

GLOBAL OPTICS

Optics and Turkey's Scientific Revival

Giovanni Volpe

Optics and photonics are playing a brilliant role in Turkey's scientific boom.

Politics and science have been closely intertwined throughout Turkey's long history—for good and for bad. The collapse of the 600-year-old Ottoman Empire, which at its peak controlled vast stretches of northern Africa, southeastern Europe and western Asia, was largely due to the Empire's inability to keep pace with European social and technological developments.

Fortunately, however, the economic and social growth of the Republic of Turkey over the last 30 years has gone hand in hand with a rebirth of Turkish science. In this context, Turkey is a great example of the deep connection between scientific and societal progress.

"Until some 10 years ago there were only a handful of experimental optics groups in all of Turkey," says Oguz Gulseren, a physics professor at Bilkent University. "Now things



View of Ankara, Turkey.

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have completely changed, and just at Bilkent University we have about 10 experimental optics groups."

After graduating from Bilkent in the late 1980s, Gulseren went to work at various labs in the United States for about 10 years. Then he returned to Turkey in the early 2000s to establish an independent research group. His experience mirrors that of other researchers educated in Turkey. "Turkey has indeed become a very attractive destination for scientists," he says. In addition to seeing an influx of Turkish scientists who had previously worked abroad, "foreign nationals have started to choose Turkey to establish their research groups."

This growth has been spurred by a sharp increase in universities. While there were fewer than 80 universities in the country in the late 1990s, that number has now

doubled—to 162. Moreover, several research centers have emerged over the past decade—for example, the Advanced Research Laboratories at Bilkent University, the National Nanotechnology Research Center (UNAM) at Bilkent University, the Center for Solar Energy Research and Applications (GÜNAM) at the Middle-East Technical University, and the Nanotechnology Research Center (NANOTAM) at Bilkent.

The revival of Turkish science started with the 1982 Constitution: Articles 130 and 131 introduced a Council of Higher Education to govern and improve higher education in the country. Some of its actions were to introduce objective criteria, such as the number of published scientific articles, in the processes of appointment and promotion, and to bring in various incentives to prompt Turkish researchers to publish more

and in internationally recognized journals. This naturally led to an increase in the number of published papers with a Turkish affiliation during the 1980s and 1990s (although not necessarily an improvement in quality).

Perhaps more important, the Constitution allowed for the establishment of universities by private nonprofit foundations. In 1984, the first Turkish private university—Bilkent—was created in Ankara by İhsan Doğramacı. Bilkent introduced a new element in the Turkish higher education landscape, and the competition that followed led to an overall improvement in education. There are now 62 private universities in Turkey.

In 2002, the Turkish government entered into serious negotiations to join the European Union. As a result, Turkey became an EU candidate country. To accede into the Union, the country's leaders must first successfully complete negotiations with the European Commission on each of 35 chapters of the *acquis communautaire*—the total body of EU law. Interestingly, of the 35 chapters, which span from company law to fisheries management to transportation, Turkey has only closed the

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chapter about education and research so far. It is thus fair to say that, from a scientific perspective, Turkey is integrated into Europe already.

To comply with the EU requirements, Turkey must sharply increase both its number of researchers and its R&D expenditure. In 2002, the country had less than 30,000 researchers and its R&D expenditure was below 0.5 percent of its Gross Domestic Product. These numbers are in striking contrast to those of Germany, which has a population of a similar size (about 80 million), but boasts 500,000 researchers and a 2.5-percent R&D expenditure over GDP.

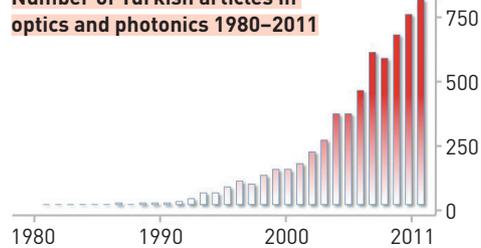
Today, however, Turkey's numbers have sharply increased to more than 80,000 researchers and an almost 1-percent R&D expenditure over GDP. Meanwhile, the Turkish GDP has also significantly risen—which means that the amount of research funding per researcher has increased by about one order of magnitude over the last decade. For example, a typical three-year grant from TÜBİTAK (the Scientific and Technological Research Council of Turkey, which is the Turkish equivalent to the NSF) has increased from roughly 10,000 Turkish liras, or from \$5,000 to \$200,000. For active research groups, it is common to have two such grants.

The outlook is bright. Scientists expect an increase in grant opportunities and the total amount of R&D funds. For optics and photonics, the future is particularly promising. Thanks to excellent universities and research centers, the quality of research in optics and photonics is steadily increasing.

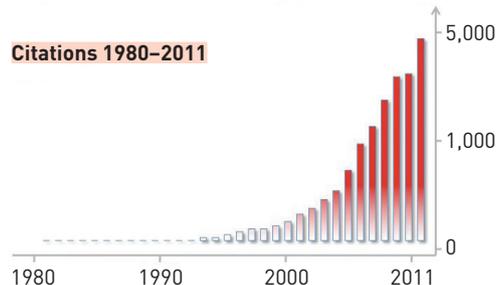
Moreover, the Turkish job market needs professionals with backgrounds in optics and photonics, thanks to a flourishing industry with many high-tech companies and manufacturers, such as Aselsan, Havelsan, Beko and Vestel. While it once struggled to stay competitive in the scientific realm, Turkey is now setting its own course for progress. **OPN**

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Number of Turkish articles in optics and photonics 1980–2011



Citations 1980–2011



Published papers in optics and photonics with Turkish affiliations and relative number of citations.

Source: ISI Web of Science.