

## *The Scientist and the A.I.-Assisted, Remote-Control Killing Machine*

Israeli agents had wanted to kill Iran's top nuclear scientist for years. Then they came up with a way to do it with no operatives present.

By Ronen Bergman and Farnaz Fassihi

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Iran's top nuclear scientist woke up an hour before dawn, as he did most days, to study Islamic philosophy before his day began.

That afternoon, he and his wife would leave their vacation home on the Caspian Sea and drive to their country house in Absard, a bucolic town east of Tehran, where they planned to spend the weekend.

Iran's intelligence service had warned him of a possible assassination plot, but the scientist, Mohsen Fakhrizadeh, had brushed it off.

Convinced that Mr. Fakhrizadeh was leading Iran's efforts to build a nuclear bomb, Israel had wanted to kill him for at least 14 years. But there had been so many threats and plots that he no longer paid them much attention.

Despite his prominent position in Iran's military establishment, Mr. Fakhrizadeh wanted to live a normal life. He craved small domestic pleasures: reading Persian poetry, taking his family to the seashore, going for drives in the countryside.

And, disregarding the advice of his security team, he often drove his own car to Absard instead of having bodyguards drive him in an armored vehicle. It was a serious breach of security protocol, but he insisted.

So shortly after noon on Friday, Nov. 27, he slipped behind the wheel of his black Nissan Teana sedan, his wife in the passenger seat beside him, and hit the road.



By Jugal K. Patel

### **An Elusive Target**

Since 2004, when the Israeli government ordered its foreign intelligence agency, the Mossad, to prevent Iran from obtaining nuclear weapons, the agency had been carrying out a campaign of sabotage and cyberattacks on Iran's nuclear fuel enrichment facilities. It was also methodically picking off the experts thought to be leading Iran's nuclear weapons program.

Since 2007, its agents had assassinated five Iranian nuclear scientists and wounded another. Most of the scientists worked directly for Mr. Fakhrizadeh (pronounced fah-KREE-zah-deh) on what Israeli intelligence officials said was a covert program to build a nuclear warhead, including overcoming the substantial technical challenges of making one small enough to fit atop one of Iran's long-range missiles.

Israeli agents had also killed the Iranian general in charge of missile development and 16 members of his team.



One of the most difficult challenges for Iran was to build a nuclear warhead small enough to fit atop a long-range missile like the one seen in a military parade in Tehran in 2018. Abedin Taherkenareh/EPA, via Shutterstock

But the man Israel said led the bomb program was elusive.

In 2009, a hit team was waiting for Mr. Fakhrizadeh at the site of a planned assassination in Tehran, but the operation was called off at the last moment. The plot had been compromised, the Mossad suspected, and Iran had laid an ambush.

This time they were going to try something new.

Iranian agents working for the Mossad had parked a blue Nissan Zamyad pickup truck on the side of the road connecting Absard to the main highway. The spot was on a slight elevation with a view of approaching vehicles. Hidden beneath tarpaulins and decoy construction material in the truck bed was a 7.62-mm sniper machine gun.

Around 1 p.m., the hit team received a signal that Mr. Fakhrizadeh, his wife and a team of armed guards in escort cars were about to leave for Absard, where many of Iran's elite have second homes and vacation villas.

The assassin, a skilled sniper, took up his position, calibrated the gun sights, cocked the weapon and lightly touched the trigger.

He was nowhere near Absard, however. He was peering into a computer screen at an undisclosed location more than 1,000 miles away. The entire hit squad had already left Iran.

## Reports of a Killing

The news reports from Iran that afternoon were confusing, contradictory and mostly wrong.

A team of assassins had waited alongside the road for Mr. Fakhrizadeh to drive by, one report said. Residents heard a big explosion followed by intense machine gun fire, said another. A truck exploded ahead of Mr. Fakhrizadeh's car, then five or six gunmen jumped out of a nearby car and opened fire. A social media channel affiliated with the Islamic Revolutionary Guards Corps reported an intense gun battle between Mr. Fakhrizadeh's bodyguards and as many as a dozen attackers. Several people were killed, witnesses said.

One of the most far-fetched accounts emerged a few days later.



Mr. Fakhrizadeh's Nissan Teana and blood on the road after the attack on Nov. 27, 2020. Wana News Agency, via Reuters

Several Iranian news organizations reported a claim promoted by the Revolutionary Guards that the assassin was a killer robot, and that the entire operation was conducted by remote control. These reports directly contradicted the supposedly eyewitness accounts of a gun battle between teams of assassins and bodyguards and reports that some of the assassins had been arrested or killed.

Iranians mocked the story as a transparent effort to minimize the embarrassment of the elite security force that failed to protect one of the country's most closely guarded figures.

"Why don't you just say Tesla built the Nissan, it drove by itself, parked by itself, fired the shots and blew up by itself?" one hard-line social media account said.

Thomas Withington, an electronic warfare analyst, told the BBC that the killer robot theory should be taken with "a healthy pinch of salt," and that Iran's description appeared to be little more than a collection of "cool buzzwords."

Except this time there really was a killer robot.

The straight-out-of-science-fiction story of what really happened that afternoon and the events leading up to it, published here for the first time, is based on interviews with American, Israeli and Iranian officials, including two intelligence officials familiar with the details of the planning and execution of the operation, and statements Mr. Fakhrizadeh's family made to the Iranian news media.

The operation's success was the result of many factors: serious security failures by Iran's Revolutionary Guards, extensive planning and surveillance by the Mossad, and an insouciance bordering on fatalism on the part of Mr. Fakhrizadeh.

But it was also the debut test of a high-tech, computerized sharpshooter kitted out with artificial intelligence and multiple-camera eyes, operated via satellite and capable of firing 600 rounds a minute.

The souped-up, remote-controlled machine gun now joins the combat drone in the arsenal of high-tech weapons for remote targeted killing. But unlike a drone, the robotic machine gun draws no attention in the sky, where a drone could be shot down, and can be situated anywhere, qualities likely to reshape the worlds of security and espionage.

## 'Remember That Name'

Preparations for the assassination began after a series of meetings toward the end of 2019 and in early 2020 between Israeli officials, led by the Mossad director, Yossi Cohen, and high-ranking American officials, including President Donald J. Trump, Secretary of State Mike Pompeo and the C.I.A. director, Gina Haspel.



The Mossad director, Yossi Cohen, presented Israel's plans to President Donald J. Trump, Secretary of State Mike Pompeo and the C.I.A. director, Gina Haspel. Amir Cohen/Reuters

Israel had paused the sabotage and assassination campaign in 2012, when the United States began negotiations with Iran leading to the 2015 nuclear agreement. Now that Mr. Trump had abrogated that agreement, the Israelis wanted to resume the campaign to try to thwart Iran's nuclear progress and force it to accept strict constraints on its nuclear program.

In late February, Mr. Cohen presented the Americans with a list of potential operations, including the killing of Mr. Fakhrizadeh. Mr. Fakhrizadeh had been at the top of Israel's hit list since 2007, and the Mossad had never taken its eyes off him.

In 2018, Israel's prime minister, Benjamin Netanyahu, held a news conference to show off documents the Mossad had stolen from Iran's nuclear archives. Arguing that they proved that Iran still had an active nuclear weapons program, he mentioned Mr. Fakhrizadeh by name several times.

"Remember that name," he said. "Fakhrizadeh."

The American officials briefed about the assassination plan in Washington supported it, according to an official who was present at the meeting.

Both countries were encouraged by Iran's relatively tepid response to the American assassination of Maj. Gen. Qassim Suleimani, the Iranian military commander killed in a U.S. drone strike with the help of Israeli intelligence in January 2020. If they could kill Iran's top military leader with little blowback, it signaled that Iran was either unable or reluctant to respond more forcefully.

The surveillance of Mr. Fakhrizadeh moved into high gear.

As the intelligence poured in, the difficulty of the challenge came into focus: Iran had also taken lessons from the Suleimani killing, namely that their top officials could be targeted. Aware that Mr. Fakhrizadeh led Israel's most-wanted list, Iranian officials had locked down his security.

His security details belonged to the elite Ansar unit of the Revolutionary Guards, heavily armed and well trained, who communicated via encrypted channels. They accompanied Mr. Fakhrizadeh's movements in convoys of four to seven vehicles, changing the routes and timing to foil possible attacks. And the car he drove himself was rotated among four or five at his disposal.



Memorials at the Baghdad airport, where Maj. Gen. Qassim Suleimani was killed. The Suleimani killing offered lessons for both Israel and Iran. Sergey Ponomarev for The New York Times

Israel had used a variety of methods in the earlier assassinations. The first nuclear scientist on the list was poisoned in 2007. The second, in 2010, was killed by a remotely detonated bomb attached to a motorcycle, but the planning had been excruciatingly complex, and an Iranian suspect was caught. He confessed and was executed.

After that debacle, the Mossad switched to simpler, in-person killings. In each of the next four assassinations, from 2010 to 2012, hit men on motorcycles sidled up beside the target's car in Tehran traffic and either shot him through the window or attached a sticky-bomb to the car door, then sped off.

But Mr. Fakhrizadeh's armed convoy, on the lookout for such attacks, made the motorcycle method impossible.

The planners considered detonating a bomb along Mr. Fakhrizadeh's route, forcing the convoy to a halt so it could be attacked by snipers. That plan was shelved because of the likelihood of a gangland-style gun battle with many casualties.

The idea of a pre-positioned, remote-controlled machine gun was proposed, but there were a host of logistical complications and myriad ways it could go wrong. Remote-controlled machine guns existed and several armies had them, but their bulk and weight made them difficult to transport and conceal, and they had only been used with operators nearby.

Time was running out.

By the summer, it looked as if Mr. Trump, who saw eye to eye on Iran with Mr. Netanyahu, could lose the American election. His likely successor, Joseph R. Biden Jr., had promised to reverse Mr. Trump's policies and return to the 2015 nuclear agreement that Israel had vigorously opposed.



President Donald J. Trump and Prime Minister Benjamin Netanyahu at the White House in September 2020. Israel wanted to act while Mr. Trump was still in office. Doug Mills/The New York Times

If Israel was going to kill a top Iranian official, an act that had the potential to start a war, it needed the assent and protection of the United States. That meant acting before Mr. Biden could take office. In Mr. Netanyahu's best-case scenario, the assassination would derail any chance of resurrecting the nuclear agreement even if Mr. Biden won.

## The Scientist

Mohsen Fakhrizadeh grew up in a conservative family in the holy city of Qom, the theological heart of Shia Islam. He was 18 when the Islamic revolution toppled Iran's monarchy, a historical reckoning that fired his imagination.

He set out to achieve two dreams: to become a nuclear scientist and to take part in the military wing of the new government. As a symbol of his devotion to the revolution, he wore a silver ring with a large, oval red agate, the same type worn by Iran's supreme leader, Ayatollah Ali Khamenei, and by General Suleimani.

He joined the Revolutionary Guards and climbed the ranks to general. He earned a Ph.D. in nuclear physics from Isfahan University of Technology with a dissertation on "identifying neutrons," according to Ali Akbar Salehi, the former head of Iran's Atomic Energy Agency and a longtime friend and colleague.

He led the missile development program for the Guards and pioneered the country's nuclear program. As research director for the Defense Ministry, he played a key role in developing homegrown drones and, according to two Iranian officials, traveled to North Korea to join forces on missile development. At the time of his death, he was deputy defense minister.

"In the field of nuclear and nanotechnology and biochemical war, Mr. Fakhrizadeh was a character on par with Qassim Suleimani but in a totally covert way," Gheish Ghoreishi, who has advised Iran's Foreign Ministry on Arab affairs, said in an interview.

When Iran needed sensitive equipment or technology that was prohibited under international sanctions, Mr. Fakhrizadeh found ways to obtain them.



President Hassan Rouhani, second from left, visiting an exhibition in Tehran on Iran's nuclear program in April. Office of the Iranian Presidency, via Associated Press

“He had created an underground network from Latin America to North Korea and Eastern Europe to find the parts that we needed,” Mr. Ghoreishi said.

Mr. Ghoreishi and a former senior Iranian official said that Mr. Fakhrizadeh was known as a workaholic. He had a serious demeanor, demanded perfection from his staff and had no sense of humor, they said. He seldom took time off. And he eschewed media attention.

Most of his professional life was top secret, better known to the Mossad than to most Iranians.

His career may have been a mystery even to his children. His sons said in a television interview that they had tried to piece together what their father did based on his sporadic comments. They said they had guessed that he was involved in the production of medical drugs.

When international nuclear inspectors came to call, they were told that he was unavailable, his laboratories and testing grounds off limits. Concerned about Iran's stonewalling, the United Nations Security Council froze Mr. Fakhrizadeh's assets as part of a package of sanctions on Iran in 2006.

Although he was considered the father of Iran's nuclear program, he never attended the talks leading to the 2015 agreement.

The black hole that was Mr. Fakhrizadeh's career was a major reason that even when the agreement was completed, questions remained about whether Iran still had a nuclear weapons program and how far along it was.

Iran has steadfastly insisted that its nuclear program was for purely peaceful purposes and that it had no interest in developing a bomb. Ayatollah Khamenei had even issued an edict declaring that such a weapon would violate Islamic law.

But investigators with the International Atomic Energy Agency concluded in 2011 that Iran had “carried out activities relevant to the development of a nuclear device.” They also said that while Iran had dismantled its focused effort to build a bomb in 2003, significant work on the project had continued.



Posters in Tehran honoring national heroes and martyrs. Mr. Fakhrizadeh, left, was relatively unknown, while General Suleimani was famous. Atta Kenare/Agence France-Presse — Getty Images

According to the Mossad, the bomb-building program had simply been deconstructed and its component parts scattered among different programs and agencies, all under Mr. Fakhrizadeh's direction.

In 2008, when President George W. Bush was visiting Jerusalem, Prime Minister Ehud Olmert played him a recording of a conversation Israeli officials said took place a short time before between a man they identified as Mr. Fakhrizadeh and a colleague. According to three people who say they heard the recording, Mr. Fakhrizadeh spoke explicitly about his ongoing effort to develop a nuclear warhead.

A spokesman for Mr. Bush did not reply to a request for comment. The New York Times could not independently confirm the existence of the recording or its contents.

## Programming a Hit

A killer robot profoundly changes the calculus for the Mossad.

The organization has a longstanding rule that if there is no rescue, there is no operation, meaning a foolproof plan to get the operatives out safely is essential. Having no agents in the field tips the equation in favor of the operation.

But a massive, untested, computerized machine gun presents a string of other problems.

The first is how to get the weapon in place.

Israel chose a special model of a Belgian-made FN MAG machine gun attached to an advanced robotic apparatus, according to an intelligence official familiar with the plot. The official said the system was not unlike the off-the-rack Sentinel 20 manufactured by the Spanish defense contractor Escribano.

But the machine gun, the robot, its components and accessories together weigh about a ton. So the equipment was broken down into its smallest possible parts and smuggled into the country piece by piece, in various ways, routes and times, then secretly reassembled in Iran.



The robot was built to fit in the bed of a Zamyad pickup, a common model in Iran. Cameras pointing in multiple directions were mounted on the truck to give the command room a full picture not just of the target and his security detail, but of the surrounding environment. Finally, the truck was packed with explosives so it could be blown to bits after the kill, destroying all evidence.

There were further complications in firing the weapon. A machine gun mounted on a truck, even a parked one, will shake after each shot's recoil, changing the trajectory of subsequent bullets.



Israel used a special model of a Belgian-made FN MAG machine gun, similar to this one, attached to a robotic apparatus. Darron Mark/Corbis, via Getty Images

Also, even though the computer communicated with the control room via satellite, sending data at the speed of light, there would be a slight delay: What the operator saw on the screen was already a moment old, and adjusting the aim to compensate would take another moment, all while Mr. Fakhrizadeh's car was in motion.

The time it took for the camera images to reach the sniper and for the sniper's response to reach the machine gun, not including his reaction time, was estimated to be 1.6 seconds, enough of a lag for the best-aimed shot to go astray.

The A.I. was programmed to compensate for the delay, the shake and the car's speed.

Another challenge was to determine in real time that it was Mr. Fakhrizadeh driving the car and not one of his children, his wife or a bodyguard.

Israel lacks the surveillance capabilities in Iran that it has in other places, like Gaza, where it uses drones to identify a target before a strike. A drone large enough to make the trip to Iran could be easily shot down by Iran's Russian-made anti-aircraft missiles. And a drone circling the quiet Absard countryside could expose the whole operation.

The solution was to station a fake disabled car, resting on a jack with a wheel missing, at a junction on the main road where vehicles heading for Absard had to make a U-turn, some three quarters of a mile from the kill zone. That vehicle contained another camera.

At dawn Friday, the operation was put into motion. Israeli officials gave the Americans a final heads up.

The blue Zamyad pickup was parked on the shoulder of Imam Khomeini Boulevard. Investigators later found that security cameras on the road had been disabled.

## The Drive

As the convoy left the city of Rostamkala on the Caspian coast, the first car carried a security detail. It was followed by the unarmored black Nissan driven by Mr. Fakhrizadeh, with his wife, Sadigheh Ghasemi, at his side. Two more security cars followed.

The security team had warned Mr. Fakhrizadeh that day of a threat against him and asked him not to travel, according to his son Hamed Fakhrizadeh and Iranian officials.

But Mr. Fakhrizadeh said he had a university class to teach in Tehran the next day, his sons said, and he could not do it remotely.

Ali Shamkhani, the secretary of Supreme National Council, later told the Iranian media that intelligence agencies even had knowledge of the possible location of an assassination attempt, though they were uncertain of the date.

The Times could not verify whether they had such specific information or whether the claim was an effort at damage control after an embarrassing intelligence failure.

Iran had already been shaken by a series of high-profile attacks in recent months that in addition to killing leaders and damaging nuclear facilities made it clear that Israel had an effective network of collaborators inside Iran.

The recriminations and paranoia among politicians and intelligence officials only intensified after the assassination. Rival intelligence agencies — under the Ministry of Intelligence and the Revolutionary Guards — blamed each other.



Members of the Revolutionary Guards in Tehran in 2018. A special unit of the Guards was in charge of Mr. Fakhrizadeh's security. Agence France-Presse — Getty Images

A former senior Iranian intelligence official said that he heard that Israel had even infiltrated Mr. Fakhrizadeh's security detail, which had knowledge of last-minute changes to his movement, the route and the time.

But Mr. Shamkhani said there had been so many threats over the years that Mr. Fakhrizadeh did not take them seriously.

He refused to ride in an armored car and insisted on driving one of his cars himself. When he drove with his wife, he would ask the bodyguards to drive a separate car behind him instead of riding with them, according to three people familiar with his habits.

Mr. Fakhrizadeh may have also found the idea of martyrdom attractive.

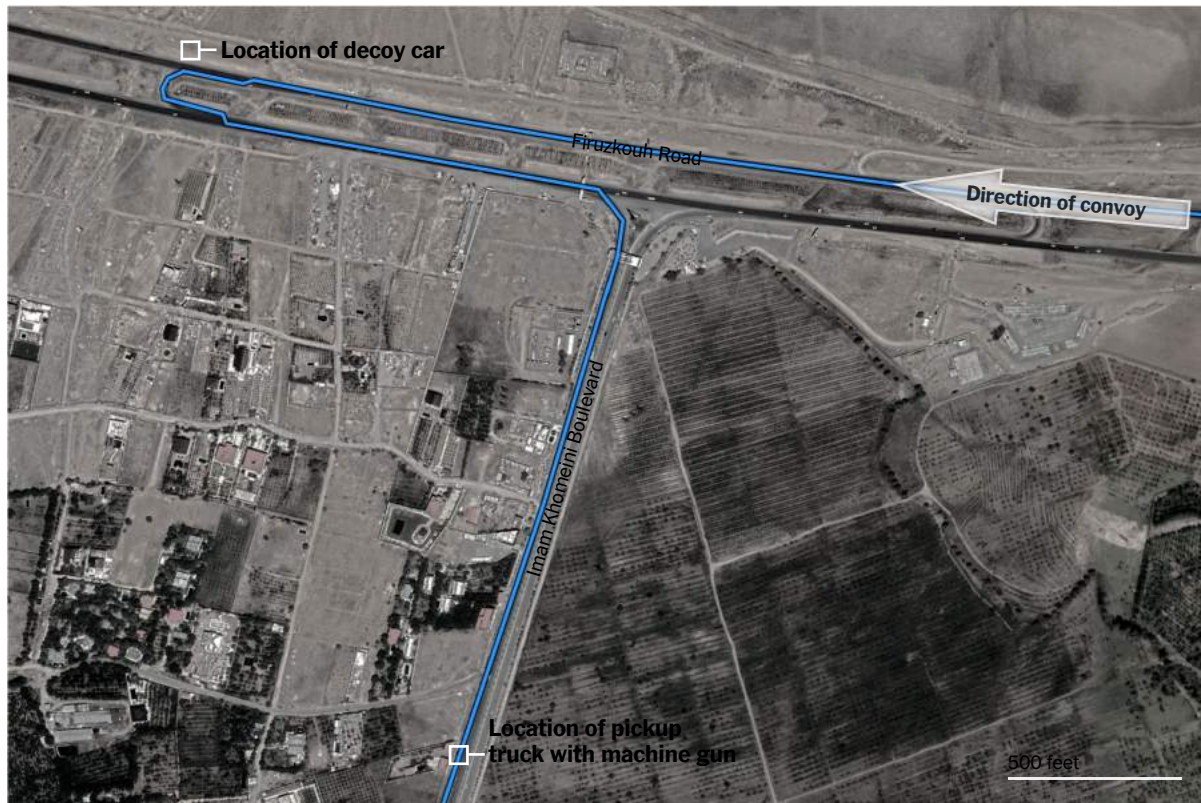
“Let them kill,” he said in a recording Mehr News, a conservative outlet, published in November. “Kill as much as they want, but we won't be grounded. They've killed scientists, so we have hope to become a martyr even though we don't go to Syria and we don't go to Iraq.”

Even if Mr. Fakhrizadeh accepted his fate, it was not clear why the Revolutionary Guards assigned to protect him went along with such blatant security lapses. Acquaintances said only that he was stubborn and insistent.

If Mr. Fakhrizadeh had been sitting in the rear, it would have been much harder to identify him and to avoid killing anyone else. If the car had been armored and the windows bulletproofed, the hit squad would have had to use special ammunition or a powerful bomb to destroy it, making the plan far more complicated.

## The Strike

Shortly before 3:30 p.m., the motorcade arrived at the U-turn on Firuzkough Road. Mr. Fakhrizadeh's car came to a near halt, and he was positively identified by the operators, who could also see his wife sitting beside him.



By Jugal K. Patel

The convoy turned right on Imam Khomeini Boulevard, and the lead car then zipped ahead to the house to inspect it before Mr. Fakhrizadeh arrived. Its departure left Mr. Fakhrizadeh's car fully exposed.

The convoy slowed down for a speed bump just before the parked Zamyad. A stray dog began crossing the road.

The machine gun fired a burst of bullets, hitting the front of the car below the windshield. It is not clear if these shots hit Mr. Fakhrizadeh but the car swerved and came to a stop.

The shooter adjusted the sights and fired another burst, hitting the windshield at least three times and Mr. Fakhrizadeh at least once in the shoulder. He stepped out of the car and crouched behind the open front door.



Imam Khomeini Boulevard in Absard after the assassination. Fars News Agency, via Associated Press

According to Iran's Fars News, three more bullets tore into his spine. He collapsed on the road.

The first bodyguard arrived from a chase car: Hamed Asghari, a national judo champion, holding a rifle. He looked around for the assailant, seemingly confused.

Ms. Ghasemi ran out to her husband. "They want to kill me and you must leave," he told her, according to his sons.

She sat on the ground and held his head on her lap, she told Iranian state television.

The blue Zamyad exploded.

That was the only part of the operation that did not go as planned.

The explosion was intended to rip the robot to shreds so the Iranians could not piece together what had happened. Instead, most of the equipment was hurled into the air and then fell to the ground, damaged beyond repair but largely intact.

The Revolutionary Guards' assessment — that the attack was carried out by a remote-controlled machine gun "equipped with an intelligent satellite system" using artificial intelligence — was correct.

The entire operation took less than a minute. Fifteen bullets were fired.

Iranian investigators noted that not one of them hit Ms. Ghasemi, seated inches away, accuracy that they attributed to the use of facial recognition software.

Hamed Fakhrizadeh was at the family home in Absard when he received a distress call from his mother. He arrived within minutes to what he described as a scene of "full-on war." Smoke and fog clouded his vision, and he could smell blood.

"It was not a simple terrorist attack for someone to come and fire a bullet and run," he said later on state television. "His assassination was far more complicated than what you know and think. He was unknown to the Iranian public, but he was very well known to those who are the enemy of Iran's development."



The grave of Mr. Fakhrizadeh at the Imamzadeh Saleh shrine in Tehran. Atta Kenare/Agence France-Presse — Getty Images

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