FAROUK EL-BAZ: LESSONS FROM SPACE

After playing an historic role in the first Moon landings, Egyptian TWAS Fellow Farouk El-Baz has spent decades using space science to improve life on Earth.

by **Edward W. Lempinen**

As a hard-working young Egyptian geologist, Farouk El-Baz created his place in the history of space exploration with a leadership role in the NASA Apollo Moon missions in the 1960s and '70s. Though just a few years past his PhD research, he helped to select lunar landing sites. He instructed crewmembers in geological observations from orbit, and trained them in space photography.

When the Apollo lunar programme ended in 1972, El-Baz's career evolved: Instead of gazing at the Moon, he would use satellites to look back at Earth. If the new work had a lower profile, it was nonetheless pioneering and vitally important. And as an Egyptian, he had a natural interest in deserts, especially those in the Arab world.

Today, more than 40 years later, El-Baz is based in the United States as director of the Boston University Center for Remote Sensing, but he's still closely involved with Egypt and the developing world. "Water is life," he says in a recent video produced by the university. "We know that we will need more water as populations increase and the economy develops... There is no question in my mind that applying advanced science and technology would allow us to find more water for future use."

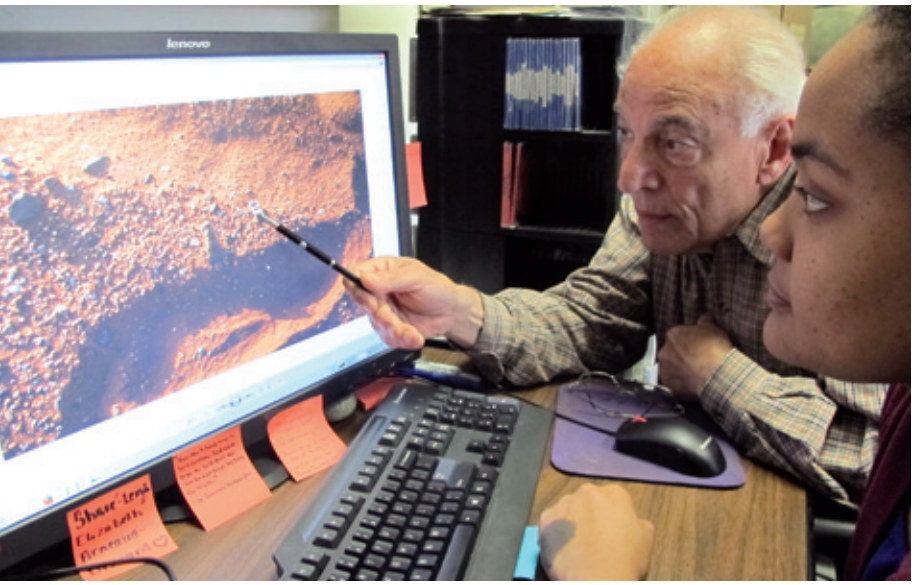
But he also has a parallel mission: to persuade Arab nations and other developing countries that a space programme can be enormously valuable, both for technological advancement and for inspiring a new generation. While advances have been uneven and great challenges remain, El-Baz continues to campaign for progress at high levels in education, policy and science diplomacy, across many countries.

"It is simplistic to think of a 'space programme' as shooting rockets into space," El-Baz said in an email interview with TWAS. "In reality, it is the upgrading of scientific research and the technological advancement of a whole generation of young people."

El-Baz was born in Zagazig, Egypt, about 70 kilometers northeast of Cairo. In 1958, at the age of 20, he received his bachelor's degree in chemistry and geology from Aim Shams University. He continued his education in the United States, earning his master's and PhD (1964) in the University of Missouri system. His PhD work included a year of research at MIT.

By 1967, he was working with NASA. But it was not an easy time to be a young Arab immigrant at such a high-powered science centre. "There were no other foreigners, not to mention Arabs, who had my responsibility," he recalled. "Because I had no training in astronautics, I knew that I had to work twice as hard as everyone else to be accepted. Then, the Six-Day War between Egypt and Israel began less than three months later.

▼ Farouk El-Baz, wearing a mask, gives a photography mission briefing in advance of the Apollo-Soyuz Test Project in 1975. The three American astronauts, from left, are: Thomas P. Stafford, Vance D. Brand and Donald K. Slayton. El-Baz wore the mask to protect the crewmen from possible exposure to disease before the launch. [Photo: NASA]



> I have hope in the younger generation. They don't seem to take the borders so seriously. *Farouk El-Baz*

▲ El-Baz with Boston University (BU) student Share-Leigh Bernard, who works as an assistant at the BU Center for Remote Sensing. [Photo: Emily Johnson, Boston University]

▼ Farouk El-Baz [Photo: Barbara Ross]

My having just immigrated from Egypt made it doubly difficult, as the US government supported Israel wholeheartedly. I knew that without being critically important to the programme, I would disappear in an eye-blink."

But with strong commitment and tireless work, he advanced to positions of influence and prominence. After the lunar programme ended, El-Baz moved through a series of successful assignments. NASA named him principle investigator for earth observation and photography on the first joint US-Soviet space mission, with a focus that included collecting images of the Sahara Desert. Soon he was creating networks between US and Chinese desert researchers. And in 1978, he was named science adviser to Egyptian President Anwar Sadat.

El-Baz was elected a TWAS Fellow in 1985, and a year later, he landed at Boston University, where he remains to this day.

One of the enduring lessons of his experience is the power of space science to lift entire nations. During the Apollo programme, he said, NASA had affiliated scientists at 126 educational institutions, which provided a systemic boost for US research culture. Space programmes have had similar effects in Japan, India and China.

Earth observation can be helpful in a range of development projects, but applications to agriculture are "particularly significant", El-Baz said. Space images can be used to evaluate crop health, find new fields and locate sources of groundwater in arid areas.

"India's first satellite in Earth orbit was dedicated to monitoring agriculture in the country," he said. "This allowed researchers to help farmers better plan seeding times and fertilizer use to increase production. Today, India feeds itself – an incredible accomplishment that was aided by observations from space."

El-Baz's work has helped discover groundwater reserves in Egypt, Oman, and the United Arab Emirates. He also discovered potentially massive reserves in the war-ravaged region of Darfur in Sudan, and he believes it could help to ease conflict.

Meanwhile, he continues to navigate the currents of Egyptian culture. He has long advocated an ambitious plan in which Egypt's urban development would be diverted from rich agricultural lands along the Nile and into adjacent desert areas. President Abdel Fattah el-Sisi has expressed interest, and appointed El-Baz to his Advisory Council of Scientists and Technologists.

El-Baz also has urged a pan-Arabic space agency, and though it hasn't happened yet, he remains hopeful. One positive sign is in the United Arab Emirates' plan to send a craft to study the atmosphere of Mars. He sees another in the young scientists of the region, who press ahead in a time of turmoil to pursue their dreams. Over the next 50 years, he predicts, they will drive new regional collaboration.

"Politically, there are a lot of differences between Arab countries," he recently told Al-Fanar Media. "But scientifically, we're the same people. We speak the same language, have similar aims and we could achieve so much more together... I have hope in the younger generation. They don't seem to take the borders so seriously. I see it here at Boston University: Students come here from all over the Arab world and they suddenly realize they're one people." ◘