An Engineer in Turkey

by Joe Martino

I spent from September 1997 through January 1998 as a visiting professor in the Industrial Engineering Department at Marmara University in Istanbul, Turkey. This was my third visit to Turkey. The two previous visits had been for a week each. This stay gave me a chance to do more than tourist-type sightseeing. Turkey is fascinating from a number of aspects, including the engineering. Here are some of my observations.

School of Engineering

Both students and faculty at the School of Engineering were of high quality. Marmara University is very selective and recruits the cream of Turkish high schools. Most of the faculty members had received their undergraduate degrees in Turkey, but most had received graduate degrees at major universities in the U.S. or Europe. My department head, for instance, had received his Ph.D. in statistics at Berkeley, which is one of the top U.S. schools in that subject.

Buildings at Marmara U. are typical of modern, urban universities anywhere in the world. They are high-rise, of reinforced concrete construction, with ample windows for lighting. The facilities, however, are more limited than what has become the norm in U.S. institutions. For instance, overhead projectors are not kept in the classrooms. For every class, I had to check one out of the Dean's office and carry it to my classroom. Computers are also less readily available than is normal in the U.S. The faculty had a computer lab available, with seven networked PCs and a server. However, at no time during my stay were all seven workstations operable. At least one would be down for repair on any given day. Some faculty members had computers in their offices, networked to the server in the lab. Students had a separate computer lab with several networked PCs. There was one laser printer for both labs, and it was frequently out of paper.

Textbooks were a problem. For the most part, they were too expensive for the students to purchase. I ended up using my "desk copy" to plan my syllabus, then prepared overhead slides for my lectures. A local print shop took the masters of the slides and sold copies to the students.

The entire university is taught in English. All students are supposed to know English before entering. Of course, the degree of fluency of the students varied greatly. In my undergraduate statistics class, there was a steady buzz of conversation as those more fluent in English tried to explain my lecture to their less-fluent classmates. In some cases, I made a point of including the Turkish equivalent when I used an unusual English word in illustrating a point.

In the graduate course I taught, almost all the students were employed full-time at some job related to engineering. As in the U.S., they were in class because they wanted to be. They were motivated to study hard. They all turned in excellent term projects.

One professor, who had taught in the U.S. while obtaining his Ph.D., pointed out to me one major difference between Turkish and American students. Here, we take it for granted that anyone who gets through high school has some degree of familiarity with hand tools—hammer, pliers, wrench, screwdriver, etc.—and that they can use these, at least after a fashion. In Turkey, I was told, this is not true. Even engineering students have little or no familiarity with "hands-on" work. As a result, they do not have the "feel" for hardware that American students do.

My impression of Marmara University is that it is on a par with any good, second-rank U.S. university. It's not Stanford or MIT, but it's not all that far behind.

Turkish Industrial R&D

R&D in Turkey is quite limited as compared with industrialized countries in Europe, Israel or Japan. Less than 1 percent of GNP is invested in R&D, by contrast with nearly 3 percent in the U.S. Nevertheless, some industrial firms do carry on high-quality R&D.

The Arcelik Company produces consumer white goods: washing machines, dishwashers, etc. This might not seem like a "high-tech" industry; however, in order to obtain economies of scale, Arcelik must export to Europe. Most European countries have strict standards for energy consumption, noise level, water consumption, etc., for household appliances. These standards are made more strict every few years. In order to remain competitive, Arcelik maintains a small, but very good, R&D lab. Most of the researchers obtained advanced training in Europe or the U.S. The lab is well-equipped, including two anechoic chambers, a fatigue-testing machine, and various test instruments.

The Netas company is the Turkish telephone company. Its R&D lab designs application-specific, integrated circuits (ASICs) for the Turkish telephone system, designs telephone switching equipment, and writes software for the system. They are successfully exporting software to some of the nations of the former Soviet Union to modernize the telephone systems there. Despite the design capability, however, Turkish capabilities in integrated circuit manufacture are limited. Netas' ASIC designs are actually fabricated by foreign vendors, including Texas Instruments.

Turkish industrial R&D is good, but limited. The researchers are competent, and often well-equipped, but lack much of the industrial infrastructure that we take for granted in the U.S. Nevertheless, despite these handicaps, they do good work.

(To be continued next month)

Joe Martino ... An Engineer in Turkey

(Continued from January '99 issue)

Modern Engineering Works

Turkey has the usual complement of bridges, dams, and roads found in any developing country. There are some excellent four-lane highways connecting the major cities. There are two bridges across the Bosphorus that link the European and Asian parts of Istanbul (although traffic is already too heavy for only two bridges, and a third is under discussion). A modern subway system is being constructed in Istanbul and another one in Izmir.

One interesting subway system in Istanbul was, at the time of its construction in the late 1800s, a state-of-the-art system. Subway cars were pulled through a tunnel by cables powered by a steam engine. The subway is still in use, but the equipment has been modernized. I read the report by the French engineer who designed the subway and headed up the construction. Most of the report describes his problems in dealing with the corrupt Ottoman Empire bureaucracy. In his view, he was robbed blind by the government, by landowners and by the workers. Conditions then evidently weren't much different from conditions today in a Third World country.

Ancient Engineering Works

Turkey is at the crossroads of history. Anyone whose ancestors came from Europe or Asia has ancestors who went through Turkey at some time in the past, perhaps several hundred thousand years ago. The earliest known human agricultural settlements were in what is today Turkey. The earliest known writing, cuneiform, originated in what is today Turkey.

While what is known of these really ancient peoples comes from archeology, within the past 2,500 years there are written records. The Romans, the Byzantines and, later, the Ottoman Turks all built major engineering works in what is today Turkey. Many of these are still in existence.

Ephesus was a Roman seaport. The ancient site is well inland from today's Ephesus, since the river on which it was built silted up the harbor and forced the inhabitants to move away. The Roman ruins are still spectacular though, with an amphitheater, a library, a public bath, and many other buildings still in existence. The site is being restored, and is slowly being returned to the magnificence it had nearly 20 centuries ago.

One of the best works I found to be most interesting was an underground cistern, built in the Fifth Century to store water for the city of Constantinople in case of drought or siege. It's still there, restored as a tourist attraction. It now has a couple of feet of water in it, and wooden walkways have been installed to allow visitors to go through the entire structure. In one corner, there is a small snack bar. I found it amazing to be sipping a cup of tea below ground in a cistern built some 1,400 years ago.

Perhaps the best-known buildings in Istanbul are the Hagia Sophia and the Blue Mosque. Hagia Sophia was originally a Christian cathedral. After the Turkish conquest, it was converted into a mosque. In 1935, it was converted into a museum. The old Christian mosaics and paintings, which had been plastered over during its time as a mosque, have been restored. It is a magnificent building, a monument to its builders. The Blue Mosque is so called because the interior is covered with blue tile mosaics (graven images are forbidden in Islam). It is even bigger than the Hagia Sophia, and for its time was a magnificent work of architecture. It is still a functioning mosque, but visitors may enter at other than the official prayer times.

In many ways, one of the most interesting works in Istanbul is the Rumeli Fortress. It was built in 1452, 50 years before Columbus reached North America. It was built on the Bosphorus to prevent European reinforcements from reaching Constantinople during the final Turkish siege of that city. It is a huge structure, built of massive stone blocks, and is bigger than any fort ever built in the U.S. (the closest I have seen is Fort Washington, outside Washington, D.C.). It was erected in only a few months, served its purpose, and has had no further use since then. It is now a tourist attraction.

Overall

There is a lot to see and do in Turkey. For an engineer, however, there are things of particular interest, which can be appreciated in ways that the average tourist will miss. I am looking forward to going back there.

President's Reception and Forum
February 9, 1999 • 5:30 p.m.

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New Member Reception and Welcome
March 1, June 7, September 13 and December 6, 1999