STEVE BRODNER

A REPORTER AT LARGE

THE ATOMIC EMPORIUM

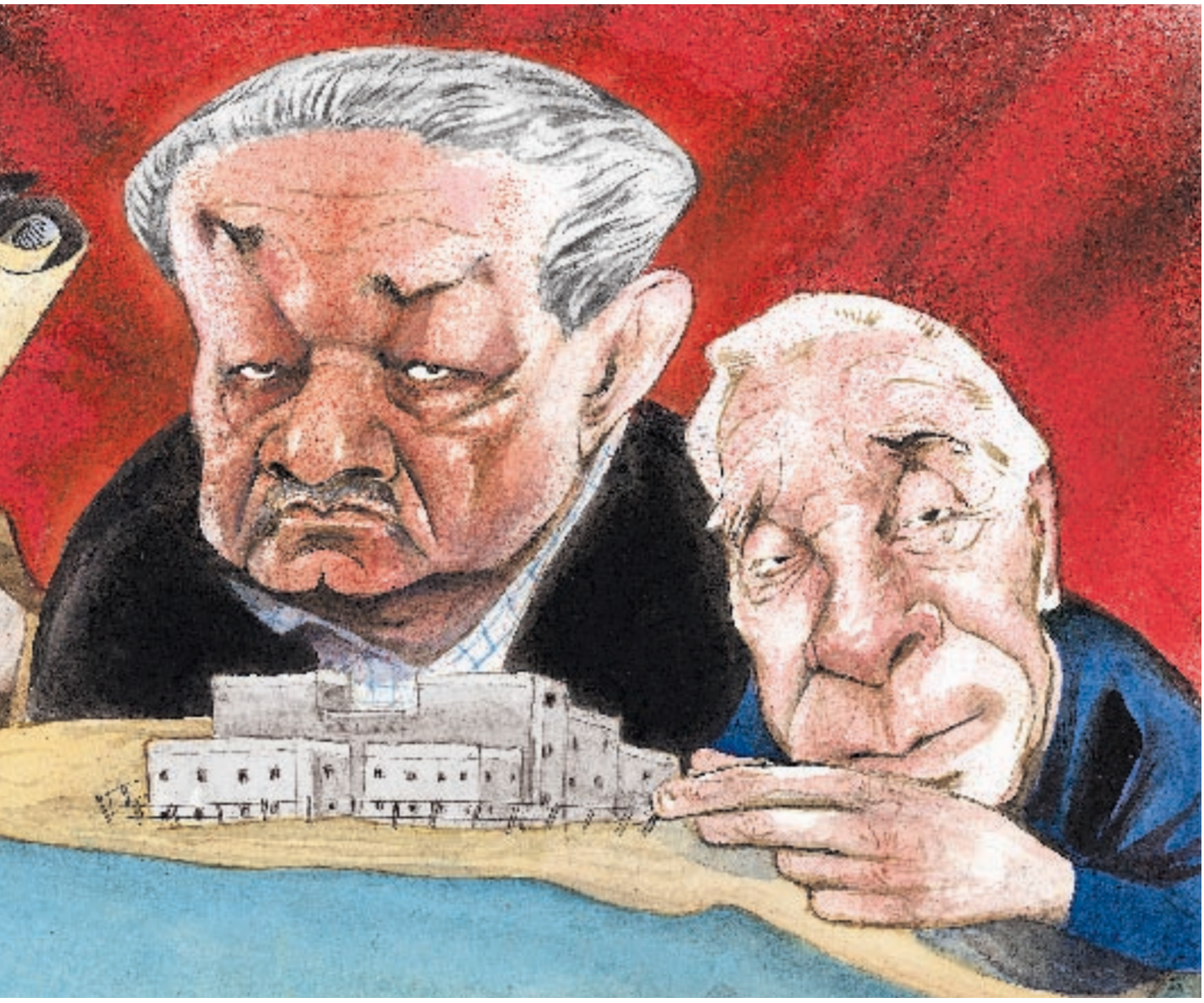
Abdul Qadeer Khan and Iran's race to build the bomb.

BY STEVE COLL

Gotthard Lerch is a big man with a flattened nose and a bulky face, and, were it not for his meticulously pressed clothing, he might be taken for a brawler. Until recently, Lerch was a successful engineer and salesman. He owns a house in Switzerland, another in Germany, and investment property in South Africa, and he has a bank account in Monaco, part of a fortune estimated by German prosecutors to run into many millions of dollars. He achieved this by specializing in the manufacture and assembly of certain industrial vacuum systems, which, among other things, happen to be useful to countries that wish to acquire nuclear weapons.

Lerch, who is sixty-three, was on trial this summer in Mannheim, Germany, on charges that he collaborated with the Pakistani nuclear scientist Abdul Qadeer Khan in illegal sales of nuclear equipment. Lerch has never been convicted of a crime, but records in this and related court cases, some dating to the nineteen-eighties, describe travel and business transactions that trace the looping trail of global nuclear proliferation since the late-Cold War period—from Europe to the Indian subcontinent and from South Africa to the Middle East.

Lerch's trial began in March in Mannheim's *Landgericht*, or regional courthouse, a fortress of poured concrete



and rusting steel, across the avenue from a Baroque palace. On the days that I attended, Lerch sat at the defense table in courtroom No. 2, his arms often folded across his chest, a thick binder lying closed before him. Although he had been incarcerated in the Mannheim jail, his skin remained tawny and smooth, as if he had managed to touch up his tan while behind bars. Each day, he arrived by a side entrance, wearing the same three-button pewter-colored sports coat, checked shirt, and gray dotted tie. His face often bore a thin smile.

In the winter of 2003, after an Iranian opposition group revealed two previously secret nuclear complexes, the Tehran government admitted for the first time that it had been carrying out a program to enrich uranium. Iran's President at the time, Mohammad Khatami, said that the sites served a peaceful nuclear-power program—to generate electricity—but the Bush Administration and some of its European allies emphasized that the facilities could also be used to make weapons. After this disclosure, Iranian officials met periodically with inspectors from the International Atomic Energy Agency to address questions about the program; they named Gotthard Lerch as one of their former business contacts. This and other fragments of evidence have led investigators in Europe to speculate that Lerch may be able to clarify two of the most pressing questions in international affairs; namely, how much technical progress has Iran made, and, therefore, how long will it be before Iran's Islamic revolutionary government has the option to build a nuclear bomb?

European leaders and President Bush have said that they consider Iran's acquisition of a nuclear weapon to be unacceptable. A nuclear Iran would certainly change the strategic balance in the Middle East. Some analysts fear that Iran's achievement might lead nearby Arab countries to pursue nuclear arms; they also worry that a nuclear arsenal might embolden Iran's leaders to increase attacks against Israel or the United States through proxy forces, such as the Lebanese militia Hezbollah. On May 31st, the Bush Administration

Khan (standing over the Natanz nuclear facility) and, from left, Daniel Geiges, Gotthard Lerch, and Peter Griffin.

offered to negotiate directly with Iran about its nuclear program, under certain conditions, but when Iran's leaders failed to respond quickly enough the issue was sent to the United Nations Security Council. How long any period of diplomacy may last—and whether the Administration will revive serious consideration of military action designed to cripple Iran's nuclear program—may depend on how long Bush and his advisers believe it will take Iran to assemble a bomb.

The answer hinges in part on what kinds of uranium-enrichment equipment Iran has acquired since it began its program, what components and support systems it has learned to make on its own, and how many of its outside suppliers may still be hidden. John Negroponte, the director of National Intelligence, has publicly estimated that Iran will not become a nuclear power before the beginning of the next decade, at the earliest. Senator Pat Roberts, the chairman of the Senate Intelligence Committee, said in an interview that, based on the information provided to his committee, Iran was at least "five to seven" years away.

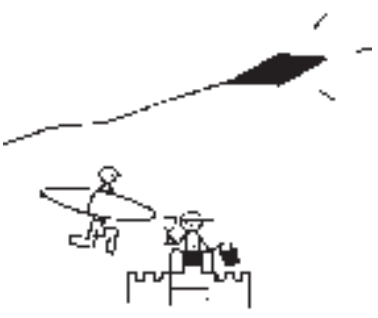
Some independent specialists on Iran's nuclear program are concerned that Iran might be able to move faster than Negroponte has estimated. Graham Allison, a Harvard University professor who worked on nuclear-weapons issues at the Defense Department during the Clinton Administration, declared in a paper published in June, "The American intelligence community may be seriously underestimating Iran's progress toward a nuclear bomb." One problem in making an accurate forecast is that some of the past dealings with Iran by alleged associates of A. Q. Khan, including Gotthard Lerch, remain opaque. A senior Bush Administration official who has studied Iran's contacts with Khan and his collaborators acknowledged, "There are just major things that we don't know."

In a statement that Lerch gave to German investigators almost two years ago, parts of which were read out during his trial, he said that he had been to Iran twice, but that his travel had nothing to do with uranium enrichment. "He has done it in a very smart way, because there's not very much trace," an investigator in Europe said. "This is still open for us—you know, what did he really do?"

The focus of Lerch's case is not Iran but a separate enterprise, to supply Libya with nuclear equipment. According to the German government's indictment, Lerch, beginning in the late nineteen-nineties, joined A. Q. Khan and others in a secret plan to manufacture and then ship to Libya a plant to enrich uranium. The scheme collapsed after a tip to American and British intelligence led to a raid on a German freighter, the BBC China, in Italy in October, 2003. Investigators found enough nuclear goods bound for Libya to make a damning case; confronted with the evidence, the country's dictator, Muammar Qaddafi, who had been seeking an accommodation with the United States, agreed to give up all weapons of mass destruction in exchange for an eventual end to economic sanctions. The supplier lists and materials handed over by Libya as part of this grand bargain led prosecutors in Europe, Malaysia, Dubai, and South Africa to arrest about a dozen businessmen who had allegedly worked with A. Q. Khan, including Lerch.

Lerch received about twenty million dollars from Libya, according to German prosecutors, roughly half of which he cleared as profit. Germany is attempting to seize Lerch's money; his lawyers claim that he is innocent. Lerch told German investigators that he was just a businessman who wanted to slow down as he approached retirement. He hoped, he said, to concentrate on his international real-estate investments, particularly in China.

The investigations into Lerch's trading offer a reminder that what professional spies sometimes call the "hard problems" of intelligence collection and analysis are truly daunting. Iran's clandestine procurement network is spread around the world, and the testimony of important witnesses, some of whom have engaged in illicit trading, can rarely be taken at face value. In addition, the underlying questions of nuclear engineering and science are complex.



Iran's nuclear goals have presented themselves at a time when other governments have shown renewed interest in atomic weapons—governments whose nuclear technology, in some cases, is linked by common reliance on supplies from A. Q. Khan and his collaborators. Admissions by Khan and court documents in Europe and South Africa allege that what is now referred to as the Khan network has been in contact with the clandestine or sanctions-evading nuclear programs of at least six countries: India, Pakistan, South Africa, North Korea, Libya, and Iran. (Like Libya, South Africa has abandoned its nuclear-weapons program.) These papers also contain hints of possible contact between Khan and customers whose identities are unknown. His dealings have sometimes involved the same sets of nuclear blueprints, which were first created by European engineers for commercial purposes thirty years ago; the blueprints are still circulating, sold and resold the way contraband court jewels were in earlier centuries. The entrepreneurial engineers who have emerged as agents of nuclear proliferation covet privacy and rarely explain themselves. Yet their motives and beliefs—professional pride, greed, fear of exposure, and, occasionally, political conviction—have had, in cases such as Iran, Libya, and Pakistan, as much influence on the nuclear balance as the decisions of Prime Ministers or Presidents.

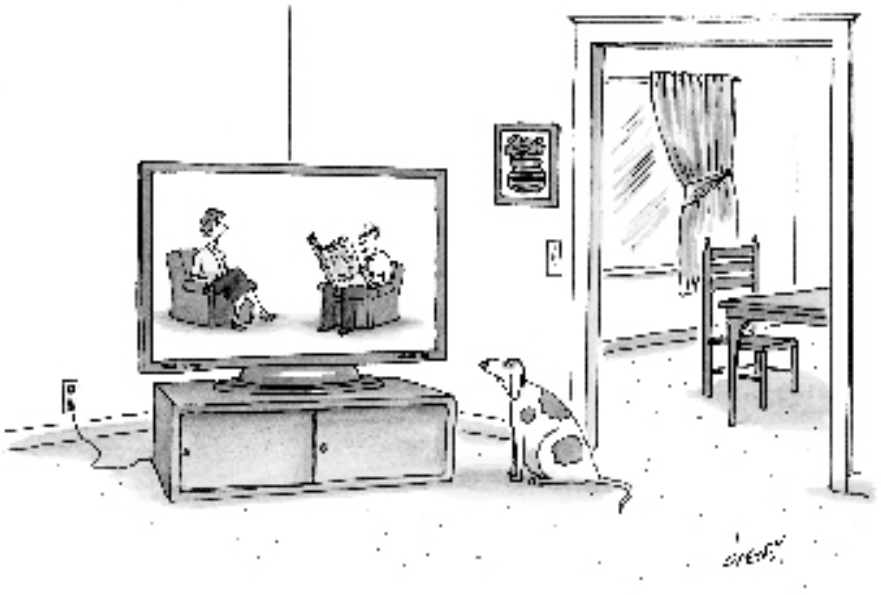
In the summer of 2004, Bush declared that the A. Q. Khan network was defunct. "We put them out of business," he said. In fact, Khan's enterprise—dispersed, diverse, and in some respects politically protected—has proved difficult to untangle. The President of Pakistan, General Pervez Musharraf, pardoned Khan after the Libya project was exposed, and has refused to allow I.A.E.A. investigators to question him freely. Khan, who is seventy, has been granted a comfortable, if restricted, retirement on an estate near Islamabad—a well-upholstered form of house arrest. Exchanges with Khan that are controlled by Pakistan's government have produced some

insights into his affairs, but they have also left investigators puzzled about a number of important questions, particularly concerning Iran. According to Leonard Weiss, a mathematician who became a specialist on Pakistan's nuclear program during two decades as a Senate staff member, "We don't really know to what extent the Khan network has been rolled up, to what extent new additions to the network have been made."

Just before noon on a Tuesday in mid-May, I walked from the Mannheim courthouse to the *Hauptbahnhof*, the city's main railway station, to look for Peter Griffin, a retired British businessman. He was due in from his home near Bordeaux, to testify at Lerch's trial. The Mannheim station is a postwar rendering of prewar German railway architecture, and its brightly lit interior shopping mall was crowded. On platform 2, as Griffin had instructed, I waited for train No. 878 from Strasbourg, which passes through Mannheim on its way to Berlin.

We had exchanged cell-phone numbers, but Griffin could not initially remember his own because, as he put it wryly, referring to Britain's main foreign-intelligence service, "MI6 keeps nicking my phones." Like other international businessmen who have had dealings with A. Q. Khan over the years, Griffin has faced intensive scrutiny. Most recently, he said, he was arrested at Britain's Luton airport, in the summer of 2005, and questioned for two days under an antiterrorism law. Griffin, who is seventy, has owned or operated a series of trading companies since the nineteen-seventies, first in Britain and later in Dubai. He has been a subject of periodic British investigations, having to do mainly with exports that he arranged to Pakistan. But he has never been charged with or convicted of any crime.

Griffin had agreed to appear as a witness at Lerch's trial, but he worried that he might be arrested as soon as he reached Germany. The Mannheim court had provided Griffin with a letter of protection, and he had given me a copy, along with a certified English translation, so that, as an independent witness, I would have a record of the promise in case he was seized by the police. The letter seemed a little antiquated, an echo from a time of princely states and private toll roads. "Court Order—at the same time *letter of safe conduct*," the official translation said. "During the said period of time it is not permitted to apprehend or arrest the witness for a possible involvement in the charges specified in the above-mentioned indictment."



"Notice anything different?"

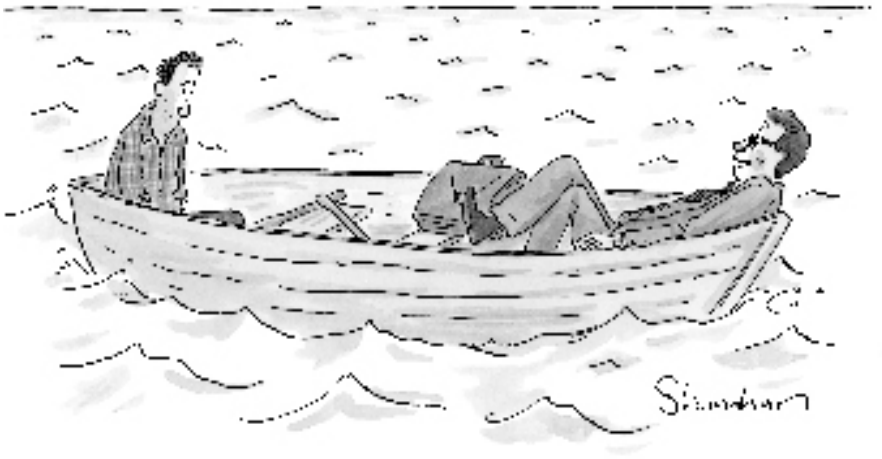
• •

As a guarantee, it seemed less than airtight, but when the train pulled in there were no police. Griffin, a trim, ruddy-faced man with cropped white hair, wearing a cream-colored summer suit and a blue dress shirt unbuttoned at the collar, descended from a second-class carriage carrying an old leatherette suitcase with two large folding straps; on his wrist was a bright gold-plated watch. A Welsh coal miner's son and a former rugby player, Griffin can be direct and pugnacious, but he is quick-witted and has a sardonic sense of humor. When I first reached him by e-mail, he replied, "I am Peter Griffin, star of stage, screen, and innuendo, and I may be able to contribute to your knowledge on this interesting subject."

"This is my version today," he said after we had settled down to lunch in an outdoor café.

Griffin told me that he knew very little about Gotthard Lerch, and he had "no inkling" of any nuclear deals with Iran, but he said that he had conducted business with A. Q. Khan on and off for two decades and worked with many of Khan's most important aides. The past year has been a particularly unhappy one for some of Khan's former collaborators; they have entered a twilight period of mutual suspicion and accusation in the aftermath of the failed Libya project. One European businessman, Henk Slebos, has been tried and convicted of export violations in the Netherlands; another group, in Switzerland, is awaiting trial. Some, like Lerch, have asserted their innocence, but others have chosen to turn state's evidence, or else have struck an ambiguous posture, offering limited coöperation to investigators, with a promise of more if the deal is right. There was always an element of tension among Khan's varied suppliers, Griffin said. Governments and the media, he told me, have misrepresented Khan's business associates by labelling them as a coherent-sounding "network," when in fact those who dealt with Khan rarely worked together, and were often competitors.

Griffin blames much of his own trouble on B. S. A. Tahir, a young Sri Lankan who enjoyed a "father and son" relationship with Khan, as Griffin put it. Tahir was imprisoned in Malaysia in 2004 because of his alleged involvement with the Libya project. Statements that he is reported to have made under interrogation appeared more than two years ago, after the Malaysian police issued a press release. Among other things, the release



"Really? That's the first time you've eaten somebody?"

• •

named Griffin's company, Gulf Technical Industries, as a participant in the Libya conspiracy. After Tahir's claims were publicized, Griffin collected records from the Dubai government and other sources in an effort to prove that Tahir had forged documents and had hijacked his firm, using its name without Griffin's knowledge. Griffin told me that none of the Libya-related business transactions he participated in involved nuclear equipment or were otherwise illegal.

As we finished lunch, Griffin said that the investigations into A. Q. Khan's activities, as well as recent events, such as the invasion of Iraq, had changed his view of how governments work. "I used to think there was a grand plan, where the intelligence services of America, Britain, France, and Russia got together to say, 'Right, this is how it's going to be,'" he said. "Now I realize it's not that way at all. It's all knee-jerk reactions."

He threaded a tie around his neck as we walked to the *Landgericht*. We pushed through the door of courtroom No. 2 a few minutes before 2 P.M. The presiding judge, Michael Seidling, asked Griffin to wait in the building's cavernous lobby until it was time for him to testify. Spectators watching other cases in two adjoining courtrooms spilled into the lobby. One case involved a forced prostitution ring and the other concerned a double murder arising from a love triangle. "This is nothing, then," Griffin said of the Lerch trial. "This is only the Apocalypse."

Just after 4 P.M., Griffin took his place at a small table inside the courtroom. Lerch, at the defense table, to Griffin's left, squinted and stared down at his binder as Griffin talked about the history of his business dealings with Khan and Tahir. Once, in Dubai, Griffin said, more than a decade ago (he could not remember precisely when), he walked into Tahir's office on a social visit and found Lerch shouting, "I want my money!" He withdrew before he could determine what the dispute was about, he said. On a second occasion, in 2001, he said, Tahir asked him to transfer twenty-five thousand Swiss francs to Lerch's bank account, which he did without asking the purpose. (Tahir later paid him back.) Otherwise, Griffin said, he had no firsthand knowledge of Lerch's business dealings.

German criminal cases do not follow the adversarial structure of the Anglo-American tradition; they unfold more as commissions of inquiry, with the chief judge in control and witnesses called in no particular order. Griffin testified at a stage when the court appeared to be struggling to establish a basic sense of how the Libya project had been arrayed; his testimony hardly clarified the role that Lerch had played. Griffin spoke for two hours about contracts and shipping orders that preceded the seizure of the BBC China, but emphasized that Tahir, whose statements are central to the case against Lerch, should be considered unreliable. As the pertinence of Griffin's testimony emerged, Lerch smiled and scribbled notes to his lawyers suggesting additional questions.

For his part, Griffin seemed less concerned about Lerch's innocence than about his own. He used his time to describe the documents that he said exonerated his company, and he spoke in impassioned tones about how he had been victimized by Tahir and A. Q. Khan. At one point, Judge Seidling, seemingly befuddled by this complex story of accusation, asked Griffin whether he and Tahir were still friends.

"As far as I'm concerned—well, he may still like me," Griffin said. He paused for a moment, and then added quietly, "He betrayed me."

Abdul Qadeer Khan was born in Bhopal, India, in 1936. His father worked as a headmaster. After the partition of Britain's subcontinental empire, in 1947, into Hindu-majority India and Islamic Pakistan, Khan migrated to Pakistan; years later, he spoke bitterly about that journey, complaining that he had been harassed by Indian guards. He went abroad to become a scientist and studied in Germany, the Netherlands, and Belgium, eventually earning a doctorate in metallurgy from the Catholic University of Leuven. While Khan was in Europe, Pakistan lost a war to India that shattered its Army and severed its territory, leading to the birth of the modern nation of Bangladesh; three years later, in 1974, India exploded its first nuclear device. "They were threatening us," Khan said years later, in an interview with the German journalist Egmont R. Koch. India "never accepted the establishment of Pakistan," he said.

Khan and his wife, a Dutch-South African, could be warm and generous to friends and colleagues, according to Griffin, but Khan could also be prideful and quick to comment on other people's shortcomings. Around the time of India's nuclear test, Khan took a job at a firm that worked with Urenco, a profit-making consortium that had been organized by the governments of the United Kingdom, Germany, and the Netherlands. The group planned to build plants to enrich uranium for the civilian nuclear-power industry in Europe and elsewhere. Its engineers settled on a method using centrifuge machines, and engineering teams from each country began to work on designs.

Nuclear power plants and nuclear bombs rely on either uranium or plutonium, because they are fissile materials; that is, they can create the energy-releasing chain reaction called nuclear fission. Nuclear engineers often prefer to work with uranium, because it occurs naturally and is relatively easy to handle. To generate heat or explosive force with uranium, however, it is necessary to enhance its fissile characteristics. This involves raising the concentration of a particular isotope, U-235, a form of uranium whose atomic arrangements can generate a nuclear reaction. "Enrichment" refers to the complex and expensive chemical and industrial processes that increase the concentration of U-235 in a uranium compound.

An early step in all these processes is to combine natural uranium with fluorine to produce a compound called uranium hexafluoride, or UF-6, which is relatively stable. Then, in a system based on centrifuges, the UF-6 is fed through pipes into whirling rotors. The design of a centrifuge can vary, but it is shaped like a thin, spinning cylinder, in some cases about eight inches in diameter and about five feet tall. It works on a principle similar to that underlying a spin dryer: as the chamber turns at extraordinarily high speeds—up to a thousand metres per second—the U-235 isotope separates. A single centrifuge can enrich uranium by only a small amount, however. In order to reach the levels of enrichment necessary for nuclear fuel (about five per cent U-235) or for nuclear weapons (about ninety per cent), the uranium compound must be poured continuously into additional centrifuges, which are connected as a cascade, much like the design of a water-filtration plant. Among the many sensitive parts of this system are the pipes, valves, and compressors that help guide the uranium into and out of the centrifuges; this supporting technology is referred to as a centrifuge plant's "feed-and-withdrawal system."

At Urenco, during the early nineteen-seventies, a Dutch engineering team came up with a centrifuge design sometimes called the SNOR, while the German team produced a rival design called the G-2. The latter system was more efficient, in the sense that it enriched uranium faster, but it was also more challenging to manufacture. A. Q. Khan worked as a consultant for the Dutch team, reviewing metallurgy problems. Security at Urenco was lax, and in 1975 Khan, determined to help his country match India's nuclear prowess, left his job and returned to Pakistan, allegedly carrying centrifuge blueprints with him. "He actually took both sets of drawings," another investigator in Europe said, referring to the SNOR and the G-2. "And the specifications, and the lists of suppliers." Khan was later tried in absentia in Holland on charges of nuclear theft.

By the next year, in Pakistan, Khan had been appointed the head of what became known as Khan Research Laboratories, and settled on the SNOR centrifuge design as the initial route to building a bomb. A single nuclear weapon requires about forty pounds of weapons-grade uranium; Khan decided that he needed to construct an industrial plant with thousands of centrifuges spinning at once, and, even then, it would take several years to produce enough material for a small nuclear arsenal. He chose Kahuta, a town southeast of Islamabad, as the site for his plant.

The narrator of a promotional sales video—which was produced by the laboratory, apparently to advertise its product lines to international customers—describes, over thumping music, how Khan saw this challenge: "In theory, it was simple but, practically, a gigantic task." The video, recovered two and a half years ago from Libya, celebrates Khan's achievements in illicit uranium enrichment as a kind of underground Third World legend, and its production values suggest a bootleg by a particularly dangerous punk band. The uranium-enrichment work that Khan undertook would be "a thrilling tale." The narrator explains, "The price for freedom was high, but freedom is surely not a commodity that can be judged by its price. And Pakistan had no other choice but to go nuclear."

By far the most difficult aspect of any nuclear-bomb-building project is the acquisition of fissile material. Learning how to shape the metal for a weapon, or how to set off a nuclear explosion, can be a challenge, but plans for crude devices have been in fairly wide circulation for half a century. There are a number of distinct technologies for creating fissile material, but centrifuges are particularly attractive

to countries that wish to keep their nuclear programs hidden, because the machines can be housed in ordinary buildings, and they do not give off indications, such as extensive electricity consumption, that can be detected easily.

Khan travelled back to Europe and found many willing middlemen and corporate venders. When Egmont Koch suggested to Khan that this period marked the start of his smuggling operations, his reaction was to describe how he relied on the freewheeling ethos of global commerce. "I mean, why do you paint a picture—smugglers, smuggling, and sneaking. . . . If you want to buy a thing, you place the order directly and you'll get it," Khan explained. "It is no problem.... You are not willing to sell it to me, but you are willing to sell it to Tom. So Tom buys from you, he takes ten per cent or fifteen per cent, and he sells it to me. This is purely a business deal!"

Beginning in the late seventies, the C.I.A. monitored Khan's dealings, and State Department diplomats often talked to European officials about particular sales. Sometimes the governments would stop an export and sometimes they would refuse. "For most countries, I think it was purely commercial—the money," said Richard Barlow, a former intelligence officer at the C. I.A. who tracked Pakistan's nuclear procurement during the nineteen-eighties, and whose warnings about Khan's progress were often ignored. West Germany and the Netherlands made a national priority of promoting manufactured exports, particularly when they involved precision engineering, and they viewed some of the American lobbying about exports to Pakistan as just another form of trade competition. "There would be endless meetings, export-control meetings," Barlow said. "We never really got that serious about it, the way we are now."

During this period, Gotthard Lerch worked as a division manager and as a salesman at the German engineering firm Leybold-Heraeus GmbH. The company had Urenco contracts for feed-and-withdrawal systems for the prospective enrichment plants. German prosecutors later charged that Lerch, who left Leybold in 1985, in order to form his own engineering company, had misappropriated blueprints; after a trial, in 1992, he was acquitted.

Khan often relied on old friends and university classmates as he constructed his supply network, and from the beginning there was a haphazard, almost accidental quality about his deals. Peter Griffin says that he became a supplier after an acquaintance of the scientist, searching for machine tools, dialled the wrong listing from a business directory. Griffin later met Khan over dinner "in a wonderful Pakistani restaurant within shouting distance of the House of Commons," as he recalled. He travelled to Pakistan and took orders for an array of Pakistani industrial and development projects—factories, water projects, conventional military programs, and farms, as well as nuclear projects. Khan's "aspirations and ambitions were tremendous," Griffin said. "I asked him, 'Do you ever want to be President?' He said, 'No way, I just want to help my country develop.' Very patriotic . . . He said, 'If it's good for Pakistan, I'd buy it from the Devil.'"

Khan spent large sums in this early period; his suppliers jostled for access to his largesse. The scientist's son-in-law, Griffin recalled, found a fortune-teller called the Professor upon whom Khan relied, put him on his payroll, and instructed the seer to advise Khan that if he did not give his son-in-law "a lot of business with high profit margins," as Griffin put it, Khan would "fall under a bus or something like this."

"They've eliminated your grant to promote local agriculture."

Iran's nuclear ambitions date back to the nineteen-seventies, when Mohammad Reza Pahlavi, the Shah of Iran, announced a large-scale plan to develop nuclear power. After the 1979 Islamic revolution installed Ayatollah Khomeini as Iran's leader, many scientists left the country and the program fell dormant. During the mid-eighties, a group of Islamic clerics led by Ali Akbar Hashemi Rafsanjani preached that science could strengthen their revolution, and Iran revived its interest in uranium enrichment.

By now, A. Q. Khan's plant hummed with cascades of SNOR centrifuges. (Khan renamed the Urenco centrifuges the P-1 and the P-2, but, according to investigators in Europe, he made few alterations to the original designs.) "By 1981, our plant at Kahuta was fully operational," Khan says in his sales video. "On the 10th of December, 1984, I wrote a letter to the then President, General Zia ul-Haq, and informed him that we were now in a position to detonate a device—a nuclear device—on a week's notice."

Iran signed a secret nuclear-coöperation agreement with Pakistan the following year, according to Leonard Weiss, who tracked the issue at the time for Senator John Glenn and conducted investigations into Pakistan's program for a Senate subcommittee. Pakistan's motives

were unclear; Zia, the country's military leader, was a religious man, but not a revolutionary in Khomeini's vein. The 1985 agreement was detected at the time by American intelligence, but its provisions were unknown, Weiss said.

A one-page sheet, handwritten in neat letters, is the earliest known record of a business transaction between Iran and A. Q. Khan, or Khan's associates. The document dates to 1987, according to the I.A.E.A., and appears to be a shopping list prepared for Iran, created after a series of meetings in Europe. It refers, among other items, to materials for two thousand centrifuge machines. The handwriting has been checked against samples from Khan, Tahir, Lerch, and others, but no match has yet been found.

Gotthard Lerch is one of several German businessmen who had contact with Iran's nuclear program during these years, according to investigators, although whether he was at the European meetings is not known. An Iranian physicist who worked at the Atomic Energy Organization of Iran and now lives in the United States told me that, when he travelled to Germany during the nineteen-eighties to purchase vacuum equipment for conventional military use, he met with Lerch, and that the German "tried to show me some movies" promoting sales of equipment that could be used for uranium enrichment. "Lerch was certainly meeting with the Iranians, but it's a little unclear what he did or did not sell to Iran," said David Albright, a former U.N. inspector in Iraq, who directs the Institute for Science and International Security, in Washington.

In 1987, Iran paid some of Khan's associates for what Iran's government has described as a relatively small package, mainly P-1 centrifuge blueprints. Iranian officials have explained that, like Pakistan, they wanted to build an indigenous nuclear industry. For this reason, they asked for drawings but not finished machines. There remains a great deal of uncertainty, however, about Iran's story. "That whole thing, that '87 transaction—there's a lot that A.Q. could shed light on," Robert Einhorn, who was the Assistant Secretary of State for Nonproliferation during the Clinton Administration, told me.

After this purchase, Iran claims, it had no further contact with Khan or his colleagues until 1993. In the meantime, Iranian officials took their blueprints and tried, mainly in Europe, to acquire the parts and machinery needed to make centrifuges. Iran's drive for nuclear independence "failed miserably," however, according to one of the investigators in Europe, and by 1994 they were negotiating again with the intermediaries in Dubai.

This time, Iran purchased components for five hundred used P-1 machines that were being taken out of service at Kahuta, where Khan was installing P-2 centrifuges. Iran's government paid millions of dollars for Pakistan's P-1 components—which it believed were new—and when it received them it possessed, apparently for the first time, the firm beginnings of its own industrial uranium-enrichment capability, which it kept secret. Iranian negotiators continued to talk with Tahir and other of Khan's aides, however; there were about ten additional meetings between 1996 and 1999, according to the account that Iran has provided.

The Iranians complained about the quality of the components they had received from Khan and demanded better customer service. There is more than a hint of rivalry between Iran's scientists and their suppliers from the Indian subcontinent. And yet by 1998 there was no mistaking who was ahead of whom: in May of that year, in reply to a series of nuclear tests by India, Pakistan exploded six nuclear bombs at a test site in its southwestern province of Baluchistan.

By now, Khan Research Laboratories had grown into a nuclear city-state brimming with contented employees, who had the advantages of the laboratory's own outstanding schools, hospitals, genetic-engineering labs, and even sports stadiums, "so much so that an excellent cricket stadium has been constructed, with arrangements that are of international standards," the narrator in the lab's sales video declares. With nuclear achievement came improved athletic prowess. "The performance of the K.R.L. cricket team is also on the verge of improvement," the narrator says.

On Rabie Street, in Vanderbijlpark, South Africa, a mining town about forty miles southwest of Johannesburg, several three-story metal buildings house a number of machine-tool workshops. Less than a mile away is Sharpeville, one of the largest, and poorest, townships in South Africa, and the site of a massacre on March 21, 1960, when white policemen shot and killed sixty-nine black protesters. Sharpeville and other townships nearby were erected by the country's apartheid government as crude encampments for black mine workers; they remain degraded places burdened by unemployment and crime.

One evening recently, when I drove to Vanderbijlpark, a filmy smoke from cooking fires in the townships clung to the horizon. The veldt in this region is dry and stony, speckled with waterberry and gardenia trees. Gold mining has stripped the hillsides of all but scrub, yet, with the price of precious metals surging, corporations are returning with advanced technology to sift gold dust.

Until 2004, about half a dozen South African engineers and machine-tool specialists worked on a program that one of the supervisors referred to as A. F. Project, which stood for "Arab Fuckers." The full scope of this work has yet to be unravelled. Mainly, A.F. Project appears to have involved the manufacture of nuclear-related systems for Libya, according to an indictment filed earlier this year by South African prosecutors, but documents discovered in the investigation also involve Iran, Pakistan, India, and South Africa's own apartheid-era nuclear programs.

I flew to Johannesburg in mid-June to interview Daniel Geiges, a sixty-eight-year-old Swiss engineer who has lived in South Africa since 1969. Although South Africa, as apartheid rule ended, gave up its nuclear-weapons program, the country still hosts a nuclear-power industry. South African prosecutors have indicted Geiges and Gerhard Wisser, the owner of a small consultancy where Geiges worked, called Krisch Engineering, for fraud and violations of South Africa's nuclear-control laws. Geiges and Wisser have been accused of filing false export forms and of improper shipments of sensitive equipment to and from Dubai, allegedly for the Libya nuclear project. The indictment also describes Gotthard Lerch as a participant in the conspiracy, although it does not charge him with a crime.

Daniel Geiges's trial has been postponed until next year; in the meantime,

he received a diagnosis of colon cancer and has begun a regimen of chemotherapy. He has given an extensive statement to South African investigators, and his lawyer, Johan Hattingh, has attempted to negotiate a plea agreement—so far unsuccessfully. Geiges said that he had agreed to talk with me about his work on A.F. Project because he hoped that publicity about his willingness to coöperate might help speed a resolution of his case. He is virtually destitute, according to his lawyer, and because he has three school-age children he is anxious to settle his affairs.

Geiges is a slim, neat, brown-haired man with a dark goatee. I met him in Hattingh's offices in Pretoria, about thirty miles north of Johannesburg. He spoke precisely and tersely, in lightly accented English, and said that he first came to South Africa because, as a Swiss, "you live in a small country and you feel you have to go out, you have to get additional experience outside your country." He intended to stay for just a few years, but the longer he remained, he said, "the more I felt, whenever I went back to Switzerland, Germany, how narrow and narrow-minded things are. Here you've got a lot more—you've more elbow room."

He said that he first met Gotthard Lerch in the early nineteen-seventies, when Lerch was an executive at Leybold and Geiges had been hired as a subcontractor to manage a project for the Uranium Enrichment Corporation of South Africa. Lerch's company supplied some of the components that South Africa relied on.

Geiges said that in the mid- to late eighties he became aware that he was working for customers outside South Africa. His consultancy received an order for pipe work and autoclaves, which are used in the feed-and-withdrawal systems of centrifuge-based uranium-enrichment plants. "I was told, yes, that was for Pakistan," Geiges said. His boss, Gerhard Wisser, gave him the blueprints and, as Geiges recalled, said that they had come from Lerch. "I wasn't there myself," Geiges said, "but that is what Wisser told me—that he had received them from Lerch." Lerch, through his lawyer, declined a request for an interview; asked about Geiges's recollection, the lawyer said that he would not comment. (Wisser, through his attorney, also declined a request for an interview.)

That particular project took about a year to finish; later, there were other, smaller orders. At one point, Khan's aide B. S. A. Tahir and a scientist identified in the South African indictment as "Dr. Hashmi, a senior Pakistani nuclear expert," travelled to Johannesburg for discussions about Pakistan's nuclear-engineering requirements.

There is evidence that Khan's associates may also have used South Africa to make nuclear components for Iran during this period. Investigators have given Geiges a document from a South African transport company that appears to be a one-page price quotation dated October 2, 1991. The document is entitled "Shipment to Arak in Iran." Arak, the I.A.E.A. learned in 2003, is where Iran has begun construction on a nuclear reactor moderated by heavy water; the reactor's size and specifications are ideal for the production of plutonium. Geiges said that he doesn't know what deal, if any, the document describes. Investigators have been pressing him about it, he said, but "obviously I can't tell them things I don't know."

A.F. Project began when Wisser returned from a meeting in Dubai and asked Geiges to draw up a price estimate for a complete feed-and-withdrawal system for a plant that would be based on P-1 centrifuges. Geiges said he was told to use the blueprints that allegedly had provided a foundation for Pakistan's plant at Kahuta.

I asked Geiges whether he and Wisser had ever talked about the politics of nuclear weapons, or of their gradual spread. "There was not really very much reason to discuss that," he said. "Obviously, the mere fact that he brought this kind of project would indicate that he didn't necessarily share the views of the United States and its European allies in that regard.

"Look, for me it was in the first place a job which I'd been taught to do," Geiges continued. "I was three years away from retirement, and rocking the boat at that stage was simply not an option." He felt, he said, that he had "basically two options." He could "do it to my best ability, and within the given parameters, or I run to the authorities with a slim chance of making a fool of myself if it turns out that the whole thing could be legalized." If he became a whistle-blower, he thought, he would likely have to "lose a job and accept cuts in my retirement benefits—and become a pariah which no other employer would touch."

About two years after the manufac-

AFTERWORDS

1.
Packs of wild dogs roamed the streets of the very rich,
looking for scraps that might have been thrown their way
by a caring cook or merciful maid. Birds flew in
from everywhere, going up and down and side to side.
In the distance, beyond the stucco mansions
with their patios and pools, beyond the cemetery
with its marble angels, barely visible to the naked eye,
a man was scaling a cliff, then stopped and turned, and
opened his mouth to scream, but when the screams arrived
they were faint and cold, no different from the snow
that kept on falling through the windless night.

2.
They rushed from their houses to welcome the spring,
then ran to the piers to gaze at the backs of fish,
long and glistening, then to the stables to see
the sleek, cloud-breathing horses. Nothing could keep them
from their joy, neither the storm gathering strength
in the west nor the bombs going off in the east;

theirs was the bliss of another age. Suddenly,
a woman appeared on the beach and said that soon
she would sing. "Soon she will sing," murmured
the gathering crowd. "Soon she will sing," I said
to myself as I woke. Then I went to the window
and a river of old people with canes and flashlights
were inching their way down through the dark to the sea.

3.
Twenty crows sat on the limbs of an elm.
The air was so clear that one could see up
the broad valley of patchwork fields to the next town,
where a train releasing a ribbon of steam
pulled out of a small wood station. Minutes later,
a man stepped onto the platform, waited, then lifted
his suitcase over his head and hurled it onto the tracks.
"That's that," he said, and turned and walked away.
The crows had taken off, it was cold, and up ahead
long windblown shadows lashed the passive ground.

—Mark Strand

turing work began, two customers, identified to Geiges only as Abdul and Ali, arrived for a visit.

"They seemed to know more than anybody else about the complicated system," Geiges recalled. "They said they were Ethiopians. I stupidly believed it, because I was not aware of the fact that Ethiopians are generally of much darker complexion. These guys—it was possible that they were Libyans, but I'm by no means certain."

Geiges said that he never reflected much on who the ultimate customer might be. "Obviously, the names indicated that they came out of a certain region," he said. He was aware, however, that the plant he was helping to build could produce uranium enriched to ninety per cent U-235—the level needed for bombs—because Lerch once told him so, he said.

Geiges studied centrifuge technology on the Internet, and he calculated—based on the Pakistani-derived blueprints that he was working with, as well as on test results from Pakistan's P-1 centrifuges he had been given—that the plant he was building could produce only four or five grams of highly enriched uranium per hour. That did not seem especially dangerous, no matter who the ultimate Middle Eastern client was, he said. "On the basis of five grams per hour, if you run the cascade for three hundred and sixty-five days, twenty-four hours a day, you'll end up with just under twenty-four kilograms of material."

"Right," I said. "One bomb."

"*Ja*," he agreed.

"Maybe all you need, depending on what you want," I said.

"*Ja*, but on that basis it would have taken about two hundred years to catch up with the Israelis."

The plant that Geiges worked on may have been for Libya, but the blueprints and the test results he received from Pakistan are the same ones that Iran has relied on, and the centrifuge-flow calculations that Geiges referred to are essential to any attempt to predict how fast Iran might be able to build a nuclear bomb. In Iran's case, there are several questions at issue: how many P-1 centrifuges it has been able to manufacture, how quickly its scientists will learn to operate their cascades, and how far it has progressed on the more advanced P-2 design.

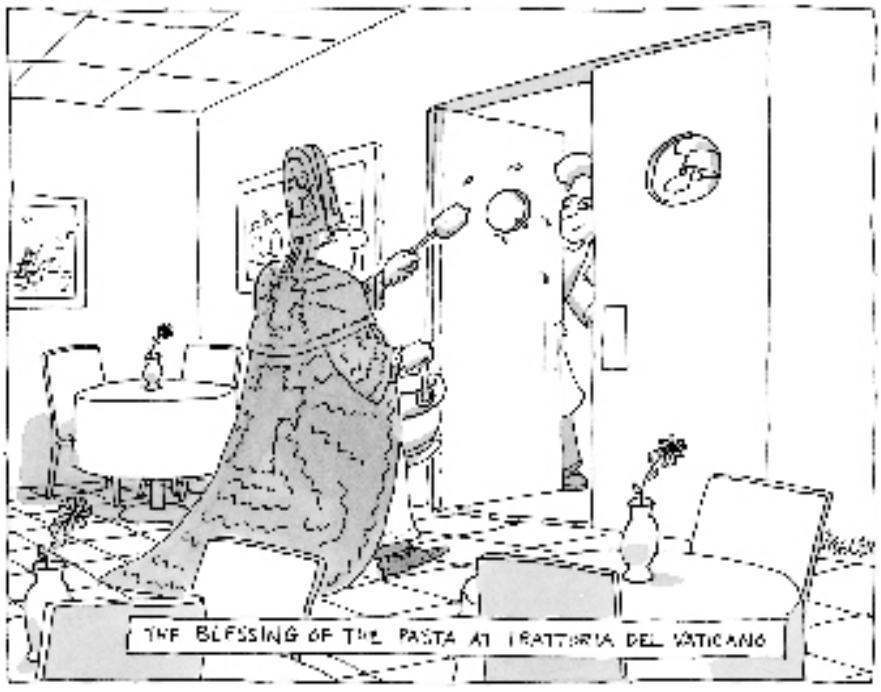
When American and European intelligence agencies assessed similar uncertainties about Iraq's nuclear program in the run-up to the U.S.-led invasion of Iraq, in 2003, they were inhibited by the fact that Saddam Hussein had banned U.N. inspectors from the country in 1998. Iran, on the other hand, has continued to permit I.A.E.A. inspectors to enter the country, and this has provided a much more detailed flow of current information about its nuclear program. Since the beginning of this year, however, the inspectors' work has been curtailed by the Iranian government.

A number of sites have attracted the I.A.E.A.'s interest since Iran's uranium-enrichment work was first revealed, but the inspectors have focussed particular attention on a cluster of buildings, arranged roughly in the shape of a star, near the mountain town of Natanz, about two hundred miles south of Tehran. From the outside, the facilities look like warehouses, but inside one of them inspectors have found what amounts to a building within a building—a large centrifuge hall that has been constructed to seal out dust and other impurities, and which Iran calls a "pilot" facility. Within this hall are six concrete blocks, each designed to support a cascade of a hundred and sixty-four centrifuges. On one of the blocks stands a finished cascade of P-1s in working order; several of the other blocks contain cascade components in varying stages of construction. In another part of the building are electrical and feed-and-withdrawal systems.

As part of an agreement that Iran made to suspend enrichment activities while it negotiated with Britain, France, and Germany, work inside this building was discontinued and Iran placed its lone centrifuge cascade under I.A.E.A. seals from 2004 until the beginning of this year. Those talks failed, however, and Iran has now resumed work at Natanz.

In public speeches, Iran's leaders have celebrated uranium-enrichment technology the way other countries celebrate sports championships or space launches. On April 11th, amid great fanfare, Iran's President, Mahmoud Ahmadinejad, announced that scientists at Natanz had for the first time enriched uranium to the levels required for nuclear fuel, although the amounts involved would have been very small.

About a hundred and fifty yards southeast of the pilot enrichment building at Natanz lies the entrance to an underground facility, reportedly situated beneath some twenty-five feet of earth and rock. Iranian officials have said that



• •

this underground plant, once it is completed, could hold about fifty thousand centrifuges. Until this year, I.A.E.A. inspectors saw only empty concrete caverns. More recently, Iranian technicians have begun to move equipment into the underground facility. Iran has announced that it plans to install three thousand centrifuges by the end of this year; the government knows, of course, that the United States is aware of this underground facility, so it may conclude that placing all its equipment there would be unwise.

Iran's goal of three thousand working centrifuges by year's end seems very ambitious, according to David Albright, the former U.N. inspector. About a month is required to assemble a hundred P-1s. That rate might be increased by double shifts, but, even so, Albright estimates that Iran will likely be able to install cascades of only about fifteen hundred centrifuges by the end of 2007. If that number of cascades were to operate around the clock, based on the typical flow rates of the P-1, they would be able to produce enough highly enriched uranium for a single nuclear bomb after about a year.

It is easy to see why such specialists as Harvard's Graham Allison fear that American intelligence may be underestimating the speed with which Iran could build a weapon—for instance, even if Iran needed until the end of 2008 to build and continuously operate a cascade of fifteen hundred P-1s, it might still be able to enrich enough uranium for a single bomb before 2010. However, according to Albright and other analysts, there are a number of reasons to doubt that Iran will be able to move as fast as the theoretical P-1 flow rates might allow.

One issue is Iran's stockpile of components and spare parts. Albright estimates that Iran currently has about seven hundred rotor assemblies and materials for between a thousand and two thousand centrifuges, and possibly for as many as five thousand. Iranian negotiators have told the I.A.E.A. that they can make their own high-strength aluminum for P-1 rotors and their own autoclaves for the feed-and-withdrawal system. However, "they need spare parts, they need enrichment-related equipment—valves, piping," Albright said. He added that he is skeptical that Iran has developed an extensive ability to manufacture these items on its own. "I think they're buying," he said.

European companies that make sensitive nuclear parts are usually alert enough, these days, not to sell to Iranian agents directly, so Iran has turned to a new generation of intermediaries who are "a mixture of normal criminals," said Benedikt Welfens, a Potsdam prosecutor in charge of a widespread investigation into nuclear smuggling involving German companies. "They jack the price up fifty per cent, and then they sell it to Iran." Britain's Department of Trade and Industry recently posted a list of forty-five Iranian companies, universities, and government departments that it said had become subjects of concern "based on the last three years' experience" of attempted transactions involving materials that could be used to build missiles or weapons of mass destruction.

Even if Iran does assemble three thousand P-1s within the next year, it may have trouble running them. Centrifuge rotors spin so fast that the smallest imperfection—even a smudge or a fingerprint—can cause them to wobble and fail. A malfunctioning centrifuge rotor can be as destructive as a small tornado, breaking adjacent assemblies and piping. During an experiment in 2003, Iran reportedly watched up to one-third of its P-1 machines crash. "It's just tricky to run them all," Albright said. "That's why people think it will take time" for Iran to enrich enough uranium for its first nuclear bomb.

If Iran can master the P-2, it will be able to move much faster. According to a public briefing in April by the U.S. Under-Secretary of State, Robert Joseph, Iran has claimed that its version of the P-2 centrifuge can enrich uranium four times more quickly than the P-1. In that case, Iran could enrich enough material for four bombs each year if it were ever able to assemble and operate a plant of fifteen hundred P-2 centrifuges. In April, Ahmadinejad announced that Iran was embarking on a new round of P-2 research. There is great uncertainty, however, about the work it may already have undertaken in this field.

Iran has acknowledged receiving blueprints for the P-2 in 1995 from A. Q. Khan's business collaborators in Dubai. But Iran also said that it put these P-2 blueprints on a shelf and did no work on them until 2002, when it hired a contractor in Tehran to conduct experiments—work that ended in 2003. According to investigators in Europe, the Tehran contractor is a young man with little professional experience; he joined the Atomic

Energy Organization of Iran because it offered a legal alternative to compulsory military service. For two years, according to the investigators, he worked on ball-bearing problems on the P-1, and when his government service ended he set up a consulting firm. He then approached Iran's nuclear authority about the dormant P-2 blueprints and received a small contract to conduct mechanical studies. He said that he built fewer than ten of these machines and ran only two of them, experimentally. He also acknowledged making inquiries to European firms about purchasing thousands of ring magnets, which are used to hold P-2 centrifuge cylinders in a vertical position as they spin. The contractor has said that he never actually placed a big order, but his description of his inquiries has struck some analysts as unconvincing.

Iran's sparse account of its P-2 work has fed suspicion among some Bush Administration officials that it may have a hidden, parallel uranium-enrichment program that is much farther along than the outside world understands. "There are big unanswered questions about the P-2 centrifuges," said Gregory Schulte, the Bush Administration's ambassador to international organizations, in Vienna, where the I.A.E.A. is headquartered. As for the possibility of a secret, parallel enrichment program, "It's something that we all need to worry about," Schulte added. "You always have to worry about 'What don't we know?'"

Some European investigators, though concerned about the gaps in Iran's account of its P-2 work, are nonetheless skeptical about the Bush Administration's emphasis on the possibility of a large-scale secret program. "I know that it's very, very strong in the minds of our U.S. colleagues," one of the investigators in Europe said. "I've got no evidence of that. And all I would say is that Iran is not such a large country. Many of the players know each other. . . . They're all part of the same associations; many of them have been at university together. I would have thought if there is a parallel program there would be some communication going on between the two programs. I don't see any evidence of that."

Some of the more hawkish officials in the Bush Administration argue that Iran will have passed a decisive point once it is able to continuously operate just a single cascade of a hundred and sixty-four centrifuges, because this would show its mastery of the crucial technology. According to this argument, if military action to disrupt Iran's nuclear program is to be considered, it should be considered soon.

As a narrow question of nuclear engineering, it may be correct that Iran is rapidly passing a point of no return, according to Marvin Peterson, a former Energy Department official who has studied Iran's program since the late nineteen-seventies. But Peterson strongly opposes military action against the Tehran government, and he doubts that Iran can be stopped. "It's too late," he said. Learning how to operate a P-1 centrifuge is "like a black art," he continued. "It's just a quality-control problem, making the thing very precise. . . . But, if the Pakistanis can do it, so can Iran."

"The Khan network is not something that should shock us," said Sam Nunn, the former U.S. senator from Georgia, who co-chairs the Nuclear Threat Initiative, an advocacy group that was established in 2001 with funding from Ted Turner. "It is our worst nightmare, but it has never been a nightmare in the sense of being unrealistic. When you see the kind of money involved, and the stakes involved, and the spread of this kind of technology around the world, it's virtually inevitable."

Even a radical regime like Iran's might be deterred from the use of nuclear weapons by the prospect of retaliation. However, Nunn continued, "once you start with a profit motive involved, then whether you start selling to private groups or Al Qaeda becomes a real open question. You can't deter people who don't mind dying, and don't mind their families dying, and think they will become martyrs."

Whether it is because this threat is in some mathematical sense improbable, or because its repetition as pulp-nightmare narrative on prime-time television shows like "24" has dulled the country's collective senses, the diffusion of nuclear-weapons technology through profit-making trade has attracted remarkably little outrage in America's political or media culture—certainly not as much, say, as the weaknesses in the nation's system for policing immigrant Hispanic gardeners. Nor has it spawned the sorts of protest about nuclear danger that roiled Europe during the Cold War.

Gotthard Lerch's smuggling trial in Mannheim did not attract much of an audience this summer. A few local free-

"Held up at work? You could have called."

lancers turned up to feed a tidbit or two to the wire services, but none of the major German or international newspapers paid close attention. A plump, cheerful, white-haired pensioner enjoyed following the proceedings, and occasionally joined reporters in the lobby to chat about how the case was going. The atmosphere was strikingly informal. The prosecutor, Peter Lintz, is a young man who sometimes rode his bicycle to the courthouse. One of Lerch's attorneys, Gottfried Reims, is big and sloppy and prone to dramatic flights of speech; his younger co-counsel, Christof Püschel, has unruly brown hair, and he sometimes sat at the defense table with a laptop and a portable printer, typing out motions of protest. Lerch's lawyers argued that their client could not receive a fair trial. They said that key documents were missing, and they pointed to the intense, continuing interest of Western intelligence agencies in their client's activities. They claimed that intelligence and police investigations had become improperly intermingled.

The indictment in the case is surprisingly general, devoid of specific dates, but its thrust is that Lerch participated in a series of meetings to organize the Libya project, and, in particular, helped to organize some of the manufacturing in South Africa. The witnesses who might badly damage Lerch's defense—including Tahir, and Wisser and Geiges in South Africa—have not agreed to testify. At times, the German government seemed not to regard the case as much of a priority. During breaks in the trial, Reims and Püschel sometimes huddled in a corner of the courthouse lobby which was set aside for smokers; occasionally, amid clouds of cigarette smoke, they offered impromptu commentary on the case. One afternoon, I listened as Reims held forth on stories he had read in the press that quoted George Tenet, the former C.I.A. director, describing how C.I.A. officers penetrated Khan's network and even rummaged in his living room. "Let us presume that is true," Reims said, warming to his argument that intelligence investigations had compromised the chain of evidence against Lerch. "Then let Mr. Tenet tell us what he found out in his brave operations, in Khan's living room and at his company. What is the role of the C.I.A.? What is the role of the other secret services? All these people we hear about here, whose payroll are they on?" Gotthard Lerch, he concluded, sounding pleased with his flourish, was "like an Easter lamb that's been sacrificed."

"And this song goes out there to any girl who might consider sleeping with me."

On the last Wednesday in July, Reims arrived at the courthouse looking especially pleased, and said, "Today we will witness a big event." Inside the courtroom, it became apparent why he was so buoyant: from the bench, Judge Seidling announced that he had decided to suspend Lerch's trial. Among other reasons, he cited the difficulty of obtaining testimony from witnesses living abroad and the questions raised by the defense about missing documents. Seidling also said that Mannheim might not be the proper venue for the trial.

Afterward, Reims handed out a press release with the title "Atomic Trial Burst." Later that day, the court set bail for Lerch at five million euros. Reims immediately said that he would argue for a reduction, and the court is expected eventually to lower Lerch's bail to under a million euros. "If the justice system makes mistakes and can't conduct the case, then it must set him free," Reims said.

Investigators in Europe working on the Iran case said that the criminal prosecutions mounted against Lerch and other Khan collaborators have hindered them, because it is more difficult to interview witnesses, and defendants such as Lerch have decided not to coöperate. The Bush Administration has encouraged these criminal prosecutions, even

though they can at times interfere with intelligence collection. "As a general rule, we have wanted to see these individuals prosecuted," Under-Secretary Joseph said in an interview. "For two reasons: first, so they pay for what they did, but, second of all, because of the deterrent value of that. This is a very lucrative business. . . . It was lubricated by lots and lots of money. That might be attractive to other individuals."

Indeed, Pakistan still requires imported nuclear equipment as it builds up its nuclear arsenal. Not only has Khan escaped prosecution; so have the dozen or more engineers and military officers who worked with him in international markets over the years, and there is little reason to believe that they have all given up their craft.

Apart from a scripted confession that he read on Pakistani television in 2004, A. Q. Khan has not revealed his own view of all this in years. There is every reason to think that he still regards himself as a Pakistani patriot as well as a force for peace. In past interviews, he has described Pakistan's nuclear weapons as a source of stability on the Indian subcontinent, because, he has argued, they will make a bloody conventional war between Pakistan and India much less likely. He has also discounted the possibility that radicals could seize power in Pakistan and thereby control its nuclear arsenal. "The fear is just imaginary," he said after Pakistan's 1998 nuclear tests. "I don't think anything of the sort will happen in this country. People are quite wise, quite intelligent, yes."

During a break in the Lerch trial, I flew to France to visit Peter Griffin, the retired British businessman who had worked with Khan for two decades. He and his wife, Anna, a slender woman who has retired from a career in nursing, live in an eighteenth-century stone farmhouse amid vineyards and Romanera villages; they own five acres beside a rail line near the town of Cognac. Some media accounts have suggested that Griffin lives in luxury, so when I arrived in his driveway he waved toward his compound and declared preëmptively, "It's not a castle. 'Modest' would be the way to describe it." Inside, there was a flat-screen TV and a bright, comfortable kitchen, but the swimming pool in the back yard was of the inflatable, aboveground variety; it came with the house, Anna said, but since it will please their grandchildren it remains. Upstairs is Peter's study and his library; there were several histories of the First World War, and a pair of books by Noam Chomsky, whose acid views on American foreign policy Griffin referred to approvingly several times as we talked.

Over two days, we spent much of our time going through the history and the details of Griffin's dealings with Khan, B. S. A. Tahir, and others, particularly the documents Griffin had collected in an effort to show that he and his company were innocent in the Libya project. He was clearheaded when he spoke about the complex details of his business affairs, but he would occasionally digress, often at my invitation, into sour monologues about the British and American governments. From time to time, our conversation drifted into questions of politics and global nuclear policy.

Particularly at the beginning, Griffin said, he believed that he was merely supporting Pakistan's industrial development and peaceful pursuit of nuclear energy—goals that he endorsed. He said that he first learned about Pakistan's nuclear-weapons program when he read allegations in the newspapers. Later, however, it became clearer where Khan might be headed. The scientist playfully signed for Griffin a copy of an investigative book about Pakistan's nuclear program, published in 1981, entitled "The Islamic Bomb," which was written, as Griffin put it, "by two gentlemen whose names wouldn't look out of place in the Tel Aviv phone directory."

Once, Griffin recounted, British customs investigators mounted an inspection of his company, and one of the officers declared that Griffin must surely know that he was helping Pakistan to acquire a bomb. "And I said, 'Well, so what?' I said, 'I believe that if everybody's got a big stick that's more security for the world than only a couple of people having big sticks.' "

Since the end of the Second World War, he continued, "There's been no nuclear threats. O.K., there's the Cuban missile crisis, which was push-and-go, but I don't think anything would have happened with it. I'm a bit more scared with the current philosophy on places like Iran. Because if your government decides they're going to take out Iran's facilities, it's going to open up an enormous can of worms, a Pandora's box."

In his conversation with the British customs investigators, Griffin went on, the officers "started introducing the moral attitude" about whether he really knew what he was doing. "Yes, I think that what I'm doing is what Pakistan should do, and what every nation has the right to do," Griffin recalls replying.

"Ah, but it's nuclear," the customs officer said.

"So what? You know, the thing in the sky that gives us warmth and heat every day is nuclear as well."

"But don't you think that this could implicate the security of Great Britain?" the customs officer asked.

"I don't think a rocket will go that far," he answered.

Perched on a couch in his living room, his brown-gray eyes shining, Griffin continued the story, and he explained his theory of global nuclear proliferation: "I said, 'What it is, in my opinion'—the view I held then, and I hold now—'is that the intention of the five, six, seven, eight, whoever got nuclear technology, they want to keep it for themselves, so they can become the Arabs of the future. When the oil runs out, they hold the resources for world energy, and they will then sell it to those countries, if they want to—if they don't want to, they won't sell it. So I think it is a dog-in-the-manger attitude to protect future income for the oil companies when oil runs out.' " In the meantime, he said, it behooved oil-producing countries like Iran to use their income to develop nuclear technology. "Every country will need to have access to nuclear technology, ultimately," he concluded. "Those are my views on it."

At one point, I suggested that he seemed to think that the spread of nuclear weapons would do little to make the world more dangerous. "No," Griffin answered confidently. "I think anybody—