, directed by Stefano Papachristou, and had a management composed of Greeks, Egyptians, and other nationals. To design the new plant, which was to integrate the spinning, weaving, dying, and finishing of cotton, wool, and synthetic textiles, the company hired the architect Ferdinand J. Debbané, an Alexandrian of Syro-Lebanese extraction who had studied civil engineering in Britain. The buildings he designed for STIA are certainly among the most elegant industrial structures visited during the survey. The factory was obviously designed to impress, and was advertised in the 1949 edition of *Egypt Today* with a bird's-eye drawing of the building proudly described as "a most modern textile factory" (fig. 57).

The initial complex (disregarding the later additions for the time being) was composed of two rows of buildings arranged on a roughly trianglar plot, with a long straight northern border and an inward-curving southeastern border. The outlines of the buildings generally follow the outlines of the plot to make maximum use of the available area.

The northern block therefore is a long, rectangular, single-story hall subdivided by a four-story administrative building in the center. The southern block is triangular in shape with a beautifully-curved southeastern façade. The wide factory halls are built in concrete-framework construction with a flat-roofed monitor rising above the central aisle, and have regularly-interrupted window ribbons running along all façades. The façades display a high concern for

83 This year of construction was related to me during a visit to the site by an older employee of the company and still needs to be confirmed by other sources.

"stylish" details like rounded corners, profiled window frames, cornices, ventilation openings, and roof drainage. Against the factory buildings' marked horizontality, the administrative building stands out as the only vertical element, with its monumental front and large glazed surfaces between rounded columns—again reminiscent of a portico. The interior of the entrance area is luxuriously decorated with marble and colored-stone inlay as well as other details in an almost neo-Baroque variety of Art Deco.

Later extensions were built in the mid 1950s on remaining sections in the plot's western parts and on land purchased along its eastern side. These were multistory structures, again designed by Ferdinand Debbané, and were in keeping with the original plant's architectural details. The extensions incorporated innovative technical features, however, such as the use of octagonal concrete columns with mushroom capitals for supporting the new wool factory's continuous floor slabs—a solution chosen to accommodate the heavy loads and vibrations of wool-weaving looms in this large six-story building (fig. 61). Another innovation was the use of cylindrical shell roofs, as a large single-barrel shell for the wool factory (here, it was in necessary combination with integrated concrete-trusses) and as multiple-barrel shells (in the proper sense) for the newly-added second floors on top of some of the older single-story buildings (fig. 60). In this, the British-trained Ferdinand Debbané kept up closely with technical developments and fashions in industrial architecture elsewhere in the world, and confirms what has been said about British architects in the period after the Second World War that "no self-respecting architect at this time would be without a shell-roof job."[84]

In contrast, the original 1946 design of the STIA works, similar to Sayyid Karim's Misr Tobbaco Factory of 1941, features the same peculiar combination of functionalist factory design with a clear penchant towards monumental Classicism, the symmetrical, and the ornamental. This blend of conspicuous Modernism and conspicuous display of corporate power might be partly due to the clients' needs and taste, but may also express an ongoing internal struggle between Classicism and Modernism that architects in Egypt were experiencing during this period of transition.[85] Still, when compared to the considerably more varied palette of

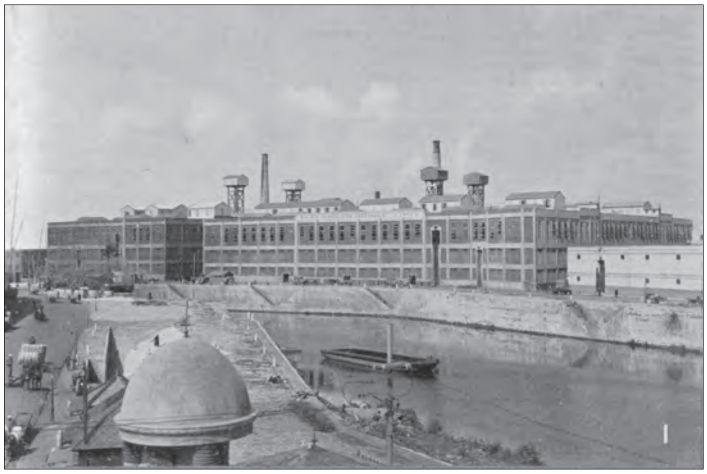


Fig. 55: **Alexandria, Minat al-Basal District, Société Général de Pressage et de Dépôts, 1936; photo of the cotton-pressing and storage buildings used for a 1939 advertisement.**

Fig. 56: **Société Général de Pressage et de Dépôts, detailed view of a cotton-pressing and storage building.**

Fig. 57: **Alexandria, Hadra District, STIA works, Ferdinand Debbané, 1946; drawing used for a 1949 advertisement.**

84 Robert Anchor, "Concrete shell roofs, 1945-65," in Mike Chrimes, Dawn Humm, and James Sutherland (eds.), *Historic Concrete: The Background to Appraisal (London: Thomas Telford, 2001)*, p. 177.

85 I owe this idea to a comment made by Aly Gabr (architectural historian and the grandson of 'Ali Labib Gabr) during our conversation on June 26, 2009.

Fig. 58: **STIA works, street façade view of the southern blocks.**

Fig. 59: **STIA works, view of the northern block showing the administration building flanked by factory halls; the second floor of the factory halls was added in the mid-1950s.**

styles that Egyptian architects (including those of "local-foreigner" background) applied and experimented with in this period for residential or public buildings, their factory designs were certainly among the most thoroughly Modernist in the country.

Industrial architecture after the 1952 revolution

The takeover by the Free Officers in 1952 did not, at first, change the basic assumption that free enterprise based on private property rights was the precondition for economic and industrial development. The new regime initially focused on agricultural reform and on developing infrastructure and social services, and maintained a liberal policy that encouraged private enterprise and foreign investment. A new policy of increased state intervention in the economy and of capital-intensive industrialization from above only came into effect in the wake of the 1956 Suez War. Still, light industries at this point were meant to be financed by private capital, and only the then underdeveloped heavy industries were subject to state-financed development. However, the sequestration and nationalization of foreign holdings in Egypt began in November 1956, starting with all British and French firms. As private investments in industrial development failed to meet the regime's expectations, the government went on to nationalize other private enterprises, including Egyptian ones. Most important was the nationalization of the powerful Bank Misr in 1960, with its vast holdings in the industrial sector, which considerably increased the state's share in this sector. The construction from 1960 to 1964 of the Aswan High Dam for electricity generation, and the increased exploitation of natural resources like oil and gas in the Red Sea, the Delta, and the Mediterranean aimed at supplying energy for the regime's ambitious program of rapid industrialization.

The success was palpable. While in 1952 the industrial sector accounted for only 10% of Egypt's Gross National Product, it had surpassed 20% in 1962. Numerous large factories were built in industrial areas around Cairo like Helwan, Madinat Nasr, Shubra al-Khayma, and Imbaba, as well as elsewhere in Egypt. From 1960 onward, the yearly growth of the industrial workforce was at 2%. And while in 1957, 90% of Egypt's industrial workforce worked in small workshops with a headcount of four or fewer persons, factories with more than 500 workers had become more common by 1970. As we will see from the examples presented below, this growth was also due to the expansion of existing factories after their nationalization. The massive reduction of private enterprise and its replacement by a command economy in the 1960s, however, also had decisive negative effects on Egyptian industry. This is evident in the lack of competition, a cumbersome bureaucracy, surplus labor, over-staffing, and reduced productivity. The disastrous Arab-Israeli war of 1967 and the resulting financial exhaustion of the state led to a slump in production and even the temporary idleness of large factories.

Industrial development only began to pick up again after Anwar el-Sadat's accession to power in 1970, and—more importantly—with his new Open-Door Policy (*Infitah*) since 1971, which allowed for establishing a free-market economy with the aims of instigating private-sector development, attracting foreign capital, and revitalizing the public sector through competition. The earlier program of massive state-sponsored industrialization was given up in favor of a more balanced policy of agricultural and industrial development.[86] Still, the state's investment in public-sector industry did not come to a halt, as illustrated by the new STIA factory that will be presented below. The state's continued involvement in industrial development is also manifested in the planning and construction of new, centrally-planned cities in the deserts outside Cairo, like the 10th of Ramadan City, the 6th of October City, and Madinat al-Sadat, which began in the late 1970s. They were to include large industrial areas and indeed quickly attracted significant investment and new factories from the growing private sector.[87] The development of these industrial areas is still under progress and is beyond the scope of this article.

The two examples of industrial buildings of the post-nationalization period presented here are located in Alexandria. They are the extensions of al-Shirka al-Ahliyya (the former Filature Nationale), built in 1962, and the new plant of STIA, built between 1971 and 1974.[88] They are beautiful and artful examples of two different building types—the single-floor hall and the multistory block—and evince the continuation and maturing of Modernism in Egypt's industrial architecture during this period. As works by Egyptian architects and engineers, they also illustrate the degree to which Modernism had been appropriated as a local architectural language of impressive vitality and variety.

The extensions of al-Shirka al-Ahliyya were begun in 1962, immediately following the company's nationalization, on purchased land to the east of the existing plant, which more than doubled the size of its plot (from about 15 to 33 *feddans* (a *feddan* equals 4,200 square meters)) (figs. 62-68). The new buildings comprised a dyeing mill for cloth and a dyeing mill for yarn, with an overall surface area of 20,000 square meters, in addition to repair workshops and a generator building. They were meant to expand production capacities in line with the firm's original integrated spinning, weaving, and dyeing activities. According to a long-time employee of the company, these buildings were built by an Egyptian engineering firm named "SPICO."[89] Taken together, these few buildings present considerable architectural variety and give us a fairly good idea of what other single-story

Fig. 60: **STIA works, view showing the multistory wool-factory building to the right, and the administration building and shell roofs of the second-floor factory-hall additions to the left.**

Fig. 61: **STIA works, wool factory, Ferdinand Debbané, mid-1950s; interior view showing mushroom columns.**

86 On the subject of economic development during the Nasser and Sadat periods, see Vatikiotis, *The History of Modern Egypt*, pp. 393-402 & 427-436; Scharabi, *Industrie und Industriebau*, pp. 39-40 & 49-52; Ezzat Molouk Kenawy, "The Economic Development in Egypt During the 1952-2007 Period," *Australian Journal of Basic and Applied Sciences*, 3:2 (2009), pp. 588-603; and Robert Mabro, *The Egyptian Economy, 1952-1972* (Oxford: Oxford University Press, 1972).

87 See, Günter Meyer, "Wirtschaftsgeographische Probleme der Industrieansiedlung in den neuen Entlastungsstädten der ägyptischen Metropole" [Economic-geographic Problems of Setting up Industries in the New Overspill Towns of the Egyptian Metropolis] *Erdkunde* 42 (1988), pp. 284-294.

88 It proved extremely difficult to obtain access and photo permissions for factories of this period, let alone to obtain information on them. For many factories that are scheduled to be visited, permissions are still pending. Fortunately, the management and employees of al-Shirka al-Ahliyya and STIA were very welcoming and supportive—for which I would like to express my heartfelt gratitude.

89 SPICO had merged with another company to become the public-sector company presently known as the Nile General Company for Reinforced Concrete.

Fig. 62: Alexandria, Muharrem Bey District, al-Shirka al-Ahliyya (Filature Nationale), extensions, SPICO engineering company, 1962; new dye works for yarn, with openings in the shape of Diocletion windows.

factory halls of this period looked like. The dyeing mill for cloth is a vast and lofty single-story hall with thirteen barrel roof units in cantilevered shell construction with shell-roofed monitors, built in reinforced concrete with exterior red brick infill walls. The dyeing mill for yarn is a smaller building of an externally very similar design. Yet it features a low ground floor for mechanical installations serving the upper-floor workshop hall. Also, the six units of barrel-vaulted roofs with monitors on the upper-floor are supported by concrete trusses. In addition, the barrel vaults feature large glazed openings in the shape of Diocletian windows at both ends—a beautiful detail that triggers associations not only with Roman thermae, but also with early-Modernist buildings like Otto Wagner's early-20th-century Post Office Saving Bank in Vienna.

With their magnificent roof structures, the two dyeing mills are unique when compared to other factory halls of the period identified during the survey. But other parts of al-Ahliyya's 1960s extensions also feature roofing solutions that were much more common during the period. An example is the north-light saw-tooth roof construction in reinforced concrete used for an extension of the cloth-dyeing hall (fig. 67). Similar north-light roofs—either with inclined flat slabs or with cylindrical shells—have been observed at many other factories. Yet another roofing system, also observed at other factories, is the beautiful, softly-undulating multi-barrel shell-roof without monitors used for al-Ahliyya's new generator building (fig. 68). In combination with the windows' stacked *brise soleil* elements, which resemble cooling fins (and in a way are very fitting for a generator building), this building epitomizes the factory as machine.

While the al-Ahliyya extensions consisted by and large of single-story halls, the last example presented here is the multistory textile mill erected by STIA between 1971 and 1974 (figs. 69-70). STIA, whose 1946 plant and 1950s extensions have already been discussed above, was renamed el-Nasr Wool & Selected Textiles Company after nationalization, but kept its original acronym as an established brand name. With no further space left available within the confines of the old works, this exceptionally-successful public-sector company built a new wool factory on a vacant plot located a few hundred meters to the northeast of the old plant. The new plant was to comprise a multistory main block with an attached administration building as well as single-story wool dyeing works, repair workshops, storage halls, and wa-

Fig. 63: **al-Shirka al-Ahliyya, view of 1962 extensions, with new dye works for cloth (right) and for yarn (left).**

Fig. 64: **al-Shirka al-Ahliyya, new dye works for cloth.**

Fig. 65: **al-Shirka al-Ahliyya, new dye works for cloth, interior view showing cantilevered shell roof.**

Fig. 66: **al-Shirka al-Ahliyya, new dye works for yarn, interior view.**

Fig. 67: **al-Shirka al-Ahliyya, new dye works for cloth, 1960s extension with north-light saw-tooth roof.**

Fig. 68: **al-Shirka al-Ahliyya, 1962 extensions; view of generator building with undulating multi-barrel shell roof.**

ter and power-supply installations.[90] Among these, the main block is certainly the most interesting and was already considered innovative at its time. Designed by the Alexandrian architecture firm Abu al-Fadl, Hadari and Khuli, the building is composed of a cubic central block of five stories in externally-visible concrete-framework construction that is symmetrically flanked by two receding annexes with trapezoidal plans and red-brick cladding.[91] With their ribbon windows and eye-catching concave end-walls, these annexes clearly stand in the tradition of earlier Modernist structures of the 1930s and 1940s. Remarkably, the annexes have nine floors, but are of the same height as the five-story central block. The reasons behind this are functional and structural: functional, because the annexes house the staircases, freight elevators, office rooms, changing rooms, sanitary rooms, and other service facilities, while the central block contains solely the large workshop halls, each of which takes up a whole floor; and structural, because the factory halls have a greater clearance height and because of the peculiar floor construction used in this part of the building. In order to limit the number of columns inside the halls and still provide enough load-bearing capacity for the heavy jennies, looms, "Sulzer" diesel generators, and other machinery, all the floors were built following an innovative double-floor or sandwich system, for which two superimposed concrete slabs with integrated girder-and-beam grids are vertically connected by densely-spaced concrete posts. The interior clearance between the interconnected floor slabs is about 1.5 meters, and thus constitutes a kind of hidden mezzanine floor used for piping and installations.

Beyond being an example of innovative engineering, the STIA building also represents the continuity of "monumental" architecture in the industrial context. The building is located on a triangular plot on the northwestern side of a public roundabout, Midan Sirri Pasha. Its trapezoidal annexes re-

90 To these, a sport club for workers and employees was added on an adjacent plot. Such social infrastructure apparently became more frequent with public-sector companies in the 1970s, and would offer yet another interesting subject for further research.

91 Original plans of the building—with the architect's signature—are kept in the archives of STIA and were kindly made accessible to us.

spond to the radial roads, while the three-story administrative building in front of the central block is curved, following the shape of the roundabout. Its curving shape could be a reference to the work of Oscar Niemeyer, who due to his developing-world and communist background would have been a fitting role-model for Egyptian architects of the 1960s and 1970s.[92] Finally, in its siting and grand architectural gesture, the Alexandrian STIA wool factory building has a peculiar affinity to the Mugamma' building, the enormous central administrative complex on Midan al-Tahrir in central Cairo.[93] The overall effect is truly impressive even today, and we may assume that the erection of such a building by a public-sector company in the early 1970s instilled a sense of pride among passersby on this major urban traffic junction. State-owned factories were still skillfully designed and built under Sadat's *Infitah* policy to serve as symbols of progress and development, and as monuments of power—of the state, rather than of corporate capital.

Fig. 69: **Alexandria, Hadra District, STIA, new wool factory, Abu al-Fadl, Hadari, and Khuli 1974; view of the southern facades of the administration building and the central factory block facing Midan Sirri Pasha.**

Fig. 70: **STIA, new wool factory, view of the trapezoidal annex and central factory block from the west.**

Concluding remarks

As this overview has shown, Egypt's industrial architecture developed from the beginning as a material manifestation of international connectedness, in close interaction with local and global forces and resources, integrating know-how, manpower, and material from very diverse origins: Italian, French, Maltese, Turkish, and Egyptian technicians, Egyptian masons, Rumi carpenters, firebricks from Scotland, wood from Bilad al-Rum, stone and brick of local origin, and machinery from England. Egypt's earliest modern factories already drew from and catered to an increasingly globalizing market, and throughout the 19th and 20th centuries, this connectedness intensified. The main initiators and patrons of industrial establishments changed repeatedly, from a ruler's monopolist initiative under Muhammad 'Ali, to private enterprise and international corporate capital from the mid-19th to the mid-20th century, to state-socialist patronage under Nasser, and back again to a larger role for private and corporate capital with Sadat's *Infitah*.

Independent of this chronology of ownership, the country's industrial architecture increasingly followed global trends in building technology and architectural fashions. Muhammad 'Ali's factories were idiosyncratic structures, often of large dimensions, that made extensive use of established techniques while reflecting the ruling elite's predilection for the supra-regional Ottoman Rumi-style. Buildings from the later 19th century tended to be privately owned, were smaller, and evinced the growing influence of European building types (especially the gable-roofed factory hall with monitor). They reflected the shift of taste towards European historicist styles, but were still mostly built in traditional materials like brick and timber. Starting in the last two decades of the 19th century, revolutionary developments took place on several levels. Against the background of British colonization, increased land capitalization, and a concomitant building boom, the con-

92 Oscar Niemeyer's work was certainly known to Egyptian architects—not least because he planned and built the International Fair of Tripoli in Lebanon (1963-1975).

93 The Mugamma' was built from 1950 to 1954, at the end of King Faruq's rule, but has come to symbolize the republican era as it was completed soon after the 1952 revolution.

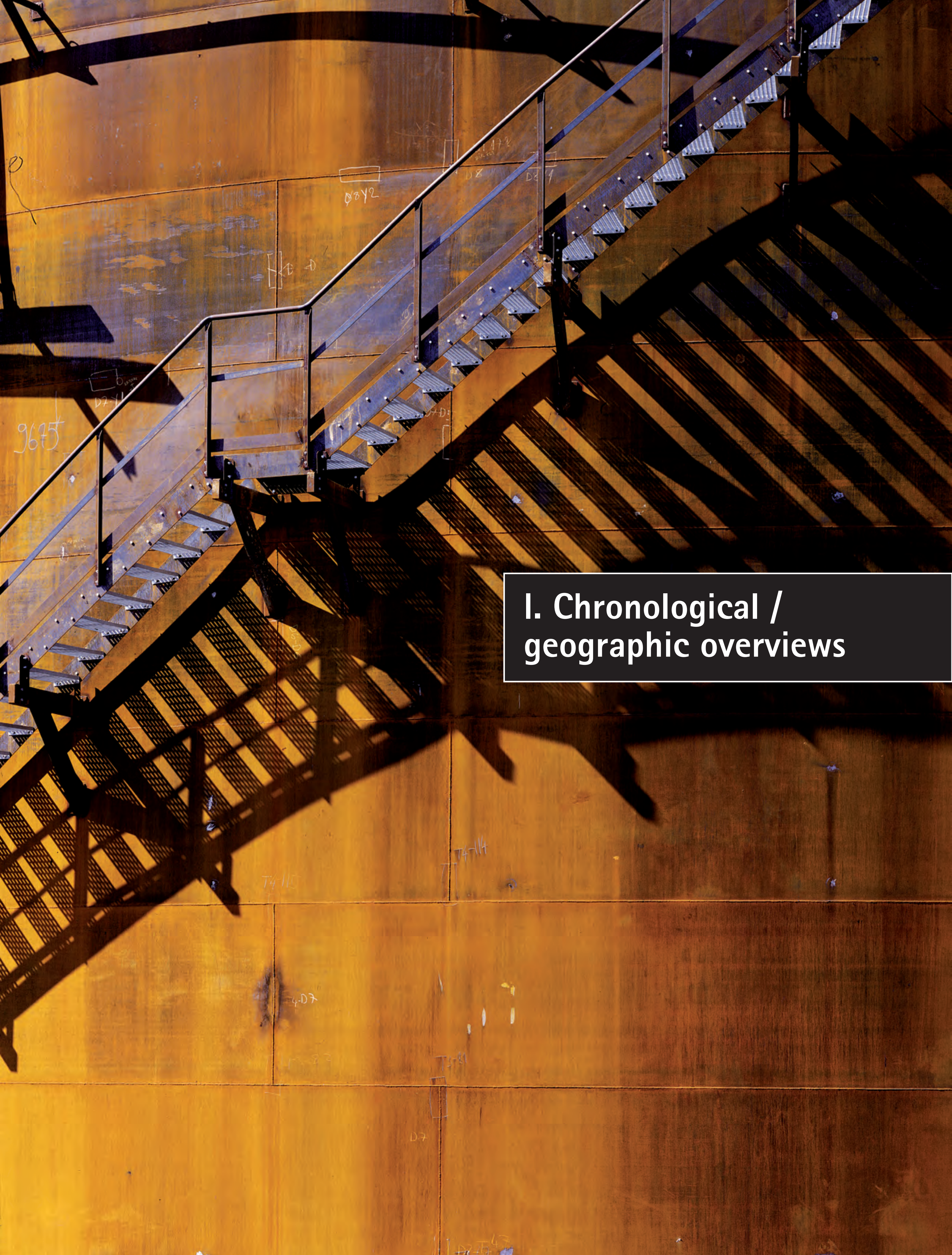
struction business expanded vastly. Iron, steel, and soon even concrete construction experienced rapid proliferation; architects and contracting firms were hired by a new type of local and foreign capitalist to build factories that were technically up-to-date with those in main industrial countries, and stylistically in line with what Scharabi aptly termed the "international style" of historicist architecture.[94] It is also important to note that this was the beginning of a "corporate monumental architecture" in Egypt, which became widely accepted for industrial buildings, and was to continue as such even after these industrial establishments were nationalized and turned into public-sector companies.

The most intriguing development of the second quarter of the 20th century was probably the triumph of Modernist architecture. This triumph was more complete and enduring in industrial architecture than it was in other areas of Egypt's architectural production. This is intriguing because it was to a very large degree due to the local—and partly nationalist—agency of internationally-trained Egyptian architects and their Egyptian capitalist clients, who turned away from historicism and appropriated Modernism for their factory projects. Can Modernist industrial architecture in Egypt, therefore, be considered an expression of anti-colonial nationalism? Or was it a dream of social order through "Western" techniques? These questions may have to remain unanswered for now, but it is certain that under the anti-colonial, nationalist, and socialist government of Nasser, high Modernism continued to serve as the quasi-official signature style for industrial buildings—now almost exclusively designed by Egyptian architects and engineers. Modernism accordingly had been made a national style, at least as far as industrial architecture is concerned.

Mohamed Scharabi ended his book on industry with a rather negative judgment of the industrial buildings constructed in Egypt since 1945, stating that they "are hardly different from those in Europe and North America," and that they "appear, like everywhere in the world, anonymous and hardly distinguishable."[95] This may not be completely wrong, at least from an initial reading of them, but then, it is equally true of many of the buildings constructed in Egypt since the end of the 19th century. However, since modern industrial architecture is an international phenomenon that is intrinsically tied to global networks of exchange, this should not be considered a liability, but a specific characteristic of industrial architecture. At closer examination, it should be noted that when visiting these factories, one cannot but develop an appreciation of their architectural quality, which reflects a continued engagement with architectural developments taking place elsewhere in the world as well as artful adaptations and solutions resulting from specific local circumstances, conditions, and needs. As such, these industrial buildings are material evidence of the intrinsic intersections of global and local history, and offer a vast, but still widely-neglected potential for historical research.

94 Mohamed Scharabi, "Der Historismus, ein Internationaler Stil. Das Beispiel Kairo," [Historicism, an International Style. The Example of Cairo] *İstanbuler Mitteilungen* 39 (1989), pp. 483-491.

95 Scharabi, *Industrie und Industriebau*, p. 51.



I. Chronological / geographic overviews

Industrial architecture and nation-building in Turkey: A historical overview

Sİbel Bozdoğan

Discussions of modern architecture in Muslim geographies are often confined to worn-out polarities like tradition / modernity, Islam / the West and the related binary opposition, ornament / tectonics. It is therefore very refreshing to see the Aga Khan Award for Architecture focus on a building type that is less about questions of representation, identity and / or "national style" than the quintessentially modern questions of technology, industry, and labor, namely industrial buildings and workspaces.

At least since the Industrial Revolution, these buildings have exemplified the paradigm of the Modern Movement in architecture, in the same way that churches were the representative typology of Gothic architecture, or palaces that of the Neoclassical. Perhaps more significantly for Muslim countries, industrial buildings and spaces of production have come to symbolize transformation, modernization, and progress, the quest for which has been central to most nation-building efforts in the post-colonial and / or post-imperial Muslim world, in what scholars have called "ideologies of delayed development."[1] More recently, with the shift of emphasis from modern, industrial nation-states to globally-interconnected post-industrial societies, the architectural and urban character of industrial buildings and workspaces has also changed, making the Aga Khan Award's exploration of the topic very timely and provocative.

Following these premises, this paper offers a broad historical overview of the evolution of industrial architecture in Turkey, discussing major trends and paradigmatic examples in both the political context of national development in Turkey and the cultural context of Modernist industrial aesthetics abroad. Following a well-established periodization employed by most economic, social, and cultural histories of modern Turkey, four distinct periods (or "waves of industrialization") are highlighted, corresponding to important shifts in the direction, objectives, leading actors, and geographic distribution of industrialization, as well as in the prevailing design concepts, programs, and construction techniques of factory buildings and complexes. Whereas the earlier periods will be treated in some detail, the last and most recent period will be covered only briefly. The major paradigm shifts after 1980, from production to consumption and from manufacturing to the communications and service sectors, accompanied by concomitant transformations in the design of industrial buildings and workspaces (not only in Turkey, but globally) is a vast and separate topic beyond the scope of this overview.

Late-Ottoman industrialization efforts: The *Tanzimat* to the First World War

The Industrial Revolution, which led to what Karl Polanyi has famously called the "great transformation" of European

1 M. Matossian, "Ideologies of Delayed Development," in J. Hutchinson and A.D. Smith (eds.), *Nationalism* (New York: Oxford University Press, 1994), pp. 218-225.

economy and society in the long 19th century, also had dramatic and irreversible impacts on the Ottoman Empire.[2] As many economic historians point out, traditional Ottoman crafts were unable to compete with European manufactured goods that flooded the Empire's markets. During the late-Ottoman period, from the initiation of the reforms known as the *Tanzimat* in the 1830s to the First World War, the Ottoman Empire was incorporated into the capitalist world system as a weak peripheral player, primarily as a provider of raw materials and as a lucrative market for European products.[3] At the same time, beginning with the reformist reigns of sultans Selim III (r. 1789-1807) and Mahmud II (r. 1808-1839), the first initiatives were taken to modernize the traditional manufactures of the Ottoman Empire by introducing steam power and new machinery. This was accompanied by building new imperial factories, thereby even elevating hopes for what some scholars have called a belated "Ottoman industrial revolution."[4] Entirely dependent on European machinery and technical know-how, however, the effectiveness of these Ottoman industrialization efforts were limited at best and fell far short of reversing the Empire's increasing trade deficits.

In 1848, a Belgian worker of the Ottoman textile mills in Izmit made the following observation: "It would be very odd if we could not turn out a piece of the finest cloth occasionally, seeing that we have the best machinery of England and France, that the finest wools for the purpose are imported via Trieste from Saxony and the best wool countries, and that we Belgians and Frenchmen work it. You could not call it Turkish cloth—it is only cloth made in Turkey by European machinery, out of European material and by good European hands."[5] Frequently quoted by economic historians, this passage captures the basic weakness of industrialization attempts under semi-colonial conditions of dependency. More significantly, as was common to such "delayed industrialization" efforts in dynastic empires of the periphery, these efforts were geared primarily towards military and palace use, rather than any large-scale production for a mass-market.

In the case of the Ottoman Empire, in addition to improving and expanding existing dockyards (*Tersane*), powder-mills (*Baruthane*), cannon foundries, and small-arms manufactures (*Tophane*), a number of new factories were built to produce textiles, cloth, and leather goods to supply the new, modern armies that replaced the Janissaries in the early-19th century. Luxury goods for palace consumption, such as carpets, porcelain, and glass were also important imperial industries at a time when Ottoman sultans were increasingly emulating the lifestyles of European monarchs. These state-funded imperial factories (*fabrika-i hümayunlar*) were, almost by definition, located in İstanbul and its immediate hinterland, and concentrated especially in four major industrial zones: Beykoz on the Asian side of the Bosporus; the entire Golden Horn area; the Marmara Coast from the cotton textile factory in Bakırkoy (*Basmahane*) and the foundry and machine works of Zeytinburnu to the gunpowder works near Küçükçekmece; and beyond İstanbul to the east, in the textile town of Izmit and the adjacent village of Hereke, where the famous imperial carpet factory was established in 1843.

The earliest industrial buildings made their appearance in the otherwise picturesque landscape of Beykoz as early as 1805, when Sultan Selim III built a paper mill and a woolen textile mill for military use (*Beykoz Kağıt ve Çuha Fabrikası*) relying on the water power of the area's many streams.[6] It was, however, the tannery, leather goods, and shoe factory built in 1810 to cater to late-Ottoman military demands that would evolve into one of the major state industries of the Kemalist republic in the 1930s as the legendary Sümerbank Shoe Factories (fig. 1). Similarly, the traditional hand-blown glass works of Paşabahçe, another small village also near Beykoz (where the delicate *çeşmibülbül* glasswares were made since the reign of Mahmud I (r. 1730-1754)), would be modernized into the Paşabahçe Glass Factory in 1934-1935 (fig. 2). Both examples illustrate important continuities between late-Ottoman and early-republican industries, turning the names of Bosporus villages (Beykoz and Paşabahçe) into brand names with lasting legacies.

In the Golden Horn area, in addition to the imperial arsenal in Kasımpaşa and the brick factory in Kağıthane, both

2 K. Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time* (Boston: Beacon Press, 2001 (1944)).

3 My main sources are Ş. Pamuk, *The Ottoman Empire and European Capitalism 1820-1913* (Cambridge: Cambridge University Press, 1987); D. Quataert, "Ottoman Manufacturing in the 19th Century," in *Manufacturing in the Ottoman Empire and Turkey 1500-1950* (Albany: SUNY Press, 1994), pp. 87-121; and C. Issawi, "De-Industrialization and Re-Industrialization in the Middle East since 1800," *International Journal of Middle East Studies*, 12 (1980), pp. 469-479.

4 E.C. Clark, "The Ottoman Industrial Revolution," *International Journal of Middle East Studies*, 5 (1974), p. 68.

5 C. McFarlane, *Turkey and Its Destiny*, 2 vols. (London: John Murray, 1850), p. 453; cited in Clark, "The Ottoman Industrial Revolution," p.75.

6 For a detailed account of the leather industry in Beykoz from the early-19th century into the republican period, see Ö.Küçükerman, *Geleneksel Türk Dericiliği ve Beykoz Fabrikası* [Traditional Turkish Leather Industry and the Beykoz Factory] (Ankara: Sümerbank, 1988).

very interesting large-span structures, the famous Imperial Fez Factory (*Feshane*) was established in 1835 to produce woolen fezes that Mahmud II introduced into the Ottoman bureaucratic and military system. The factory was fitted with imported machinery from Europe and a steam engine in 1868, and by the end of the century became the pride of late-Ottoman industrialization (fig. 3). Photographs of the factory as well as its woolen products were sent to the 1893 World's Columbian Exposition in Chicago, earning the Empire a prestigious award. More significant for the purposes of this paper is *Feshane*'s architectural presence. It may be argued that with its prominent chimneys and clerestoried roofs over large sheds, *Feshane* established the factory as a distinct, recognizable, utilitarian building type that did not exist in the traditional typological repertoire of Ottoman architecture. At the same time, the Classical arcaded façade of the boiler rooms as well as its ornate entrance portal bearing imperial insignia are manifestations of the well-known 19th-century duality between the new utilitarian forms of engineering and the symbolic and representational foundations of art and architecture (figs. 4 & 5). In the same way that steam engines from the 1830s displayed Greek Revival detailing, elevating the machine to an art object, the spinning and weaving machinery and the boilers of *Feshane* were enveloped in Classical architecture.

Other imperial establishments also display this 19th-century duality between the exterior envelope, typically brick or masonry outer walls treated with varying levels of architectural grandeur and Classical proportioning, and the interiors, which were simple functional spaces separated into bays by cast-iron or masonry supports and spanned by wood or cast iron roof trusses.[7] The cannon foundries and small arms manufacture at Tophane are representative examples of this typology, as evident in the famous photographs in the Abdulhamid II albums of 1893 (figs. 6 & 7). In the case of the Beykoz shoe and leather works, we also observe the use of "saw tooth" roof forms for sky-lighting the workspace in an otherwise straightforward masonry building. From a brief overview of major imperial factories, we can conclude that 19th-century Ottoman industrialization efforts were largely limited to the introduction of new machinery and steam power to the manufacturing processes, while the factory buildings them-

Fig. 1: İstanbul, Beykoz, Sümerbank Shoe and Leather Factories, view of the complex in the 1950s.

Fig. 2: İstanbul, Paşabahçe Glass Factory, 1934–1935.

Fig. 3: İstanbul, Imperial *Feshane*, machinery in the woolen cloth and *fez* factory, c. 1893.

7 For a general list and description of Ottoman imperial factories in İstanbul see, A. Batur, "İstanbul'da 19.yy Sanayi Yapılarından Fabrika-i Hümayunlar," [Imperial Ottoman Factories in 19th Century İstanbul] *Proceedings of the 1st International Congress on the History of Turkish-Islamic Science and Technology* (İstanbul: İstanbul Technical University Press, 1981), pp. 331-341.

Fig. 4: ***Feshane*, exterior of the boiler rooms.**

Fig. 5: ***Feshane*, Imperial insignia on the entrance portal.**

Fig. 6: **İstanbul, *Tophane* (cannon foundry), classical exterior elevation, c. 1893.**

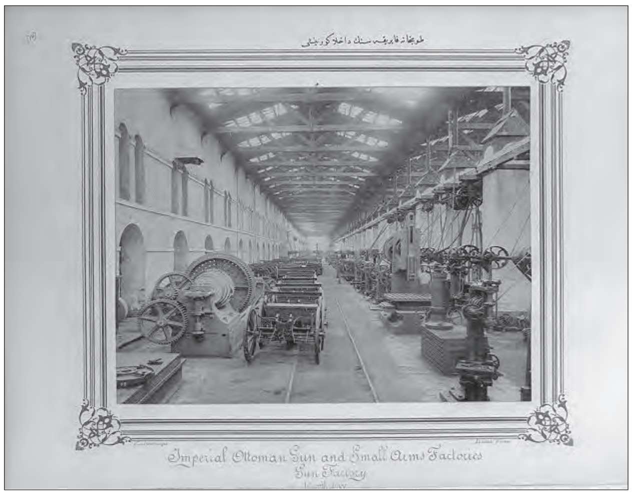


Fig. 7: ***Tophane*, interior view of the gun factory.**

selves remained conventional brick or masonry structures. We encounter none of the innovation of the vast steel and glass machinery halls being built at that time in Europe and the United States.

One interesting exception is a prefabricated cast-iron structure cited in the biography of William Fairbairn, the prominent Scottish shipbuilder and inventor of the riveting machine, who served Sultan Abdulmecit between 1839 and 1843 as a technical consultant, and received an imperial medal for his services in 1847. Fairbairn describes "an iron house for a corn-mill, 50 feet long, 25 feet wide and three storeys in height with an iron roof," manufactured in his Millwall shops in London, shipped to Turkey in pieces, and assembled in İstanbul in 1840.[8] Regarded by architectural historians as a major influence on the development of cast-iron

8 W. Pole (ed.), *The Life of Sir William Fairbairn* (London: Longmans, Green, and Co. 1877), p. 174. This particular factory is mentioned in other sources as a military grain mill (*Askeri Tahiniye Fabrikası*). See, for example, Batur, "İstanbul'da 19.yy Sanayi Yapılarından Fabrika-i Hümayunlar," p. 334; and Wolfgang Müller, "İstanbul'da Erken Dönem Endüstri Yapıları," [Early Industrial Buildings in İstanbul] *Archiscope*, Special Issue on Industrial Buildings, no. 3 (December 1998), p. 62.

buildings and storefronts in the 19th century, especially those by architect, inventor, and pioneer of cast-iron architecture James Bogardus in New York City, Fairbairn's building was a cast-iron frame structure with prefabricated cast-iron spandrels on the lower level and wrought-iron on the upper stories, covered with a barrel-vaulted roof made of corrugated iron sheets (fig. 8).[9] From the one reconstructed image available to us, it clearly bears the mark of Fairbairn's expertise in riveted cast-iron plates, and anticipates his famous Britannia Tubular Bridge over the Menai Straits in England (1846-1850), an engineering marvel that he would design five years later with the prominent engineer Robert Stephenson. Fairbairn's biography also mentions a second prefabricated iron structure for a woolen cloth factory erected near Izmit in 1840.

In his account of imperial factories of the Ottoman state, Fairbairn finds most of them in a very primitive state and observes that although new machines were introduced into these operations, they were "far from perfect and the native workmen appeared to be at a loss how to work and manage machinery of such a complicated character ... and little or nothing was done in the shape of manufacture, through the apathy of the Turks and their aversion to new things."[10] Its condescending Orientalist overtones aside, Fairbairn's observations on the state of Ottoman industry echo those of other European observers who wrote that although new machinery was brought in the 1830s, it soon fell into disrepair and idleness due to lack of maintenance and technical know-how.[11]

Nevertheless, by the latter part of the 19th century, the Ottoman administration had clearly recognized the significance of industrialization for building a strong nation-state with a presence on the world scene. The Empire's participation in World Fairs, beginning with the Crystal Palace Exhibition in London in 1851 and followed by Sultan Abdulaziz's personal visit to the Paris World Fair of 1867, increased awareness of the industrial might of European powers and inspired the Ottomans to organize industrial exhibitions of their own. This proto-nationalist desire to advance the Empire's industrial progress explains the 1863 Ottoman General Exposition (*Sergi-yi Umumiyi Osmani*).

Fig. 8: İstanbul, reconstructed image of a prefabricated cast and wrought-iron corn mill erected by the Scottish shipbuilder William Fairbairn in 1840.

Fig. 9: İstanbul, Yıldız Porcelain Factory, Raimondo D'Aronco, 1892.

Held in a temporary exhibition building in Sultanahmet Square, it consisted of two long sheds illuminated by clerestory windows under a double-pitched roof. The simplicity of the rear elevation contrasted visibly with the ornate, arcaded entrance facing the square, once again illustrating the divide between the utilitarian and the symbolic.[12] The idea of an "industrial school" to reform crafts education and to train technicians to work with machinery was also born around this time, leading to the establishment of the Sultanahmet workshops and later the "Hamidiye Industry Schools" (*Hamidiye Sanayi Mektepleri*), which were active between 1876 and 1908 in many of the Empire's cities and provinces.[13]

Two major additions to Ottoman industry in the Hamidian era were the Hamidiye paper factory in Beykoz (1887) and the imperial porcelain factory in Yıldız (1892). The corbelled brick entrance "towers" of the latter were designed by the Italian architect Raimondo D'Aronco, who served Sultan Abdulhamid II around the turn of the century (fig. 9). The fa-

9 T.C. Bannister, "Bogardus Revisited: The Iron Fronts," *The Journal of the Society of Architectural Historians* 15: 5 (December 1956), pp. 12-22.
10 Pole, *The Life of Sir William Fairbairn*, p. 169.
11 See, for example, Julia Pardoe's comments on the factories in Beykoz in *The City of the Sultan: Domestic Manners of the Turks in 1836* (London: Henry Colburn, 1837); cited in Ö. Küçükerman, *Geleneksel Türk Dericiliği*, p. 93.
12 See, Z. Çelik, *Displaying the Orient* (Berkeley: University of California Press, 1992), pp. 139-142.
13 See, Ö. Küçükerman, *Feshane Defterdar Fabrikası* [The Feshane Factory in Defterdar] (Ankara: Sümerbank, 1988), pp. 148-150.

mous photograph albums of Sultan Abdulhamid II, our primary visual resource on Ottoman industrial architecture, were also prepared around this time to be sent to the 1893 Chicago World's Columbian Exposition. Containing photographs not only of factories but also of schools, hospitals, libraries, and new palaces, the albums were intended to boast Ottoman progress in education, sciences, and industry, and to reverse the image of a stagnating, oriental Empire.

In the brief period between the Constitutional Revolution of 1908 and the First World War, a strong nationalist and corporatist industrial discourse emerged under the ideological rule of the Young Turks, who looked westward to Germany and eastward to Japan for inspiration.[14] The magazine *Industry* (*Sanayii*), the precursor of the republican *Endüstri*, started publication after 1908, and included on its editorial board not only engineers like Nafiz Ziya Bey, the director of trolley lines and electricity distribution in İstanbul, and Herr Krank, the German engineer in charge of the arsenal steelworks, but also prominent intellectuals and professors of the Imperial Academy of Fine Arts like Celal Esat Arseven and Ismail Hakkı Baltacıoğlu.[15] The 1913 proposal for a new law to encourage industrial development, the publication of the first industrial censuses in 1917, which still constitutes our major source on late-Ottoman industries, as well as the protocol signed with Germany to send Turkish interns to German factories, all testify to the fact that at the eve of the First World War, industrialization had become a national priority, albeit a doomed one under the specter of the coming global conflict.[16]

Opening the Silahtarağa electric power plant on the Golden Horn in 1913 with three turbines and six steam boilers was the Ottoman government's last major industrial initiative before the First World War (fig. 10).[17] The plant was contemporary with such icons of Modern industrial architecture as Peter Behrens' AEG factory in Berlin (1909) and Walter Gropius' Fagus Works in Alfeld on the Leine (1911-1913). Whereas Behrens' "temple for German industry" famously elevated technical form to artistic expression, Gropius' building was a pioneer in transparency and in developing a modern factory aesthetic dissociated from historical precedents, thereby anticipating the canonic interwar Modernism of the Bauhaus. In comparison to these famous monuments of Modern architecture, Silahtarağa's simple industrial sheds are rather unremarkable. Nevertheless, they illustrate a distinctly German brand of modern factory design that would continue into the early-republican period. Organized in the manner of an industrial farm complex consisting of separate large-span steel-frame structures with pitched roofs, both the site planning principles and the architectural expression of the Silahtarağa buildings would be repeated, most notably in the early-republican sugar factories in Uşak (1926) and Turhal (1934), the latter designed by the German architect Fritz Breuhaus and built by the German construction firm Buckau (fig. 11).

Early-republican state industries: The First World War to 1950

At the end of the War of Independence, which culminated in 1923 with the establishment of the new Turkish republic over the ruins of the Ottoman Empire, Turkey was a war-torn, capital-deficient country dependent on massive imports to meet domestic demand for industrial products. In contrast, her meager exports were limited to some raw materials and minerals. As early as 1921, Ferit Bey, who would become finance minister of the new Ankara Government, lamented Turkey's unfavorable balance of trade, and declared that what Turkey needed desperately was "factories, factories, and more factories."[18] In the Izmir Economic Congress of 1923 it was clearly stated that industrialization was to be accomplished within a capitalist framework through private initiative. In order to provide credit to facilitate this process, the state established *Iş Bankası* (Business Bank) in 1924 and *Sanayii ve Maadin Bankası* (Industry and Mining Bank) in 1925. A new Industrial Incentives Law (*Teşvik-i Sanayi Kanunu*) was passed in 1927 explicitly calling for building "industrial plants for mass-production with the assistance of advanced machines, tools or mechanical equipment."[19]

14 On the inspiration of Japan, see, R. Worringer, "Sick man of Europe" or the Japan of the Near East? Constructing Ottoman Modernity in the Hamidian and Young Turk Eras," *International Journal of Middle East Studies*, 36 (2004), pp. 207-230.

15 Ö. Küçükerman, *Geleneksel Türk Dericiliği ve Beykoz Fabrikası* [Traditional Turkish Leather Industry and the Beykoz Factory] (Ankara: Sümerbank, 1988), p. 147.

16 The 1917 industry statistics are re-published in G. Okçün, *Osmanlı Sanayii: 1913 ve 1915 Yilları Sanayi Istatistiki* [Ottoman Industry: The Industrial Censuses of 1913 and 1915] (Ankara: Ankara University Department of Political Science Publications, 1970).

17 For an excellent history of the complex, see, A. Aksoy (ed.), *Silahtarağa Elektrik Santralı 1910-2004* (İstanbul: Bilgi University Publications, 2007) (in Turkish).

18 Cited in Y. Tezel, *Cumhuriyet Döneminin Iktisadi Tarihi 1923-1950* [Economic History of the Republican Period 1923-1950] (Ankara: Yurt Yayınları, 1986 (1982)), p. 128.

19 Z. Toprak, *Sümerbank* (İstanbul: Creative Yayıncılık, c.1989), p. 24.

It was also hoped that these measures would begin nurturing a national entrepreneurial class in areas hitherto dominated by foreigners, Levantines, and non-Muslim Ottoman *millets*, who, according to the 1917 industrial census, controlled 80.4% of all industrial establishments.[20] The imposition of protectionist tariffs on foreign businesses, to be followed later by levies on non-Muslim businesses, testifies to this foundational republican agenda of creating a national, Muslim-Turkish bourgeoisie. Major incentives were extended to potential entrepreneurs such as tax exemptions, rent-free land for building factories, and the duty-free importation of machinery and building materials. But the response was limited given the insufficiency of capital accumulation and the absence of an entrepreneurial culture.

The economic crisis of 1929, which marked the end of liberal economic policies everywhere, was the catalyst for Turkey's transition to a planned economy and massive state-sponsored industrialization programs inspired by German, Italian, and Soviet models. As many historians point out, Turkey's state-led industrialization did not, however, rest on collectivist ideological foundations as was the case in the Soviet Union, Fascist Italy, or National Socialist Germany. Rather, it was a last resort aimed at jump-starting industrialization. That Turkey's state enterprises were conceived in support of, rather than in opposition to, private initiative was clearly stated by the Republic of Turkey's founder and first president, Mustafa Kemal Atatürk, who declared: "Our statist policies are essentially based on private individual enterprise: however, in order to urgently accomplish the welfare of the people and the construction of the nation in as short a time as possible, the state is directly involved in economic activities on which our national welfare depends."[21]

Fig. 10: **İstanbul, *Silahtarağa* Electric Power Plant; view of the site in the 1930s.**

Fig. 11: **Uşak, Sugar Factory, 1926.**

The primary agent of early-republican, state-led industrialization was Sümerbank, the successor to the Industry and Mining Bank. Established in 1933, it had the dual objective of taking over the industrial heritage of the Ottoman Empire, and starting up new industries most urgently needed for basic goods like textiles, leather, sugar, cement, iron, steel, chemicals, and paper, whose raw materials were all available in the country. Textiles and leather, being lighter industries that did not require highly-developed technology and worked well in the labor-intensive, capital-scarce conditions of Turkey, were the centerpieces of Sümerbank's activities. As a start, the four major industries inherited from the Ottoman Empire (namely Fezhane for woolen textiles, Hereke for wool and silk, Bakırköy for cotton calico printed textiles, and the Beykoz shoe factories) were modernized and incorporated into a comprehensive five-year national development plan inspired by Soviet experiences with a planned economy.

This was followed by establishing new Sümerbank factories, especially in cotton textiles. According to economic historian Şevket Pamuk, such industrial activity represented the belated fulfillment, albeit within the context of a new national economy, of the old 19th-century Ottoman quest for

20 Y. Kastan, "Atatürk Döneminde Sanayileşme ve Karabük Demirçelik Işletmeleri," [Industrialization During Atatürk's Time and the Karabük Iron and Steel Plant] *Kastamonu Eğitim Dergisi*, 2:2 (October 2003), p. 488.

21 S. Süreyya Aydemir, *Ikinci Adam: Ismet Inönü*, [The Second Man: Ismet Inönü] vol. 2 (İstanbul: Remzi Kitapları, 1999 (1966)), pp. 445-446, cited in Kastan, "Atatürk Döneminde Sanayileşme," pp. 492-493.

catching up with the Industrial Revolution.[22] Most of these early-republican state industries were geared towards import-substitution and the accompanying policies of "national self-sufficiency," which made no provisions for exports. The Sümerbank posters and advertisements by the prominent graphic designer Ihap Hulusi Öney capture the nationalist spirit of the time and remain among the most canonic images of early-republican visual culture (figs. 12 & 13).

The construction of new Sümerbank factories in the 1930s still constitutes a national epic, endowing images of industry with an unprecedented iconic power endlessly reproduced in official postcards, advertisements, photograph albums, and propaganda publications like *La Turquie Kemaliste* (fig. 14). The most paradigmatic of these is the Sümerbank cotton textile plant in Kayseri (1934-1936), where the most up-to-date machinery was employed in cotton yarn and cloth production (figs. 15 & 16). Designed by Constructivist Soviet architects, built by the Turkish contractor Abdurrahman Naci Bey with long-term, low-cost Soviet loans, and operated by Turkish workers trained in the Soviet Union, it monumentalized the interwar model of industrialization through strong state initiative and the belief in the regulatory role of five-year development plans.

In addition to the main factories designed by Ivan Nikolaev, the project included workers' housing by Alexander Pasternak, and the cafeteria / social center by Ignati Milinis, a former associate of the Constructivist architect Moshei Ginzburg.[23] The perspective drawing of the factory sheds extending into the landscape are indeed representative of the utopic vision of Soviet Constructivism, treating the entire site plan as a vast assembly line, a treatment also demonstrated in the projects for the Magnitogorsk industrial town in western Siberia (fig. 17).[24] The symmetrical and monumental, stone-clad, colonnaded gateway to the Kayseri complex, however, displays a Classicism that was the hallmark of state architecture everywhere during the interwar years (fig. 18).

This Turkish-Soviet industrial cooperation in the early 1930s should be viewed within the larger context of the prevailing interwar belief that the universal rationality of scientific, technological, and industrial progress transcends differences in politics and ideology. Nothing illustrates this better than the transfer of technology from the United States to the Soviet Union in the early 1930s, especially Fordism and Taylorism, which were the "revolutionary forces" behind building the Soviet industrial empire: from the Ford automobile and truck assembly lines in Moscow, to American contractors from Ohio building Russia's "city of steel" in Magnitogorsk.[25] In such a world, Kemalist Turkey harbored no qualms about importing technical know-how from communist Russia in the same way that communist Russia imported technology and expertise from capitalist America. That feasibility reports for various industrial projects were commissioned to both Soviet and American experts during the preparation of the first five-year national development plan, or that Prime Minister Ismet Inonu traveled to Fascist Italy in 1932 in search of

Fig. 12: **Sümerbank advertisement designed by Ihap Hulusi for the woolen textiles of *Feshane* and *Hereke* factories, 1930s.**

22 Pamuk, *The Ottoman Empire*, p. 127.

23 I am grateful to Jean Louis Cohen for making available to me the Russian-language monograph, *Ivan Nikolaev 1901-1979* (Moscow: 2002), and for translating relevant parts from the book.

24 For a comparative discussion of Soviet and Turkish state-owned industrial complexes, see, Özlem Arıtan, "Sosyalist Modernleşme, Sovyet Sanayii Yerleşkeleri ve Türkiye'deki Devlet Yerleşkeleri," [Socialist Modernization, Soviet Industrial Settlements and State Enterprises in Turkey] *Arredemento Mimarlık* (November 2006), pp. 120-127.

25 For a particularly informative historical account of the role of American technology, Fordism, and Taylorism in building the Stalinist Soviet Union, see, T. Hughes, *American Genesis: A history of the American Genius for Invention* (New York: Penguin Books, 1990), pp. 249-284.

Fig. 13: **Sümerbank advertisement designed by Ihap Hulusi for the Beykoz Shoe and Leather Factories, 1930s.**

Fig. 14: **Cover of the official publication *La Turquie Kemaliste* representing the rise of the young republic among factory chimneys and industrial progress, late 1930s.**

Fig. 15: **Kayseri, Sümerbank Cotton Textiles Plant, Ivan Nikolaev and his team of Soviet architects, 1934–1936.**

Fig. 16: **Sümerbank Cotton Textiles Plant, Turkish government-issued postcard showing machinery.**

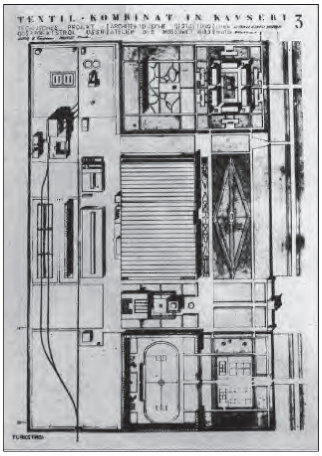


Fig. 17: **Sümerbank Cotton Textiles Plant, site plan.**

Fig. 18: **Sümerbank Cotton Textiles Plant, monumental entrance.**

funds and technical know-how demonstrate this Kemalist quest for "civilization and progress" regardless of its source. In the eyes of many early-republican intellectuals, the project of industrializing Turkey was nothing less than the continuation of the War of Independence on a new front, or "... the main principle and highest goal of [the] Turkish national liberation movement."[26]

This linking of industrialization with the larger Kemalist project of nation-building and modernization distinguishes early-republican industrial culture from preceding (or succeeding) periods and also informs the distinct character, design, and location of early-republican factories. Significantly, the geographic distribution of Kemalist state industries was a direct result of this larger "civilizing mission" espoused by the regime. As the national hero Ataturk himself put it, "it was necessary to distribute industrial establishments across the entire surface of the motherland ... in order to introduce modern, civilized, progressive life styles into the remotest corners of the country."[27] It is therefore not surprising that in contrast to the concentration of industrial establishments in İstanbul and a few other coastal areas and port cities during the late-Ottoman period, early-republican factories and industrial plants were located across Anatolia, in medium-sized towns made accessible by the country's expanding railway network.

Among the most significant of these were Sümerbank's five major textile plants: Kayseri and Nazilli, designed by the Soviets (1932-1936), and Bursa, Malatya, and Konya Ergelisi, built by the Germans (1937-1939). Also significant were the sugar factories in Eskişehir and Turhal (1933) and a major new cement factory in Sivas (1942). Of epic proportions, however, is the iron and steel works of Karabük, located near the coal mines of Zonguldak near the Black Sea coast in Northern Anatolia. An agreement was signed in 1936 with the British H.A. Brassert & Co. to construct and set up the plant. Ground was broken in 1937, and production started in 1939 with two blast furnaces for steel production, a rolling mill for the casting of pipes, and another mill for sheet metal. "Today heavy industry is starting in Turkey..." said Prime Minister Ismet Inönü when laying the foundations of the plant in 1937. He went on to state,

> ... equally important is the social significance of this enterprise. The housing, health and schooling needs of its prospective workers will also be addressed, for which purpose, separate projects will be prepared. With the iron and steel works of Karabük, we are not only establishing an industrial institution, but also we are building a moral and social institution of culture and civilization for our nationalist, republican country.[28]

The idealized image of an industrial Anatolia is especially evident in the visual culture of the 1930s, when photographs of factories, bridges, power plants, dams, and grain silos featured prominently in official early-republican publications. Particularly significant are images of factories contextualized within the Anatolian landscape, as, for example, in a 1938 photograph of the Zonguldak coke processing plant for the Karabük iron and steel works (fig. 19). Depicted as a technological object harmoniously situated in an idyllic northern

26 S. Süreyya Aydemir, "Beynelmilel Fikir Hareketleri Arasında Türk Nasyonalizmi," [International Ideological Currents and Turkish Nationalism] *Kadro*, no. 20 (August 1933), p. 13.

27 Aydemir, *Ikinci Adam: Ismet Inönü*, pp. 445-446; cited in Kastan, "Atatürk Döneminde Sanayileşme," pp. 492-493.

28 From Turkish newspapers of April 3, 1937; cited in Kastan, "Atatürk Döneminde Sanayileşme," p. 498.

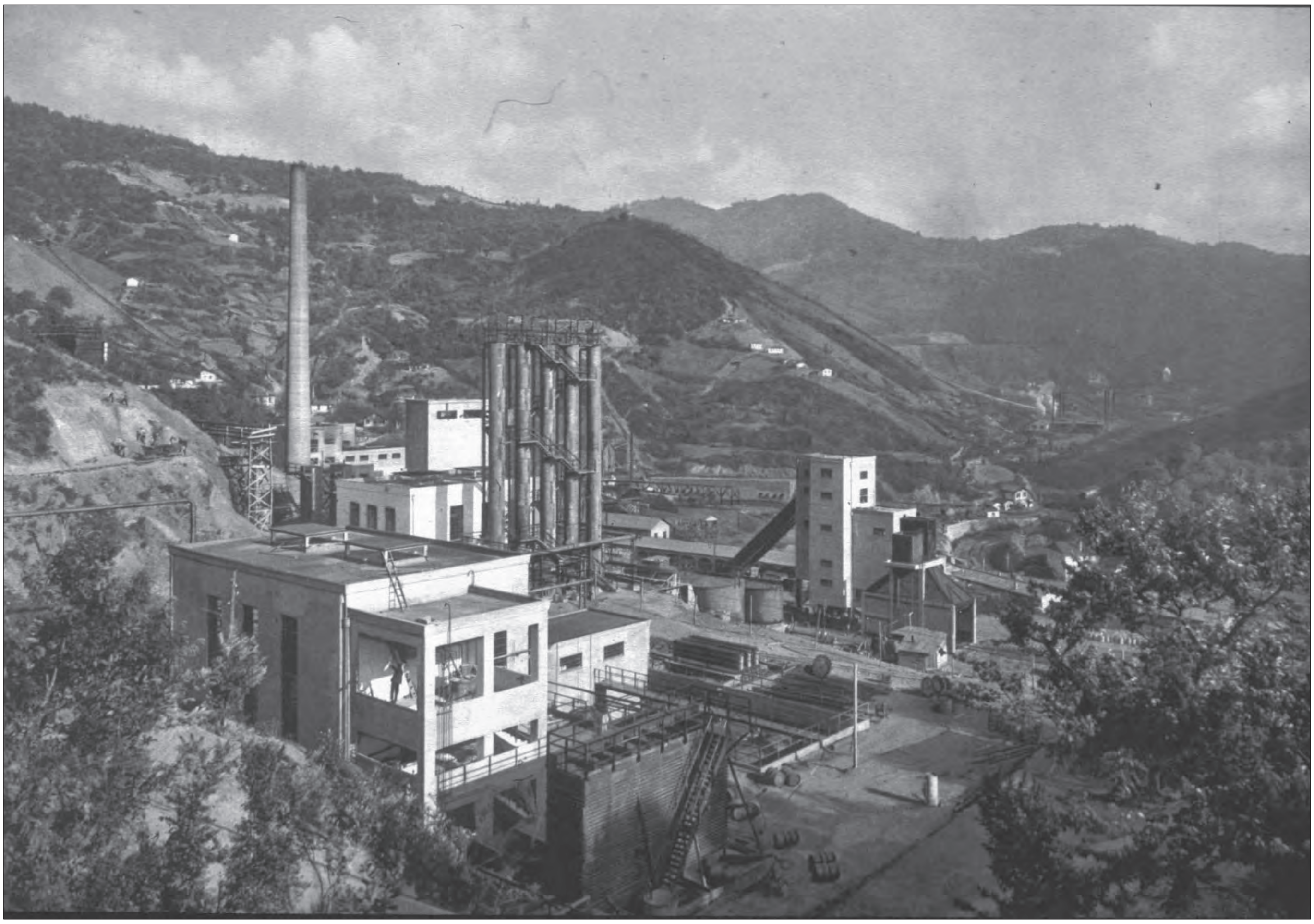


Fig. 19: **Kozlu, Zonguldak, coke smelting plant, Turkish government-issued photograph, 1936.**

Anatolian mountainside setting, it is a "machine in the garden," to use Leo Marx's famous phrase.[29]

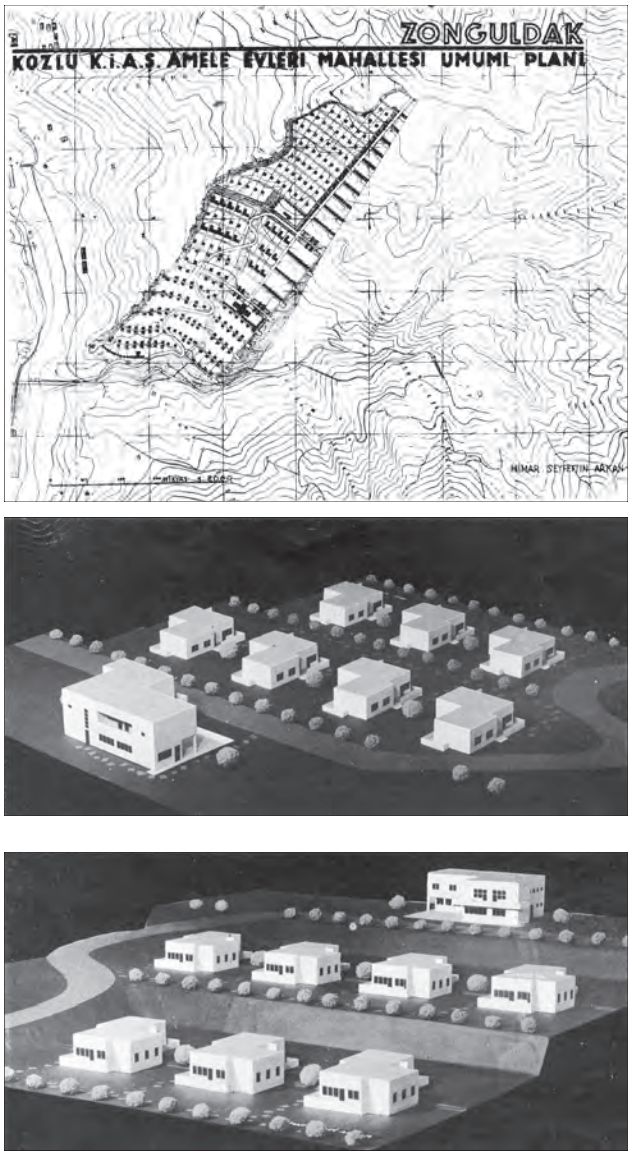
Leo Marx and others have written extensively about the modern shifts in American collective consciousness from the cult of sublime nature in the 19th century to one of man-made industrial landscapes in the early 20th, most famously celebrated by Charles Sheeler's painting "American Landscape" (1930) depicting the Ford River Rouge plants in Dearborn, Michigan. It may be argued that a comparable shift in national consciousness was intended by early-republican Modernist imagery. For example, widely-circulated images of the Kayseri textile plant extending into the horizon in the central Anatolian landscape suggest, like Sheeler's paintings, that such photographs were also nationalist statements on how land truly becomes "patria" when transformed and tamed by industry. Furthermore, by celebrating factories and industrial imagery (chimneys, cooling towers, cylinders of grain silos, etc.) as aesthetic objects in and of themselves, these canonic photographs of the 1930s undoubtedly contributed to the emerging discourse of the Modern Movement or "New Architecture" (*Yeni Mimari*) in Turkey.[30]

Integral to this "Anatolian industrial landscape" ideal, and perhaps more significant from an urbanistic point of view, these major early-republican factories were not singular buildings or groups of buildings, but were designed as comprehensive "factory towns" in the spirit of Soviet collectivist examples. In addition to its immense production sheds, machine shops, and electric power plant, the Kayseri textile

29 L. Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America* (New York: Oxford University Press, 1964). The photograph of the Zonguldak plant is from the photo album *Fotograflarla Türkiye* [Turkey in Photographs] (Ankara: Ministry of Interior, 1938).

30 I have addressed this theme in more detail in the third chapter of my *Modernism and Nation-Building: Turkish Architectural Culture in the Early Republic* (Seattle: University of Washington Press, 2001).

Fig. 20: **Sümerbank Cotton Textiles Plant, unmarried workers' housing building.**



Figs. 21 a & b: **Kozlu, Zonguldak site plan and model of workers' housing for coal miners, Seyfi Arkan, 1936.**

plant, for example, included workers' housing, a daycare center, cinema, infirmary, library, swimming pool, and soccer stadium. The main road connecting the factory to the city separated the production units from the workers' housing, which consisted of different typologies of reinforced concrete apartment units.

Unlike Soviet communal housing experiments, these were based on family-oriented typologies that separated married workers and their families from unmarried workers, and differentiated between ranks and occupational hierarchies. Four two-story blocks containing 64 two-bedroom units were reserved for married workers and their families; a three-story block with a 350-bed capacity housed the unmarried workers; eight duplex units and sixteen three-bedroom apartments were given to supervisors and their families (fig. 20). A similar idea of status differentiation informs Seyfi Arkan's workers' housing project in the Kozlu coal mines near Zonguldak (1936), one of the most significant collective housing projects of early-republican Modernism. A visible typological distinction separates the repetitive multi-story apartment blocks for the workers from the small, single-family villa-type houses for the technicians and supervisors, and a larger duplex villa for the director (fig. 21).

In the Nazilli cotton yarn and textile plant, also by Soviet designers, a 205-unit housing complex for workers and supervisors was planned adjacent to the factory grounds, along with a social center, cafeteria, and sports fields. In the Bursa Merinos woolen textiles plant, social and recreational services (cafeteria, infirmary, day care center, lecture halls, and sports club) were planned within the complex in close proximity to the large sheds for weaving and thread manufacture. As Burak Asılıskender and Özlem Arıtan have argued for the Kayseri and Nazilli cases respectively, Sümerbank state industries contributed greatly to the urban and social transformation of the towns they were located in, turning the factory workers and their families into modern citizens committed to the ideals of the Kemalist Revolution.[31] Above all, the mixed-gender workspaces and social / recreational facilities

31 See especially, B. Asılıskender, *Cumhuriyet'in Ilk Yıllarında Modern Kimlik Arayışı: Sümerbank Kayseri Bez Fabrikası Örneği*, [Search for a Modern Identity in the Early Republic: Sümerbank Textile Factory] master's thesis, İstanbul Technical University, 2002; and his "1930'larin Modern Yapıtının Günümüzdeki Yalnızlığı," [Contemporary Loneliness of the Modernist Building of the 1930s] *Tol Mimarlık Kültürü Dergisi* (Kayseri: Turkish Chamber of Architects Kayseri Branch Publications, Winter 2003), pp. 46-51. Also see, Özlem Arıtan, "Sümerbank Yerleşkeleri: Ideolojik ve Mekansal bir Okuma," [Sümerbank Complexes: An Ideological and Spatial Reading] *Arredemento Mimarlık* (January 2005), pp. 102-109.

significantly reinforced the republic's secularization agenda, not unlike the ideological function of the "workers' clubs" of Soviet Constructivism. In the same way that the latter were conceived as "social condensers" to create the "new man" of socialism, state-owned industrial complexes were considered instrumental in creating the new Kemalist citizen.[32]

Coinciding with the rise of the Modern Movement in interwar Europe, early-republican industrial buildings were instrumental in the introduction of this New Architecture (*Yeni Mimari*), as the Modern Movement was then called. Major icons of Modernist factory design were built in Europe around the same time: most notably the Fiat Factory in Turin by Matteo Trucco (1927), the Van Nelle tobacco factory in Rotterdam by Johannes Brinkman and Leendert van der Vlugt in cooperation with Mart Stam (1926-1930), and the Boots Factory in Nottingham by Owen Williams (1933). A newly-emerging and very active Modernist architectural profession in Turkey followed European developments closely, including the latest developments in factory design. However, large-span structures of immense scales and levels of transparency were not possible in Turkey given the poor state of building technology as well as tight budgets, even for major state factories. For example, some of Ivan Nikolaev's most visionary propositions for the Kayseri textile plant were not built at all, and whatever was built looks more avant-garde in perspective drawings than in actual implementation, which relied heavily on local stone as exterior finishing material, now badly aged (fig. 22).

Nevertheless, Turkish architectural culture elevated the status of factories from that of utilitarian sheds designed by builders to architect-designed modern objects representative of the rationalist, functionalist principles of the New Architecture. Here, two examples stand out: the brewery in Ankara Atatürk Model Farm (1933-1934) by Ernst Egli, the leading official architect of Kemalist Ankara, and the distillery in Mecidiyeköy, İstanbul (1931) by Rob Mallet-Stevens, the prominent French Modernist architect (figs. 23 and 24). Both were built for the state monopoly (*Tekel*) for the production of liqueur, spirits, and beer, another major early-republican industry that employed Modernist imagery extensively, perhaps because of the association of alcohol with modern, secular lifestyles dissociated from tradition.

32 For a recent collection of essays on factory housing in early republican Turkey see A. Cengizkan (ed.), *Fabrika'da Barınmak: Erken Cumhuriyet Döneminde Türkiye'de İşçi Konutları—Yaşam, Mekan ve Kent* [Dwelling in the Factory: Workers' Housing in Early Republican Turkey—Life, Space, and City] (Ankara: Arkadaş Yayınevi, 2009).

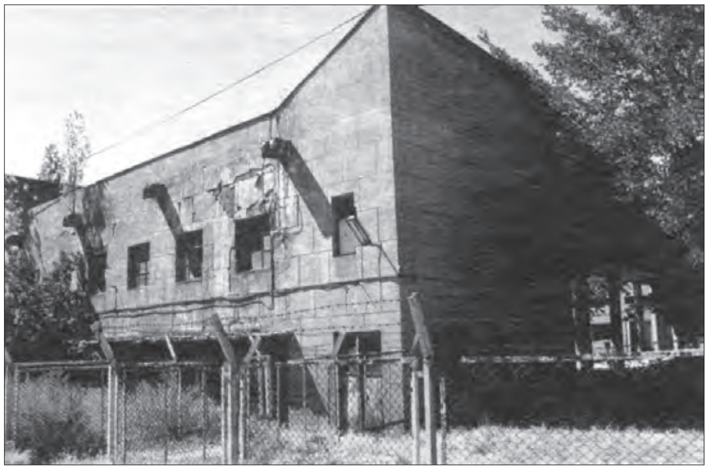


Fig. 22: **Sümerbank Cotton Textiles Plant showing the dilapidated current state of the electrical power station.**

Fig. 23: **Ankara, brewery in Atatürk Model Farm, Ernst Egli, 1933-1934.**

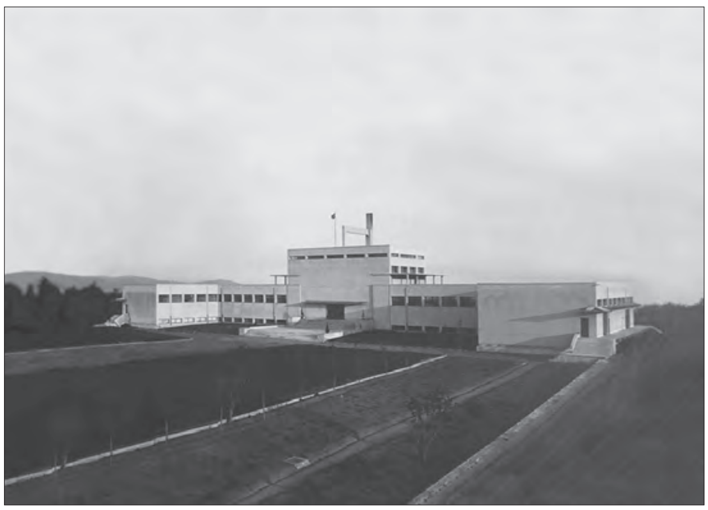


Fig. 24: **İstanbul, Mecidiyeköy, Distillery/Liquor Factory, Rob Mallet-Stevens, 1931.**

Collectively, the design and layout of early-republican factories reflect this new, elevated status of the industrial building as Modern architecture *par excellence*. The masonry columns, brick vaults, and / or cast-iron structures of the late-Ottoman factories discussed earlier gave way in this period to reinforced concrete as the primary material for large-span structures. Most significantly, the design of factories entailed much larger production units, incorporating conveyor belts and Fordist assembly-line methods, along with repetitive factory jobs. The plans typically reflected the priority of production efficiencies rather than the quality and individuality of workspaces. Typically, access to these state industrial complexes was through a symbolically-charged gatehouse that employed conspicuously Modern forms: simple volumes, unadorned surfaces, and Modernist typography advertising the progressive modernity of the Kemalist state in the same way that ornate late-Ottoman factory portals symbolized the progressiveness of the Sultan and the Empire.

Notable among these is Mallet-Steven's two-story entrance structure to the Mecidiyeköy distillery. Containing administrative offices and spaces for guards, it was designed as a three-dimensional exercise in elemental block composition evocative of Bauhaus compositions. The most recognizable formal element of factory design, however, was the "saw-tooth" roof forms or north-facing curved "fins" for clerestory lighting to illuminate the main workspace—a formula that was well-established with the Soviet-designed textile factories in Kayseri and Nazilli, among others (figs. 25 & 26). A small textile factory shed designed by Halit Femir and Feridun Akozan, and published in the professional journal for Turkish architects in 1950, illustrates how this iconic form of a modern factory carried over into the 1950s, this time in the hands of Modernist Turkish architects, within the dramatically different historical context of the post-Second World War period (fig. 27).[33]

Mixed-economy policies and import substitution: 1950–1980

With the landslide victory of the Democrat Party (DP) in 1950, Turkey's early-republican period came to a decisive end. Abandoning the statist economic policies and nationalist isolationism of the Republican Peoples' Party during the previous two decades, the DP regime promoted a mixed economy with a greater role for private enterprise. However, no actual transfer or sale of state-owned enterprises took place, as would happen after 1980, and import-substitution continued to be the primary economic strategy. State capitalism focused on heavier industries, construction materials, and infrastructure development, leaving the manufacture of consumer goods to the private sector, which expanded dramatically. For example, in the textile industry, Sümerbank no longer dominated industrial production, and new enterprises like Bossa and Güney Sanayii in Çukurova emerged as major players. By the end of the 1950s, 73% of cotton spindles and 69% of cotton looms, as well as 70% of wool spindles and 82% of wool looms were privately owned, making the 1950s "a golden age for private firms in the textile industry" according to one economic historian.[34] For the first time since the *Tanzimat*, the state relinquished its leading role in Turkish industrialization to large private companies and con-

Fig. 25: **Nazilli Cotton Textiles Plant, construction of the roof "fins," 1932–1936.**

Fig. 26: **Ankara, Yüniş Woolen Textiles Factory, 1920s.**

33 "Bursada Ipekçilik Kollektif Şirketi Dokuma Fabrikası," [Silk Company Weaving Factory in Bursa] *Arkitekt*, nos. 221-222 (1950), pp. 93-95.

34 Toprak, *Sümerbank*, p. 95.

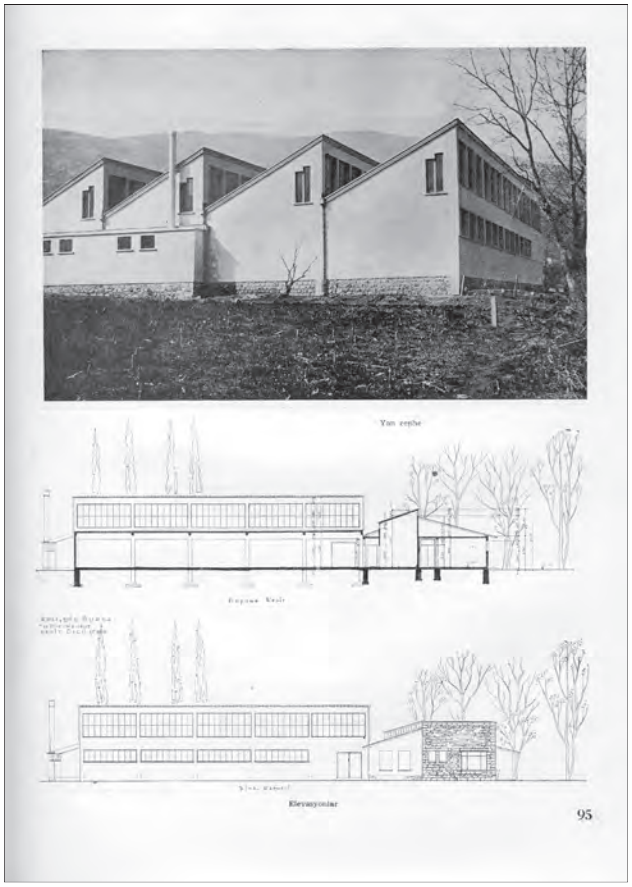


Fig. 27: **Bursa, Silk Textile Factory, Halit Femir & Feridun Akozan, 1950.**

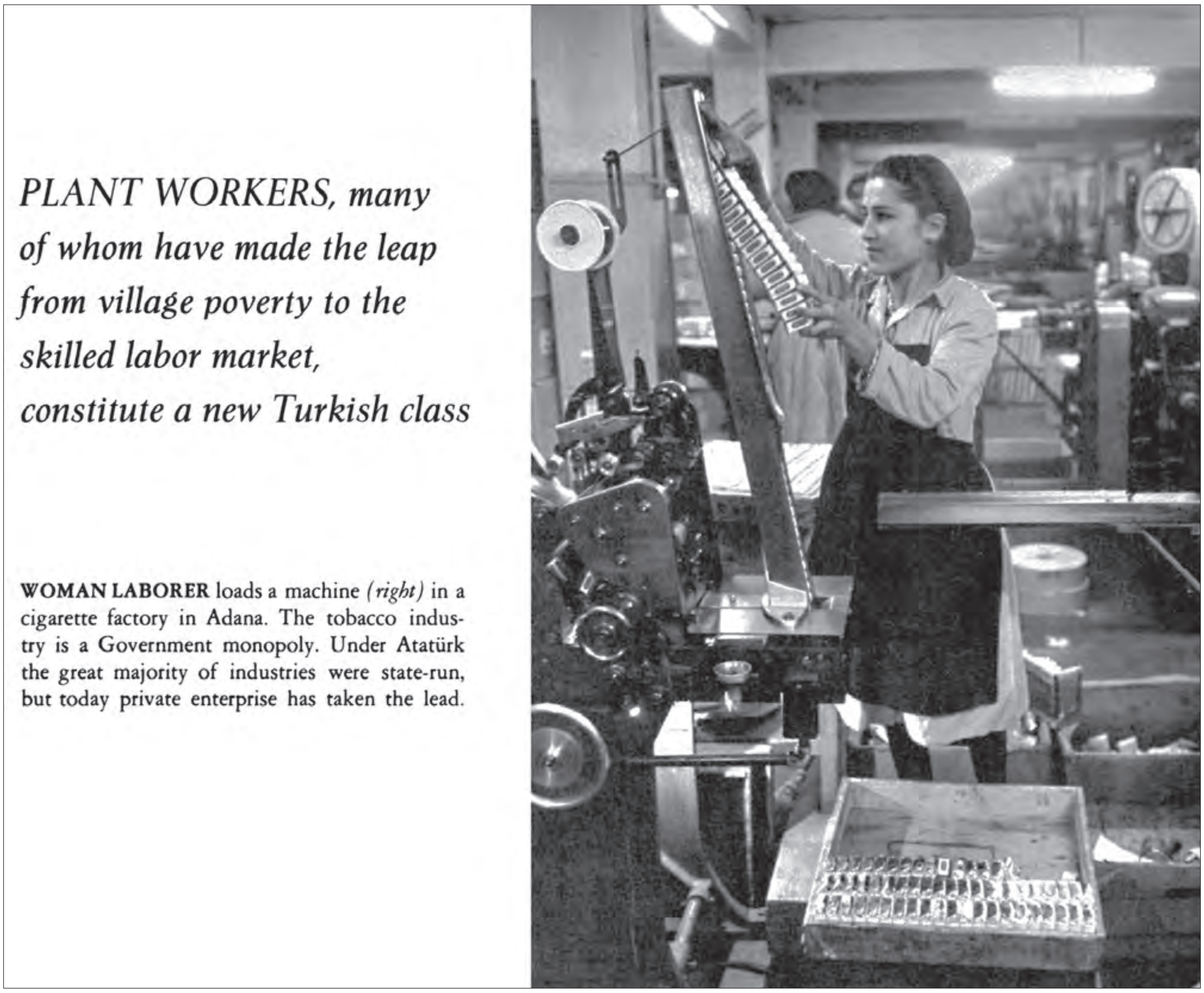
glomerates that still dominate Turkish industry (such as Koç, Sabancı, and Eczacıbaşı holdings). One very important consequence of this was that the managers and technicians trained in the state industries of the early republic moved into the private sector, providing invaluable know-how in running the new industrial establishments.

Turkey's import-substitution-oriented industrial growth in this period needs to be viewed within the larger context of the prevailing discourses of development in the post-Second World War world at large. In this new era, Turkey was heralded as one of the most successful models of the "modernization theory" that dominated social sciences, area studies, and international politics throughout the Cold War (fig. 28). Central to modernization theory was a basic dichotomy between modernity and tradition: the former an unambiguous blessing and the latter an obstacle to its realization. It was postulated that as societies became more "modern" through increased literacy, increased mobility, enterprise, the use of communication technologies, urbanization, and other such indicators, their traditional traits and cultural practices such as fatalism, religiosity, and lack of curiosity about the world would give way to new patterns of thought and behavior largely derived from American institutions and values.[35]

This was a time when fierce ideological warfare was waged in the world at large between the Soviet model and "the good life" promised by American capitalism—one epitomized by the famous "kitchen debate" between the American and Soviet leaders Richard Nixon and Nikita Khrushchev during an international exhibition in Moscow in 1959. Against the heavy industries and space programs of the Soviet state, the image of America promoted by Nixon was one of suburban homes with fully-equipped kitchens and a myriad of consumer products. After three decades of Kemalist "national self-sufficiency" doctrines, these images resonated well with the Turkish public. At the time Turkey was also enjoying the newfound prestige of NATO membership (1952) as a new American ally on the borders of the Soviet Union. Fueled by rapid urbanization, the agricultural prosperity of the DP years, and the general optimism of the postwar world, the dissemination of a capitalist consumption culture in Turkey was fast, extensive, and irreversible. Import-substitution strategies shifted from basic needs (such as shoes, textiles, and sugar) to household consumer goods such as refrigerators, kitchen appliances, washing machines, pharmaceuticals, televisions, and even a domestic automotive industry. Arçelik appliances and Anadol cars are vivid legacies of the period.

The rapid development of a construction materials and components industry was a crucial sector of postwar import substitution that transformed the architectural and urban landscape of Turkish cities over the next few decades. For example, the rising demand for urban housing and highway construction resulted in more than a five-fold increase in cement production between 1950 and 1960, and many new private cement factories were established in Izmir, Eskisehir, and Konya among others. Many "firsts" in the building industry appeared in the 1950s and 1960s: vinyl floor tiles (Kartal, 1952), a particle-board (*sunta*) industry (İstanbul, 1954), precast concrete poles (Izmir / Gaziemir, 1955), metal pipes (Ko-

35 Especially representative of this theory is D. Lerner, *The Passing of Traditional Society: Modernizing the Middle East* (Glencoe, Ill.: The Free Press of Glencoe, 1964). On the general connection between modernization theory and Turkish modernism in the 1950s see my "Democracy, Development and the Americanization of Turkish Architectural Culture in the 1950s," in S. Isenstadt and K. Rizvi (eds.), *Modernism in the Middle East* (Seattle: University of Washington Press, 2008), pp. 117-139.



PLANT WORKERS, many of whom have made the leap from village poverty to the skilled labor market, constitute a new Turkish class

WOMAN LABORER loads a machine *(right)* in a cigarette factory in Adana. The tobacco industry is a Government monopoly. Under Atatürk the great majority of industries were state-run, but today private enterprise has taken the lead.

Fig. 28: **Time-Life Magazine article celebrating Turkey's successful modernization in the aftermath of the Second World War.**

caeli, 1955), ceramic tiles and bathroom fixtures (Çanakkale Seramik, 1957; and Eczacıbaşı Vitra in Bozüyük, 1977), plate glass for windows (Çayırova, 1961), plastic pipes (Izmir, Çamdibi, 1962), fiberglass (1966), and Formica (Bolu, 1967), followed by various prefabricated, precast concrete building components, steel sections, trusses, and space-frame systems after the late 1960s.[36] The rise of a domestic construction industry that replaced expensive imported building materials was an important factor behind the emergence of the small-scale builder-contractor (*yap-satçı* in Turkish, literally a "builder-seller"), giving major cities their pervasive fabric of medium-rise apartments on small urban lots.

Even a cursory glance at the locations of new factories suggests that the post-Second World War period differed from the early-republican period in two important respects: namely, the conceptualization of factories as social spaces, and the geographical distribution of industries. Most conspicuously, factories were no longer conceived as collectivist company towns. Although cafeterias, lockers, and other auxiliary functions for the worker's welfare would be part of the program, workers' housing typically was not included in the overall design of industrial complexes. Furthermore, unlike the earlier republican ideological emphasis on spreading industry across Anatolia, post-Second World War industries of the private sector were re-concentrated mostly in the

36 Ü. Alsaç, "Türkiye Cumhuriyet Dönemi Endüstri Kronolojisi," [Turkish Republican Period Chronology of Industry] *Archiscope*, Special Issue on Industrial Buildings, no. 3 (December 1998), p. 66.

İstanbul-Izmit-Bursa-Gebze area, now a vast industrial region that draws on the abundant labor force of migrants from Anatolia, including women.

These workers and their families typically lived in the informal *gecekondu* settlements on the urban fringes of these industrialized cities. Congestion, pollution, struggles with poverty, and the endless shifts of toiling masses at factory gates became familiar tropes of films, photography, and literature during these socially-conscious decades. Hence, it is possible to suggest that this period is characterized as much by advances in factory design and the rise of a strong private enterprise in Turkey, as by the rise of organized labor movements, labor unions, and labor conflicts. The country finally caught up, not only with the technological and aesthetic dimensions of modern industrial capitalism, but also with its social and environmental problems.

More important for the purposes of this overview is that in conjunction with these developments, we see after 1950 the emergence for the first time of native Turkish architects, architectural partnerships, and building contractors capable of designing and building large factories and production plants. Modern factory design, typically commissioned to European architects in the early-republican period, was now the domain of Turkish architects whose increasingly-sophisticated factory designs have seldom received the attention they deserve within the historiography of modern Turkish architecture. One of them, Aydın Boysan, developed a characteristic factory aesthetic during the 1960s and early 1970s, using reinforced concrete structures with steel trusses and tubular steel space-frames for the large spans of the factory floor, expressing them on the exterior as a cascading continuity of triangular roof forms resembling folded plates. Ample daylight is admitted into the main workspaces through the roof and through its triangular openings, as illustrated in his paradigmatic Arçelik Home Appliances factory in Çayırova, İstanbul (1968), where brick exterior walls are used as infill between the reinforced concrete columns (figs. 29 & 30).

Fig. 29: **İstanbul, Çayırova, Arçelik Home Appliances Factory, Aydın Boysan, 1968.**

Fig. 30: **Arçelik Home Appliances Factory, interior view.**

The same signature aesthetic of folded plates was used by Boysan in the Ipek paper factory in Karamürsel, Izmit (1970) and in the Bisaş thread and textile factory in Bursa (1967; fig. 31). In his Nasaş Aluminum Plant, also in Izmit (1970), the use of perforated steel beams for the large span of the factory floor contributes to an industrial aesthetic, anticipating the High-Tech expressionism of the 1980s in the architectural culture at large (figs. 32 & 33). Similarly, the expressive use of solid or perforated steel beams and prefabricated steel trusses and space-frames, often in conjunction with a rein-

Fig. 31: **Karamürsel, Izmit, Ipek Paper Factory, Aydın Boysan, 1970.**

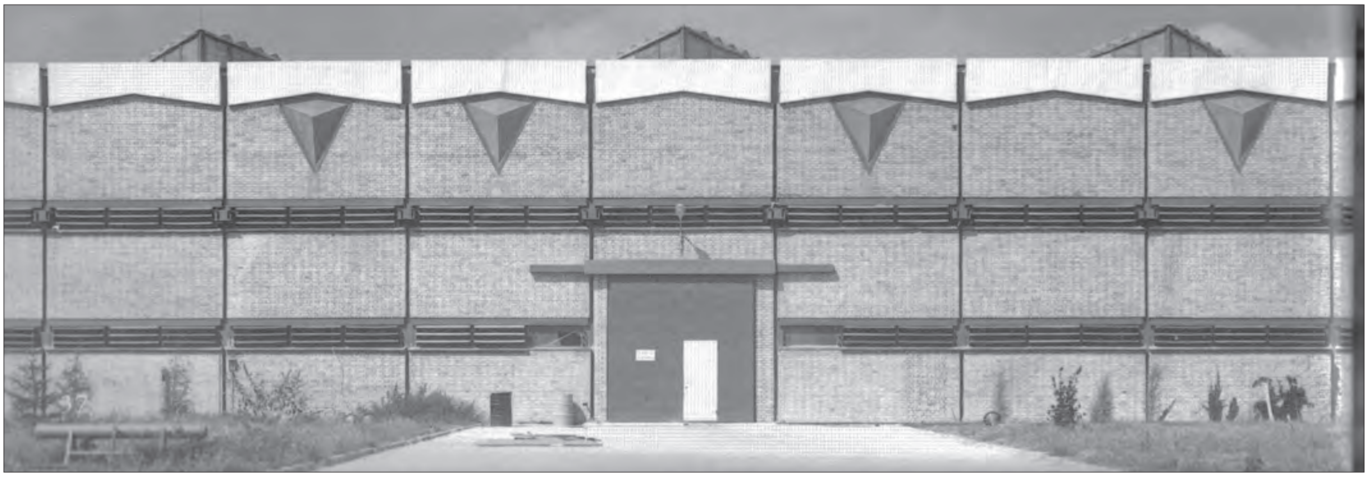


Fig. 32: **Gebze, Nasaş Aluminum Factory, Aydın Boysan, 1970.**

Fig. 33: **Nasaş Aluminum Factory, interior view.**

Fig. 34: **Izmit, Lassa Tire Factory, Doğan Tekeli and Sami Sisa, 1975-1977.**

forced concrete frame structure, is typical of factory design in the 1970s. These elements were perfected in the work of Doğan Tekeli and Sami Sisa, whose partnership has become a brand name in factory and office design in Turkey—for example in their Oyak-Renault automobile assembly plant in Bursa (1971-1972), and their Lassa Tire Factory in Izmit for the Sabancı industrial conglomerate (1975-1977; fig. 34). Also prominent is the work of Cengiz Bektaş, which includes a number of notable industrial buildings in western Turkey, for example the Printed Cotton Textiles Factory in his native Denizli (1973-1974), or his Iron and Steel Plant in Aliağa, Izmir (1979-1983).

An example that bears the legacy of the post-Second World War period industrial architecture at its best is the Vakko silk and fine textiles factory in Merter, İstanbul (1969) by Haluk Baysal and Melih Birsel, another paradigmatic Modernist architectural partnership incomprehensibly neglected until recently (fig. 35). The Vakko factory was designed as a rather unique example of experimentation with the so-called "integration of plastic arts," a pervasive trend in postwar Modernism whereby the architect's collaboration with painters, sculptors, and muralists breathed new life into the sterile glass and steel boxes of the International Style. Like some of its contemporaries in Latin American and Caribbean architecture, where "integracion plastica" was a creative local response to an imported Modernism, the Vakko factory incorporated murals, sculpture, and art work by prominent artists such as Bedri Rahmi Eyüboğlu, Sadi Çalık, Jale Yılmabaşar, and Mustafa Plevneli, with the stated objective of elevating the quality of workspaces and the welfare of the worker (figs. 36 & 37). As Ela Kaçel has pointed out, Baysal and Birsel's factory design uses plastic and graphic arts not as ornamentation but to provide surplus value in architecture, bringing together the ideals of both a critical Modernism that transcends sterile functionalist formulas and an enlightened capitalism that transcends sheer profit motives and greed.[37] Sadly, the factory was recently demolished against the protests of Docomomo-Turkey, symbolically marking the end of an epoch and the beginning of a very different one.

Fig. 35: **İstanbul, Merter, Vakko Factory, Haluk Baysal and Melih Birsel, 1969.**

Globalization and the post-Fordist Era: 1980 to the present

The period following the military coup of 1980 is commonly identified with the still-contentious legacy of the late Turgut Özal, the Prime Minister and President who initiated a spectacular transformation of Turkey along the economically-liberal and culturally-conservative paths set by United States President Ronald Reagan and British Prime Minister Margaret Thatcher in the West. The beginning of this era is perhaps best symbolized by the privatization of the national icon Sümerbank after 1987. Marking the end of nationalist developmentalism and import-substitution policies that had dominated the Turkish economy since the early republic, this period ushered an unequivocal reorientation of the country towards free markets, global capitalism, and export-oriented production—trends that continue even more vigorously under the Islamist-leaning Justice and Development Party (AKP) government since 2002. To give some figures, "[t]otal exports increased from less than 3 billion dollars in 1980 to 20 billion dollars in 1990 and more than 100 billion dollars in 2007. The share of manufactured goods in total exports rose from about 35% of all exports in 1979 to more than 95% in 2007."[38] Furthermore, global trends like outsourcing are now visible in the Turkish industrial landscape. It has become common to see not only foreign companies producing in Turkey (such as Toyota factories in Adapazarı, 1992-1994), but also international brands intended for international markets that are produced in Turkish factories (for example American or German-brand bathroom fixtures produced in the Artema-Eczacıbaşı plants in Bozüyük in central Anatolia), or Turkish factories opening new plants abroad (as in the case of the recent Vitra-Eczacıbaşı plants in Ireland and Russia, anticipating the eventual depletion of clay reserves in the Bozüyük region).

Since the 1980s, these developments have been mirrored in unprecedented advances in the design of buildings and workplaces in Turkey. With the trans-nationalization of architectural practice, the availability of cutting-edge technologies and construction systems, and the emergence of a younger generation of Turkish architects following global trends (such as Nevzat Sayın, Murat Tabanlıoğlu, and Emre Arolat), factory designs have come to conform to international standards. Many of them are located in the greater industrial zone that makes up İstanbul's hinterland, stretching from western Thrace to the Izmit-Adapazarı re-

37 E. Kaçel, "Fidüsyer: Bir Kollektif Düşünme Pratiği," [Fiduciary: A Collective Intellectual Practice] in M. Cengizkan (ed.), *Haluk Baysal - Melih Birsel* (Ankara: TMMOB Mimarlar Odası Yayınları, 2007), pp. 7-31.

38 Ş. Pamuk, "Globalization, Industrialization and Changing Politics in Turkey," *New Perspectives on Turkey*, no. 38 (2008), p. 268. Pamuk also argues that since the 1980s, Turkey's "third wave of industrialization" has led to the emergence of a new generation of industrial elite is in Anatolian cities, the so called "Anatolian tigers," who come out of predominantly rural, merchant societies and politically lean towards the AKP (p. 271).

Fig. 36: **Vakko Factory, wall relief by Bedri Rahmi Eyüboğlu.**

Fig. 37: **Vakko Factory, Bedri Rahmi Eyüboğlu working on the sculptural piece at the entrance gateway.**

gion in the East. These large, complex industrial programs, offices, and corporate buildings are executed with a level of quality and detailing that has only recently become possible in the Turkish construction scene, winning their designers national and international recognition. Although a comprehensive survey of industrial architecture and workspace design in this more recent phase of Turkish architecture is a vast topic beyond the scope of this historical overview, a few examples merit mention to complete the historical trajectory.

Among the most notable recent examples of Turkish industrial architecture are the Gön Leather Factories in İstanbul by Nevzat Sayın with their tectonic, exposed concrete aesthetic (1994-1995; fig. 38), and the ATK Textile Factory in Tekirdağ by Mehmet Konuralp, which creates an open, flexible space for the machine hall using immense "vaults" of steel trusses and cantilevers allowing sky-lighting for each bay (1995). Meanwhile, Doğan Tekeli and Sami

Sisa, the designers of the award-winning Lassa Tire Factory in Izmit (1975-1977), have continued their mastery of industrial buildings and large-span structures with such projects as the Eczacıbaşı Pharmaceutical Plants in Lüleburgaz (1992) and the Antalya Airport International Terminal (1998). Of the younger generation, Emre Arolat Associates and Tabanlıoğlu Architects have also distinguished themselves in the design of industrial complexes and workspaces, mostly through a slick, High-Tech aesthetic of steel and glass. Arolat's İstanbul Textile and Apparel Exporters' Association Offices building (1999-2000) is widely recognized nationally, while his Dalaman Airport (2006) in southwestern Turkey has won the prestigious Emerging Architecture Awards of London's *Architectural Review*, further testifying to the increasing maturity of contemporary Turkish designers (fig. 39). Tabanlıoğlu's Printing Center in Ankara for Doğan Media Holding utilizes a steel structural system with aluminum and glass cladding, featuring a landmark, transparent, cylindrical tower for entrance and circulation (1996-1997; fig. 40). The program includes printing facilities, technical departments, open offices, a VIP lounge, storage areas, and packaging facilities.

As the examples by Arolat and Tabanlıoğlu also suggest, the period since the 1980s represents an important programmatic shift in the nature of workspaces: the earlier prominence of factories and production plants is now replaced by the new importance and visibility of showrooms, office spaces, media centers, and spaces devoted to transportation, especially airports. These are the projects commissioned to the best design teams, who utilize cutting-edge technologies, sophisticated construction systems, and trans-national expertise. Meanwhile, a conspicuous manifestation of the eclipse of the modern "age of industry" everywhere is the dismantling of older industrial sites for either new development or adaptive reuse.

In Turkey, the demolition of the Vakko textile factory mentioned above is only one highly-visible example of a trend that has been taking place since the 1980s, with mixed results. While the removal of polluting industries from urban areas is generally welcome (as with dismantling the Kazlıçeşme leather tanneries along the Marmara coast of İstanbul's historical peninsula, once known for its stench, but now a rapidly-developing zone of tourism), the indiscriminate demolition of earlier industrial architecture, examples of which are icons of Turkish modernity, has attracted justified criticism from professional organizations and

Fig. 38: **İstanbul, Gön Leather Factory, Nevzat Sayın, 1994-1995.**

Fig. 39: **Dalaman, Dalaman Airport, Emre Arolat, 2006.**

Fig. 40: **Ankara, Printing Center for Doğan Media Holding, Tabanlıoğlu Architects, 1995-1996.**

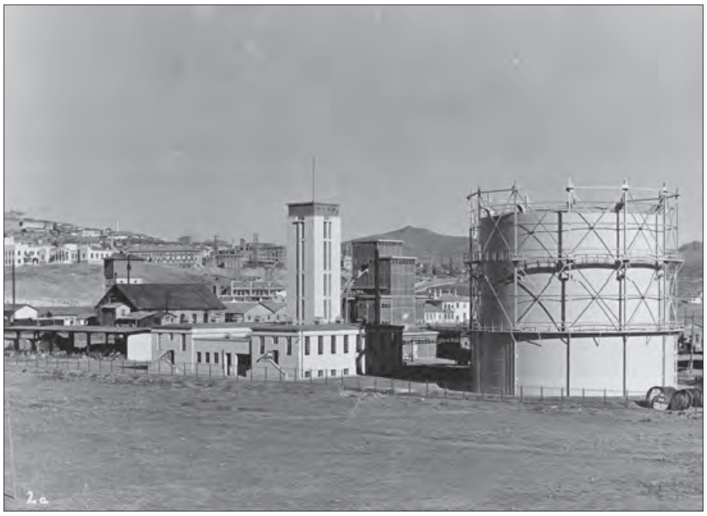


Fig. 41: **Ankara, Ankara Electricity and Natural Gas Works, 1928; demolished 2007.**

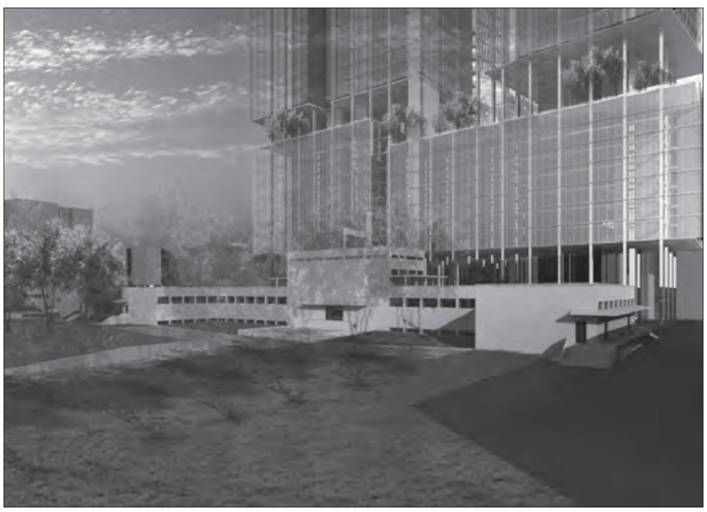


Fig. 42: **Mecidiyeköy, view showing the new residential tower above the old factory in the re-development proposal by Emre Arolat for the 1931 distillery, 2008 (also see fig.24).**

preservationists. Especially vocal is the young Docomomo-Turkey, established in 2002 and very busy since then. Along with the destruction of the Vakko Factory in İstanbul, many architects have lamented the recent demolition of the Natural Gas Works in Ankara, built in 1928 by German technicians of AEG (fig. 41), as the latest attempt by the AKP government to erase the secular, modernizing legacy of the Kemalist republic.[39]

The role of politics and ideology in these recent demolitions or in the benign neglect of old early-republican state industries (as in the case of the legendary Kayseri textile plant of the mid 1930s, now in an advanced state of deterioration) is a contentious issue. What is more certain, however, is the lucrative revenue-generating potential of highly-desirable urban sites where some of these industrial plants were established. For example, the distillery by Rob Mallet-Stevens in Mecidiyeköy, İstanbul (1931), an icon of Modern architecture in Turkey located in the busy heart of the city, has recently been designated for private re-development. In a highly-innovative project, Emre Arolat Associates have proposed a mixed-use development scheme that protects the original factory building alongside new construction (fig. 42).

Perhaps the most visible and large-scale example of these developments is the Golden Horn Valley Project that is transforming the cultural and urban life of İstanbul in unprecedented ways. The historical site of the first Ottoman industries in the 19th century, the Golden Horn was experienced by entire generations as a highly-polluted industrial zone until the 1980s, when, under the personal directive of then-mayor Bedrettin Dalan, Haussmanian demolitions were undertaken, cleaning up the shores and replacing old, brick warehouses and industrial sheds with rather uninspiring, empty parks. Since 2002, with the initiative of the İstanbul Metropolitan Planning and Urban Design Center, the entire valley has been re-conceptualized as a culture-education-tourism zone, from the Bilgi University "Santral" Campus (opened in 2007) at the very end of the Golden Horn to the "İstanbul Modern" (opened in 2004), Turkey's first museum of modern art in Tophane, where the Golden Horn meets the Bosporus.

Inspired by the success of the Tate Modern in London, these projects are highly-successful examples of the adap-

39 See, for example, A. Cengizkan, "Ankara Havagazı Artık Yok: Bir Ağıt," [Ankara Natural Gas Works No Longer Exists: A Lament] *Arredemento Mimarlık* (July-August 2006), pp. 72-77.

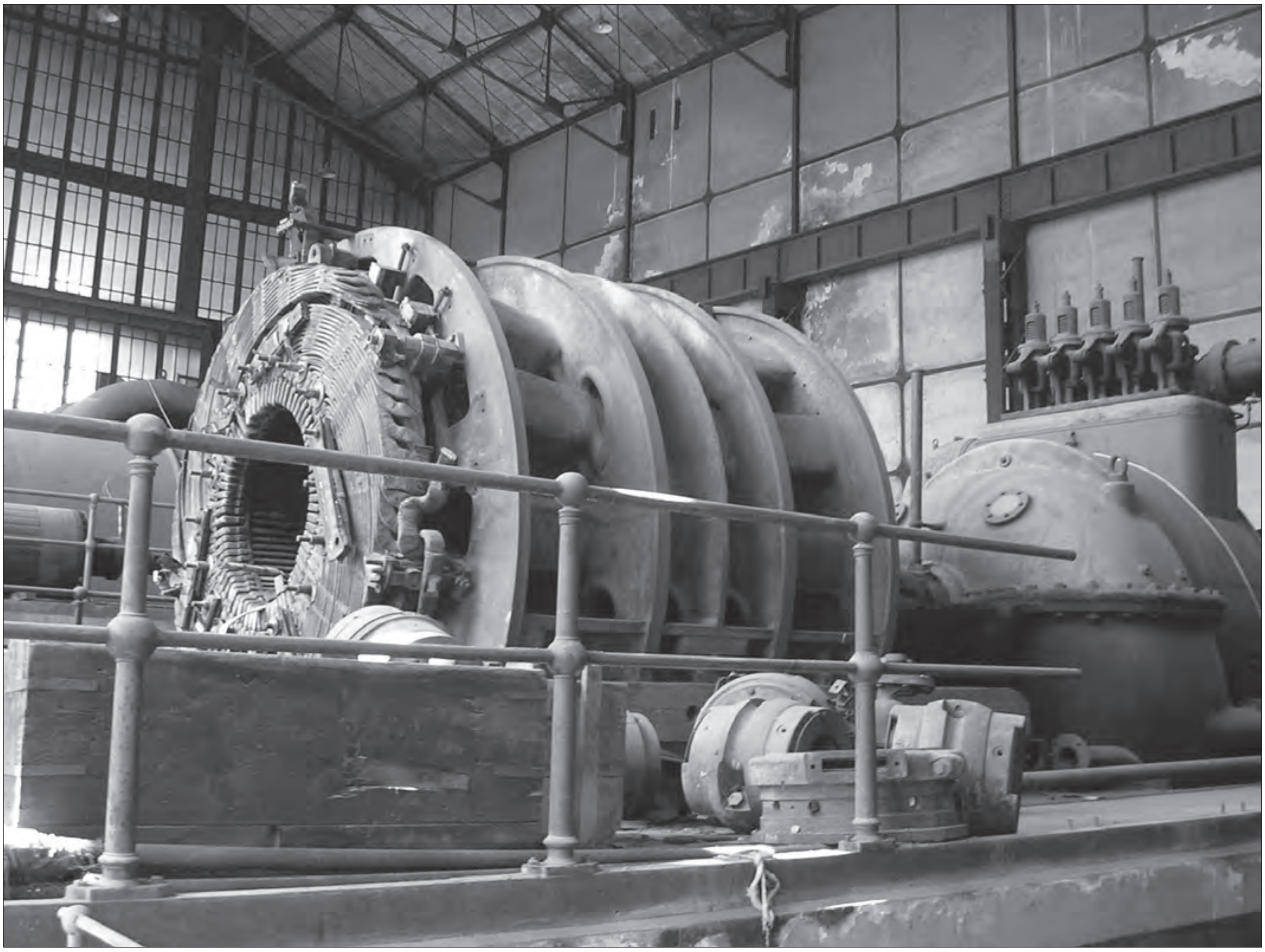


Fig. 43: **İstanbul, Santral, the old Silahtarağa Electric Plant just before its conversion into the Museum of Technology and Industry by Han Tümertekin in 2007.**

tive reuse of earlier industrial structures. In Bilgi-Santral, the machinery hall of the 1911 Silahtarğa electrical power plant was skillfully converted by the architect Han Tümertekin into the Energy and Technology Museum featuring the old turbines and generators as sublime artworks recalling a bygone industrial era (fig. 43). In the İstanbul Modern, a simple, reinforced concrete frame warehouse of İstanbul's port facilities (dating from the 1960s) was transformed by Tabanlıoğlu Architects into a spacious museum of contemporary art with a café overlooking maritime traffic on the Bosporus (figs. 44 a & b).

To conclude, it is possible to suggest that the historical trajectory of industrial architecture in Turkey is a compressed version of what the industrialized West experienced over the last 250 years, while reflecting the cultural, political, and economic specificities of modernization in peripheral geographies. Starting with the first and military-oriented industrialization efforts of the late-Ottoman Empire and the state-sponsored industrialization programs of the nationalist early republic, import-substitution strategies were pursued for decades. Since the 1980s, with the impacts of globalization as well as export-oriented production and post-Fordist strategies, the nature and design of industrial workspaces have been undergoing unprecedented transformations, with dramatic impacts on the urban landscape. Although the recent global economic downturn has introduced new uncertainties, this process appears to be irreversible.

Today, any visitor approaching İstanbul from the airport is greeted by an endless sprawl of new construction, facto-

ries, showrooms, offices, and media plazas before he or she can get the first glimpse of the mosques, minarets, and historical monuments that make up İstanbul's historical urban identity. That visitor will observe immediately that it is the architectural, urban, and social challenges represented by this panorama—rather than worn-out formal or stylistic discussions of tradition, modernity, and identity—that will occupy the agenda of design professions for the foreseeable future, not only in Turkey, but in Muslim geographies at large.

Figs. 44a & b: **İstanbul, Tophane, "İstanbul Modern" museum of contemporary arts, conversion of the old warehouses by Tabanlıoğlu Architects, 2004.**