

INTRODUCTION

Pervez Hoodbhoy

Scientists made the first atomic bomb. These men of exceptional brilliance discovered the physics of subatomic particles, and found just how a few atomic nuclei could be coaxed and cajoled into releasing their enormous energy, and then explicitly calculated everything down to the last detail. Their forbiddingly difficult mathematical formulae were based upon the newly created disciplines of relativity and quantum mechanics. The scribbled symbols seemed utterly abstract, but the deadly fireballs over Hiroshima and Nagasaki in Japan showed just how real they were.

All those who created the bomb and its physics are now dead. Some, like Edward Teller, never regretted their role. Avidly sought after by military generals and national leaders, they happily kept on inventing ever more terrible weapons. But some were appalled, realizing that they had brought humankind to the brink. Robert J. Oppenheimer, the Manhattan Project's scientific leader, famously quoting the lines, 'I have become Death, the Destroyer of Worlds', turned against the bomb and fell under suspicion of being disloyal to America. His security clearance was revoked and he was accused of being a communist, a serious matter in those hysterically anti-communist times. Albert Einstein, whose mass-energy equivalence formula lies at the very foundation of the bomb, became convinced that desperate danger lurked around the corner. Einstein teamed up with Bertrand Russell, the twentieth century's pre-eminent philosopher and mathematician, to write the Einstein-Russell Manifesto. This became the basis of a post-World War II movement for eliminating nuclear weapons.

The opposition to the bomb by some of twentieth century's greatest scientists caused many around the world to reflect and ponder upon the social responsibility of scientists. The authors of

this book are among them. Hailing from both sides of the Pakistan–India border (with the exception of one, who comes from far away!), they are scientists who reject nuclear patriotism; that misplaced belief which says hurting an adversary country is somehow equivalent to loving your own.

What prompted these scientist-authors to venture into the world of nuclear weapons, war, strategy, and politics? This, after all, is not their job and can only be distantly connected to the work that they actually do as scientists. In fact, the monopoly of scientists over nuclear weapons evaporated some decades ago. To kill millions in minutes, it is now no longer necessary to have a nuclear physicist in residence. In modern times, nuclear weapon design and construction has steadily descended from high-brow theoretical physics towards mundane issues of engineering, management, and logistics. Seventy years ago the detailed physics of nuclear explosions was a matter of the highest conceptual difficulty. But today, a graduate student with a solid grounding in physics, and access to internet literature, could, as a PhD thesis, design a crude but workable nuclear explosive. Computer codes allow accurate simulations of nuclear explosions, eliminating the earlier need for the intricate numerical procedures used by the early atomic scientists.

And yet, in dealing with thorny issues of war and peace, scientists possibly still have some residual advantage. In part this comes from knowing the physical principles behind modern weaponry. But it comes still more from the nature of scientific education. Scientists are trained to recognize and analyze a wide variety of problems of the physical world. Of course, this does not mean that they are always right when they work outside their own domains. It also does not guarantee that scientists always behave rationally or humanely in their personal lives. But the cultivation of scientific habits is undeniably an asset that allows one to think through various issues of war and peace plainly and logically; identify that which are rooted in fact; and propose ways out of difficult situations. It is this hope that brings the present authors out into a domain which, in reality, does not belong to any single discipline.

DOWN THE STEEP SLIPPERY SLOPE

Once the first bomb was ready, the scientists who conceived and built it became peripheral. They were no longer courted by the political and military leaders who now ‘owned’ it. These leaders would decide how and when it would be used, and against whom. They now had a calculated strategy for putting terror into the hearts of men.

The decision to incinerate Hiroshima and Nagasaki was not taken in anger. White men in grey business suits and military uniforms, after much deliberation, decided the U.S. ‘could not give the Japanese any warning; that we could not concentrate on a civilian area but that we should seek to make a profound psychological impression on as many of the inhabitants as possible . . . [and] the most desirable target would be a vital war plant employing a large number of workers and closely surrounded by workers’ houses.’¹ They argued it would be cheaper in American lives to release the nuclear genie. Besides, it was such a marvellous device to show to the Soviet leader Josef Stalin.

And so one fine morning, banner headlines such as ‘Jap City No More’ brought the news from across the ocean. Joyous crowds gathered in Manhattan’s Times Square in New York to celebrate. There was less of the enemy left. Rarely are victors encumbered by remorse. President Harry Truman declared: ‘When you have to deal with a beast you have to treat him as a beast. It is most regrettable but nevertheless true.’² It is a disappointing truth that six decades later even American liberals remain ambivalent about the morality of nuking the two Japanese cities. The late Hans Bethe of the Manhattan Project fame, and Nobel Prize winner in physics, became a leading exponent of arms control some decades later. Yet, in a speech at the Cornell University, he declared that, ‘the atom bomb was the greatest gift we could have given to the Japanese.’³

Even as the United States dusted off its hands and moved on, elsewhere the radioactive rubble of the dead cities spawned not only a sense of dread, but also an obsessive desire for nuclear weapons. Stalin raced ahead with his program, while Charles de Gaulle

conceived his 'force de frappe'. Mao Tse-Tung quietly decided that he too wanted the bomb even as he derided it as 'a paper tiger'. In newly independent Israel, Prime Minister David Ben Gurion apparently 'had no qualms about Israel's need for weapons of mass destruction', writes Avner Cohen, the historian of Israel's nuclear bomb. Ben Gurion ordered his agents to seek out East European Jewish scientists who could 'either increase the capacity to kill masses or to cure masses.'⁴

The wind blew the poisonous clouds of fear and envy over other third world countries as well: In 1948, while arguing to create India's Department of Atomic Energy, Prime Minister Jawaharlal Nehru told parliament, 'I think we must develop [nuclear science] for peaceful purposes.' But, he added, 'of course, if we are compelled as a nation to use it for other purposes, possibly no pious sentiments of any of us will stop the nation from using it that way.'⁵ Just three years after Hiroshima and Nagasaki, those 'other purposes' were all too clear.

Days after Pakistan's nuclear tests in May 1998, Japan invited the country's foreign minister to visit Hiroshima's peace museum. The minister was visibly moved after seeing the gruesome evidence of mass devastation. His reaction: 'we made our nukes precisely so that this could never happen to Pakistan.'

The world is awash with terrible inventions, now in the control of generals and politicians, very few of whom can be trusted with public funds or keeping solemn promises. Can they be trusted with the instruments of mass annihilation? And, if not them, then just who should one trust?

SOME PERSONAL ENCOUNTERS

Logically, those in charge of a nation's nuclear affairs should be selected from amongst the wisest, most capable, and best informed people who also have a calm temperament and capacity to withstand extreme pressure. But in reality these conditions remain unfulfilled. In India and Pakistan, leaders have rarely weighed the consequences

of their actions. Instead, they have simply reacted to events and circumstances.

India started the nuclear race, so let me start with India, from *circa* 1974. After it chose to test a supposedly ‘peaceful nuclear device’, there was little care or concern about how Pakistan would respond. The Indian leadership under Indira Gandhi was naive in its nuclear thinking. It could not imagine that Pakistan too could develop nuclear bombs and, ostrich-like, chose to remain ill-informed of Pakistan’s capabilities or ponder upon the different options it had at that time. With eyes fixed towards China, perhaps it did not even care. Having dismissed Pakistani technical capability as inconsequential, the thought that India’s military advantage could be eventually nullified by a nuclear Pakistan probably never crossed the minds of those Indians who mattered at the time. As it turned out, Indira Gandhi’s successors proved as unenlightened as her.

A personal experience: Two months before the May 1998 nuclear tests conducted by India and Pakistan, a delegation from the Pugwash Movement met in Delhi with Prime Minister Inderjit Kumar Gujral. I was one of the delegates. As we sat around a table in the Prime Minister’s House, I expressed my worry about a possible nuclear catastrophe befalling the subcontinent. To my surprise, Mr Gujral twice assured me—first in public and later in private—that there was no cause for concern. As we prepared to depart, he came by and, upon learning that I was from Karachi, grew nostalgic about the city he had grown up in. Putting his arm around me he confidently and earnestly told me, speaking in Urdu/Hindi, that Pakistan lacked the competence to make atomic bombs. For quite a while, I felt very confused . . . could he be right?

The Prime Minister was scarcely alone in being mistaken. Senior Indian defense analysts like P.R. Chari had also published articles before May 1998 arguing this point, as had the former head of the Indian Atomic Energy Agency, Dr Raja Ramanna. The Indian intelligence agency RAW, which Pakistanis generally believe to be ubiquitous and infinitely cunning, was also confused and gave contradictory reports. In fact the confusion went all the way up to

the top. This became apparent at the time when India was in a state of euphoria in the days after the Pokharan tests. Mass celebrations were still in progress when, brimming with hubris, Home Minister L.K. Advani advised Pakistan to give up its claim on Kashmir because the 'geostrategic' context had decisively changed in India's favour.⁶ At a time when Pakistan was supposed to be just a 'screwdriver turn away from the bomb',⁷ Indian newspapers taunted Pakistanis: had the Chinese forgotten to send the screwdriver over with the bomb? Or were the instructions written in Chinese? Most Indians firmly believed that Pakistan did not possess the bomb.

But they could not have been more wrong. Pakistan's bomb-makers had long been craving for an opportunity to show their own prowess. Six months after the tests, one of their leaders gave a public speech expressing his delight at the Indian test:

We had spent our lifetime on the project and still there was no chance of a hot test. And on the morning of the eleventh of May this year, one of our friends in the armed services phoned me and he said, 'Have you heard the news today?' I said, 'What?' He said, 'The Indians have conducted the explosion in Pokharan.' So I said, 'Congratulations.' I was genuinely happy. He said, 'You are congratulating us on the Indian tests?' I said, 'Yes, because now we would get a chance to do our own tests.'⁸

The confidence was well-placed. Only seventeen days later, with a thunderous roar, the mountains of Chagai shook and then turned white as five nuclear devices were simultaneously detonated inside a deeply drilled tunnel prepared years earlier. Two days later, for good measure, one more device was set off under the Ras-Koh hills. India's good cheer was suddenly shattered. Instead, recriminations and excuses started flying.

Mistaken notions extended into the Indian military as well. India's late 'nuclear visionary' and army chief, General K. Sunderji, had preached for years from a thick tome that came to be known as the 'Sunderji Bible'. His principal claim was that nuclear weapons would bring stability to the subcontinent, and that there would be no Cold

War type nuclear racing. Certainly he had Pakistan on his mind—not China—when, in the 1980s, he pressed hard for weaponizing India's nuclear capacity. With infectious enthusiasm, Sunderji lectured that India needed only a handful of fission weapons to 'take out' major Pakistani cities. More was not better, he said. Like the other military men of his time, this rather simple and likeable man thought that these terrible weapons had now made war impossible.

My single encounter with Sunderji was at a Carnegie conference in Washington in 1993. He had just finished speaking on the absolute security that nuclear weapons would bestow upon the world. I had never before seen a man who loved the bomb more; his eyes would light up upon its mere mention. So, when I introduced myself to him as a Pakistani nuclear physicist, he was overjoyed and hugged me warmly saying: 'I was commanding officer at Pokharan in 1974 when the damn thing went off. Right away I told the bug that we should give it to them [the Pakistanis] because war will then become impossible.' I did not have the heart to tell him that Pakistan, inspired by India, was indeed well on its way to having more than a few of its own. Nor, for that matter, that his (Sunderji's) dangerous initiative, 'Operation Brasstacks', had nearly brought the two countries to blows in 1987. For all his heartiness and bonhomie, this man's irresponsible and dangerous antics could have led to the deaths of thousands.

Sunderji's infectious nuclear enthusiasm had already made its way across the border. In March 1990, long before the nuclear tests had been carried out, Pakistan's General K.M. Arif wrote in *The Globe*: Let India and Pakistan both become nuclear weapon states openly and without reservations. They are both mature nations which need no counselling on their international responsibilities and conduct.

Top Pakistani generals, whose mannerisms scarcely differ from that of Indians, are fairly nonchalant about nuclear weapons. They seem to view these bombs as just another kind of bomb, albeit an oversized one. They had no appreciation of what would happen to the country after a nuclear war, apart from a rather dim understanding that many people would die.

I have many tales to tell.

In late 1989, a group of seven senior military officers, then studying operational matters at the National Defense College, came to meet me at the physics department of Quaid-e-Azam University. Their term project was to write a paper on nuclear strategy and posture in the Pak–India context. Although Pakistan did not officially acknowledge possessing such weapons then, the process of inducting them into the forces had already begun. It was also a time when there was almost zero understanding of nuclear matters in the military and, quite sensibly, they were keen to learn technical details from every available source.

Since this group was larger than could fit into my little office, I led them to the physics department conference room (still called the ‘tea room’ by everybody because that’s where we have our 10:30 am tea everyday). We spent the next two hours there, discussing everything: from blast radii and firestorms to electronic locks and PALS (Permissive Action Links). The officers took copious notes and appeared satisfied. As they prepared to leave I asked what circumstances, in their opinion, would warrant the use of nuclear weapons by Pakistan. After some reflection one officer spoke up: ‘professor’, he assured me, ‘they shall be used only defensively if at all, and only if the Pakistan Army faces defeat. *We cannot allow ourselves to be dis-honoured.*’ Around the table, heads nodded in agreement. Significantly, the calculus of destruction—that cities and populations would be obliterated on both sides—was not what mattered. Instead it was *ghairat*—the protection of honour—that was primary. Preserving a tribal value, probably acquired around Neolithic times, was considered more important than preserving life.

The same question put to Indian military officers would probably elicit the same answer. Historically, honour has driven armies to fight battles. Even as the officer spoke, my thoughts wandered to the charge of the Light Brigade. During the Crimean War of 1854, wave after wave of honour-charged British soldiers rode their horses into the mouths of Russian guns which, of course, promptly mowed them down. Tennyson later immortalized the slain men in his

famous poem: *All the world wonder'd. Honour the charge they made! Honour the Light Brigade.*

In the same year that I encountered General Sunderji, I also met with General Shamim Alam Khan. He was then Chairman, Joint Chiefs of Staff. Frankly, it's a little scary to receive a call from the GHQ in Rawalpindi. Our generals usually don't deign to talk to professors, especially dissident ones. But here was a staff car, with a smart uniformed officer, that had been dispatched to fetch me from the university. I had to wait for an hour outside Gen. Alam's office. Dr A.Q. Khan, who walked past me (he did not know me at the time) had suddenly dropped in to meet him.

Once Dr Khan left, the general had many questions for me. He told me that the army was just learning to operationally integrate its newly acquired weapons into the command structure, and so wanted to know all about Permissive Action Links; command and control issues; possibilities of accidental nuclear war, etc. Although he was certainly aware of my opposition to the bomb, he was still sufficiently curious.

General Alam was a tough, short man who passionately hated India. He regaled me with various episodes. Once he had excused himself in 1985 from an order received from President General Zia-ul-Haq. Zia was about to embark for Delhi on his famous cricket diplomacy stint and had ordered Alam to accompany him there. Alam asked to be excused saying: 'Sir, if I ever enter Delhi it shall be only if I am sitting behind the turret of my tank.' He then told me how, borrowing a small propeller-driven army reconnaissance plane from his Army Aviation Unit, he had piloted it into Indian territory and flew around for a full half an hour before returning to base. The Indians duly protested; Pakistan duly denied. His purpose for this stint was to spite Zia for his peace initiative.

After Gen. Alam had quizzed me on technical matters for over two hours, towards the end I said something to the effect that nuclear war should never even be contemplated because it would wipe out Pakistan. Alam was visibly irritated: 'professor, what you are claiming is nonsense.' He then asked me to calculate roughly

how many would die if one hundred Indian bombs were dropped on Pakistan. My rough estimation satisfied him: Pakistan would lose 13 per cent of its population of 130 million (as it was then; it's 200 million now). Gen. Alam was triumphant—this was a tolerable injury, and hence not sufficient reason to hold back from a nuclear war. In time Pakistan would recover!

General Alam's thinking was not very different from that of the late K.S. Subrahmanyam, India's most influential Indian defense analyst in the 1980s and 1990s. In one of his articles, Subrahmanyam wrote:

Even the failure of deterrence will cause vast, but still finite damage, considering the kind of arsenal the two sides are likely to have for a long time to come, with the advantage being in favour of India if India were to exercise its option (to arm with nuclear weapons). It will not mean nuclear winter, rapid escalation involving the use of hundreds of warheads and loss of control over the war. It will be analogous to the situation between the superpowers in the early fifties. That situation will still be preferable to one of India remaining non-nuclear, facing the threat of humiliation, defeat and disintegration.⁹

In the early days of Indian and Pakistani nuclear development, minimal deterrence or 'just enough' had been the mantra of the times. South Asian nuclear proponents were wont to take personal insult upon mention of an arms race, which they debunked as fear mongering. Hawkish Indian defense strategists, following Subrahmanyam, vehemently asserted that arms racing is a Cold War concept invented by the western powers and totally alien to subcontinental thinking. Their Pakistani counterparts agreed. In the late 1980s and early 1990s, the nuclear philosophy of Mutually Assured Destruction (MAD) and of steady escalation were believed to be products of twisted western minds. South Asians were supposedly wiser and would limit destructive powers only to 'what was needed'.

Subrahmanyam and I had first clashed on the subject of India's nuclear intentions at a meeting held at the University of Chicago in

1992, held to commemorate the 50th anniversary of Enrico Fermi's nuclear reactor. We then crossed swords off and on at various meetings over the years. The last time, just before he died of cancer, I was in Delhi at a meeting held in 2010 at IDSA (Institute of Defense and Strategic Analysis) of which he had been director. I reminded him of his earlier belief that Pakistan could not develop nuclear weapons, and then argued that India's decision to test had shorn it of its earlier massive military advantage over Pakistan. Perhaps because of his illness, his response was weak and unconvincing. But the real reason is that events had proved the great guru of Indian nuclearization to be plain wrong.

Even if many Indians still refuse to see it that way, the fact is that India has been essentially paralyzed after choosing to go nuclear; its ability to respond to Pakistan was enormously reduced. Take for example the events of early 2002, when the build-up of troops had escalated on both sides of the border. The Indian Parliament had been attacked weeks earlier, on 13 December 2001, and a Pakistan-based group, Jaish-e-Muhammad, had taken responsibility before suddenly denying it. India growled threateningly again and again. But faced by the awful prospect of nuclear destruction, it failed to make any moves.

Still, those were tense times. Nuclear threats had started flying in all directions. As Pakistan Air Force fighter aircraft loudly circled Islamabad, in a public debate with me at SDPI (Sustainable Development Policy Institute), General Mirza Aslam Beg, former chief of the Pakistan Army, declared: 'We can make a first strike, and a second strike, or even a third.' The lethality of nuclear war left him unmoved. 'You can die crossing the street,' he observed, 'or you could die in a nuclear war. You've got to die someday anyway.' Of course, there was no war and, thanks to the hectic efforts of U.S. and British officials and diplomats, the crisis was eventually defused.

Times of tension have brought out the steel claws again and again. Mumbai had just been attacked (26 November 2008), and I was on the same television talk show as General Hamid Nawaz (retd.), who had also served as Federal Interior Minister and Defense Secretary

of Pakistan. The general angrily attacked me for suggesting that one of the many Pakistan-based jihad groups could have been involved because, indeed, I said that attacking India is exactly what they had long promised and said they would do. But Gen. Nawaz recommended readying Pakistan's nuclear arsenal, and said that a nuclear first-strike should be among Pakistan's preferred options.

Clearly it didn't take much for this particular general to want to push the button. Hopefully others are very different from him, but then that is just a hope.

DON'T TRUST THE DIPLOMATS EITHER

Pakistan and India are, of course, different countries. When visitors say that they are similar, they risk offending their local hosts. But there is undeniably a critical symmetry between their peoples, politicians, and generals that overpowers their differences. Operations 'Brasstacks' and 'Cold Start' may have had different goals from that of Gibraltar and Kargil, but they competed in recklessness and readiness to needlessly provoke and kill. The symmetry in military minds is also present in the thinking of highly paid Pakistani and Indian diplomats and negotiators. The protagonists can often only be distinguished by their names—and that too not always because some Indian diplomats are Muslim!

Suave and westernized, their job is to don the mask of nuclear respectability. Having watched them at close quarters in arms control workshops and seminars for nearly two decades, I can vouch that they meet with amazing civility (and even a forced cordiality), and seem like men of the world. Fluent in the jargon of confidence-building measures and nuclear risk reduction measures, they have honed their skills to conceal their multi-layered mistrust and inner hostility towards the other side. Tasked to show that their country's nuclear weapons are in responsible hands, they will repeat their myth even if their leaders have screamed nuclear threats just days earlier. They must also perforce claim that their countries do not proliferate weapons; that their government is fully in control of its nuclear arsenal; and that they can handle nuclear weapons just as

well as any western nation. Each side says it is a hapless victim of terrorism. But when the going gets rough; off come the velvet gloves and out comes the iron fist. Most diplomats probably believe their own national fiction. Only the rare exception among them is honest to his inner self, introspects, and takes an independent position—and that too mostly after retirement!

SO WHO TO TRUST?

The message: Pakistanis and Indians should not trust their respective establishments when it comes to nuclear matters. Nor should they look to the United States (or, now, China!). Instead, objective reality, self-protection, and self-observation need to be our guide. It is for my Indian friends to look at the reality on their side of the border; they will see something similar though not identical. As a Pakistani, I am obligated to look upon my side.

Here is what the facts around me say: Pakistan has just about every kind of problem that there is. At the core lies an exploding population without employable skills, and thus a perpetually staggering economy. Day after day, and for year after year, newspaper headlines and the audio-visual media have been consistently broadcasting some new disaster: suicide bombings, brutal assassinations, public lynchings, pogroms, and riots.

Less dramatic but more tragic is that the population is seriously deprived of essential needs. A 2011 Oxfam report says that nearly two-thirds of the Pakistani population spends between 50 to 70 per cent of its income on food.¹⁰ A staggering 36 per cent are undernourished. This places Pakistan among the 21 undernourished nations of the world. In 2011, the London-based Legatum Institute 'Prosperity Index' ranked Pakistan at 107 out of the 110 surveyed: above Ethiopia, Zimbabwe, and the Central African Republic.¹¹ India, in spite of its booming economy and relative internal peace, does only marginally better.

Farrukh Saleem, an astute observer of Pakistan's economic scene, puts it this way:

For the first time in recent memory, net borrowing of the private sector has been negative—Rs81 billion—indicative of a shrinking private sector. For the first time ever every Pakistani man, woman and child is indebted to the tune of Rs61,000 . . . the day Syed Yousuf Raza Gilani was taking oath of office, there were an estimated 47.1 million Pakistanis living in extreme poverty. Over the past three years an average of 25,000 Pakistanis per day—every single day of the past three years—have been driven into extreme poverty. The total now stands at an estimated 72.9 million below the poverty line. . . . For the first time in recent memory Foreign Direct Investment (FDI) has suffered such a drastic fall over such a short period of time—from \$5.4 billion in 2008 to around a billion. Public Sector Enterprises are now losing Rs100 crore a day, every day of the year, and no one is worried. Pepco, just by itself, is losing Rs50 crore a day, every day of the year, and no one is worried. The Pakistan Railways is about to add a colossal \$600 million to our national debt . . .¹²

For Pakistan's political and military establishment, all this bad news is like water off a duck's back. It still glows with enthusiasm about its nuclear weapons and keeps making more. For them, these are Pakistan's greatest assets. General Musharraf called them 'our crown jewels', and commentators refer to the May 1998 tests as 'our finest hour'. But the truth lies elsewhere.

DREAMS OF A NUCLEAR BAYONET

Napoleon, in an enthusiastic moment, is said to have once remarked: 'Bayonets are wonderful! One can do anything with them except sit on them!' Indeed, following the 1998 nuclear tests, Pakistan's military and political leaders saw the bomb as a panacea for solving Pakistan's multiple problems. It became axiomatic that, in addition to providing total security, this would give Pakistan international visibility, help liberate Kashmir, create national pride and elevate the country's technological status.

The mass euphoria following the tests led to the emergence of new nuclear goals. Earlier, Pakistan had only one large reason for wanting the bomb—Indian nuclear weapons had to be countered by Pakistani ones. But a second purpose now emerged: a super-

confident military saw the bomb as a magic talisman. Having nukes-for-nukes became secondary; the bomb could strip India of its military advantage and neutralize its larger conventional land, air and sea forces.

Thereafter, just months later, Pakistani troops and militants, protected by a newly activated nuclear shield, were to cross the Line of Control (LoC) in Kashmir into Kargil.¹³ Earlier, across the length and breadth of Pakistan, militant Islamic groups had organized freely and built up a fearsome strength. They did so, protected by an impregnable nuclear Pakistan that made impossible an Indian strike on militant camps safely ensconced within Pakistan's borders. When the Mumbai attacks eventually followed in 2008, India could do little more than froth and fume. Then, years after the tests, a third purpose was to emerge. No book or scholarly article talks about it much because it operates only at the subjective level. But this reason competes with earlier ones for having bombs. Bluntly put: Pakistan's rulers began to see nuclear weapons as money spinners—they could help generate income for a stumbling economy and act as insurance against things going too far wrong. But how so? Like North Korea, Pakistan feels the world shall not allow a nuclear country to fail—no matter what. Indeed, hard times have befallen the country: electricity and fuel shortages routinely shut down industries and transport for long stretches; imports far exceed exports; inflation lies at the double-digit level; foreign direct investment is negligible because of concerns over physical security; tax reform has failed; corruption remains unchecked; and the country essentially survives on remittances earned by Pakistanis abroad. And yet the feeling is that international financial donors cannot afford to stop pumping funds into Pakistan's dysfunctional economy. In the world's eyes, Pakistan is not some African country like Somalia or Congo. Their collapse would be a local matter; Pakistan's could be a global catastrophe.

Surely it would be the world's darkest nightmare if a collapsing Pakistan was unable to prevent its 100 plus Hiroshima-sized bombs from disappearing into the night. The bailout packages currently

given to Pakistan would be a pittance compared to the cost of dealing with loose weapons. The moral: keep the cash flowing!

Therefore, over time, Pakistan's nuclear bayonet gained more than just deterrence value; it became a dream instrument for its ruling oligarchy. The silent menace of the weapons is enough to make the faint-hearted quail. Napoleon's bayonet was painful to sit upon, but nuclear weapons offer no such discomfort. The world has no option but to support Pakistan and prevent it from a fate like that of Somalia. General Musharraf was an authentic spokesman for the Pakistani establishment when he declared that our 'crown jewels' were to be protected at all costs—even if this meant accepting American demands to dump the Taliban after the 9/11 episode.

POST OSAMA BIN LADEN THERE'S YET ANOTHER REASON

Pakistan's frequently argued position is that it needs to produce still more bombs—and hence more bomb materials—because of India. Its representatives in Geneva have, along with older issues related to verification problems and existing stocks, frequently cite the Deal¹⁴—a wide-ranging accord signed in 2008.

Indeed, the Deal is a strong argument: the U.S. has committed itself to nuclear cooperation with a state that is not a signatory to the Nuclear Non-Proliferation Treaty (NPT)—and one that made nuclear weapons surreptitiously. Moreover, it is currently using its new-found economic gains to expand its military capability, both nuclear and conventional. Reports exist that India, with support extended by the U.S., is inching towards membership of the Nuclear Suppliers Group. This would increase Pakistan's sense of embattlement by yet another notch.¹⁵ Now that the sanctions imposed after the 1998 tests are long gone, India can import advanced nuclear reactor technology as well as natural uranium ore from diverse sources, Australia included. Although imported ore cannot be used for bomb-making, India can divert more of its scarce domestic ore towards military reactors.

But the Deal may actually be a fig leaf. Pakistan's rush for more bombs also comes from its changed relationship with the United States. The killing of Osama bin Laden on 2 May 2011 sharply increased the sense of vulnerability in Islamabad. American invaders had come and gone without even being challenged. The world's most prized fugitive had been discovered ensconced in an army town within walking distance of the famed Pakistan Military Academy in Kakul, and his dead body whisked away.

In spite of what columnist Ayaz Amir called the 'mother of all embarrassments', introspection and remorse were noticeably absent in the corps commanders conference held three days later. Threat and bluster dominated. America would get a befitting response should it once again violate Pakistan's territorial integrity through its 'unilateral military action'. Military chief, General Ashraf Parvez Kayani, said he would demand a 25–40 per cent cut in the number of U.S. Special Operations personnel based in Pakistan; soon thereafter U.S. military trainers were withdrawn from Pakistan.¹⁶ Only a handful trickled back a year later.

The downward spiral became dizzyingly fast after the 2011 NATO attack on two Pakistani military check-posts along the Afghanistan–Pakistan border on Saturday, 26 November 2011. According to reports, two NATO Apache helicopters, an AC-130 gunship and two F-15E Eagle fighter jets entered the Pakistani border area of Salala, killing 24 Pakistani soldiers. The Americans later expressed regret, but refused to apologize. Pakistan cut off NATO land routes to Afghanistan, and refused permission for drones to be launched from Pakistani soil. It took eight months for supplies to resume, and then too only partially, after Secretary Hilary Clinton's rather ragged apology in early July 2012.

In the Pakistani military's mind, the Americans pose a rising threat, one that may become as serious as India's. They are certainly considered more of an adversary than the Pakistani Tehreek-e-Taliban (TTP) jihadists who, although, they have killed thousands of Pakistani troops and civilians, are not reviled with any comparable intensity. Even as the TTP released its gory video-taped executions

of Pakistani soldiers, the Salala incident was freely allowed by the military to inflame public opinion.

Pakistani public views about the United States are easier to poll and document than those of the men in khaki: three quarters of respondents polled over the internet said ‘the U.S. government does not respect Islam and considers itself at war with the Muslim world.’ Only 16 per cent believe that Al Qaeda had anything to do with the 9/11 attacks, and 75 per cent disapproved of the killing of Osama bin Laden.¹⁷

Pakistani animosity rises as it sees America tightly embracing India, and standing in the way of a Pakistan-friendly government in Kabul. Once again ‘strategic defiance’ is gaining ground, albeit not through the regional compact suggested by General Mirza Aslam Beg in the early 1990s. This attitudinal shift has created a strong non-India reason that favours ramping up bomb production—the perceived threat emanating from the U.S. to Pakistan’s nuclear weapons. This perception has been reinforced by the large amount of attention given to the issue in the U.S. mainstream press, and by war-gaming exercises in U.S. military institutes. Thus, redundancy is considered desirable—an American attempt to seize or destroy all warheads would have smaller chances of success if Pakistan had more. And America would have more to fear if there were more nukes left over.

But can Pakistan’s nukes lose their magic? Get stolen, rendered impotent or lose their menacing image? More fundamentally, one must ask how and when they could fail to be the perfect protection they are imagined to be.

THE TIPPING POINT

One can easily imagine that a Pakistan-based cross border attack on India could cause a series of self-elevating crises. The military establishment’s reluctance to clamp down on anti-India jihadi groups, or to punish those who carried out the 26/11 attacks in Mumbai, suggests that this lies well within the realm of possibilities. Although not officially assisted or sanctioned, a second Mumbai

would raise fury in India and call for revenge. What then? How would India respond?

There cannot, of course, be a definite answer. But it is instructive to analyze 'Operation Parakram',¹⁸ and India's response to the attack on the Indian parliament on 13 December 2001. This ten-month-long mobilisation of nearly half-a-million soldiers and deployment of troops along the LoC was launched to punish Pakistan for harbouring the Jaish-e-Mohammad, which, at least initially, had claimed responsibility for the attack.

A seminar held in August 2003 in Delhi brought together senior Indian military leaders and top analysts to reflect on Parakram. To quote the main speaker, Major General Ashok Mehta, the two countries hovered on the brink of war and India's 'coercive diplomacy failed due to the mismatch of India-U.S. diplomacy and India's failure to think through the end game.'¹⁹ The general gave several reasons for not going to war against Pakistan. These included a negative cost-benefit analysis; lack of enthusiasm in the Indian political establishment; complications arising from the Gujarat riots of 2002; and 'a lack of courage'. That Parakram would have America's unflinching support also turned out to be a false assumption. The bottom line: when Parakram fizzled out, Pakistan claimed victory and India was left licking its wounds.

A second important opinion, articulated by the influential former Indian intelligence chief, Lt. Gen. Vikram Sood, was still harsher on India. He expressed regret at not going to war against Pakistan and said that India had 'failed to achieve strategic space as well as strategic autonomy.'²⁰ He went on to say that Musharraf never took India seriously after it lost this golden opportunity to attack a distracted Pakistan that was waging war against the Taliban on the Durand Line. Using the word 'imbroglio' for India's punitive attempt, he pointed out that no political directive had been provided to the service chiefs for execution even as late as August 2002. On the contrary, that month the Chief of Army Staff was asked to draw up a directive to extricate the army.

Now that the finger-pointing, recriminations, and stock-taking are over, one can be fairly sure that India will not permit a second Parakram. Indeed, a new paradigm for dealing with Pakistan was invented and embodied into the Cold Start doctrine.²¹ This calls for quick, salami-slicing thrusts into Pakistan while learning to fight a conventional war under a ‘nuclear over-hang’ (by itself an interesting new phrase, used by General Deepak Kapoor in January 2010).

Revelations by WikiLeaks about Cold Start are worthy of consideration. In a classified cable to Washington in February 2010, Tim Roemer, the U.S. ambassador to India, described Cold Start as ‘not a plan for a comprehensive invasion and occupation of Pakistan’ but ‘for a rapid, time- and distance-limited penetration into Pakistani territory.’²² He wrote that, ‘it is the collective judgment of the U.S. Mission that India would encounter mixed results.’ Warning India against Cold Start, he concluded: ‘Indian leaders no doubt realize that, although, Cold Start is designed to punish Pakistan in a limited manner without triggering a nuclear response, they cannot be sure whether Pakistani leaders will in fact refrain from such a response.’

Roemer is spot on. Implementing Cold Start, which might be triggered by Mumbai-II, may well initiate a nuclear disaster. Indeed, there is no way to predict how such conflicts will end once they start. Recognizing this, Gen. V.K. Singh came closer than any other Indian government official towards denying such an aggressive strategy: ‘There is nothing like Cold Start. But we have a “proactive strategy” which takes steps in a proactive manner so that we can achieve what our doctrines and strategies (demand).’²³ A rational Indian leadership—if one exists at the crisis moment—is unlikely to opt for a Cold Start type of operation. But even if the Indians do not attack, another major Pakistan-based attack upon India would bring disaster to Pakistan. Yes, Pakistani nuclear weapons would be unhurt and unused, but their magic would have evaporated. The reason is clear: an aggrieved India would campaign—with a high chance of success—for ending all international aid for Pakistan, a trade boycott and stiff sanctions. The world’s fear of loose Pakistani

nukes hijacked by Islamist forces would likely lose out against the revulsion of yet another stomach-churning massacre.

An international trade boycott alone would cause Pakistan's economy, which has little fat to spare, to collapse like a pack of cards. The initial bravado, intense at first, would fast evaporate. Foodstuffs, electricity, gas and petrol would disappear. China and Saudi Arabia would send messages of sympathy and some aid, but they would not make up for the difference. With scarcity all around, angry mobs would burn grid stations and petrol pumps, loot shops, and plunder the houses of the rich. Today's barely governable Pakistan would become ungovernable. The government then in power, whether civilian or military, would exist only in name. Religious and regional forces would pounce upon their chances; hellish anarchy would be unleashed. It would be the end of Pakistan as a nation-state.

Napoleon's bayonet ultimately could not save him, and Pakistan's nuclear bayonet has also had its day. It cannot protect Pakistan. Instead, the country needs peace, economic justice, rule of law, tax reform, a social contract, education and a new federation agreement.

OUTLINE OF BOOK

Many of this book's chapters are new and intended to reflect realities as of the present time (2012). Others have been published elsewhere but were included because they have staying power and will be pertinent for years to come. They have been updated and modified to include new facts and developments. Original sources have been duly acknowledged.

India's development of a 'nuclear priesthood', and the tireless efforts of Dr Homi Bhabha to create an appetite for the bomb, is the subject of the first chapter. M.V. Ramana relates in detail how Bhabha consciously worked to overturn the notion of a Gandhian India by enthusing—and forcing—Indian nuclear scientists to work towards building the bomb. Rather than any external threat, the notion that great nations need big bombs was the driver. Decades

later, the rise of Hindu nationalism, or *Hindutva*, led to India's quest for 'international status' through the May 1998 tests.

While there were only a few Indian scientists who opposed the bomb, some of these dissidents had exceptionally strong scientific reputations. Among them were Meghnad Saha, C.V. Raman, and D. Kosambi. In their view, Bhabha's efforts were misdirected and would lead India in the wrong direction. Ramana notes that, 'despite this relatively long history of opposition, anti-nuclear scientists in India have, for the most part, not made much use of their technical expertise. This has both good and bad consequences.' He says that dissident scientists tend to be of disparate backgrounds and are concerned with a huge range of social problems, which necessarily dilutes their impact. Well, maybe! One wonders if they had, or have, an alternative.

Zia Mian, in the second chapter, details how the atomic age came to Pakistan by way of the United States' Atoms for Peace program. His erudite essay recalls those heady days when atomic energy seemed to hold boundless promise. Pakistan's elite jumped upon the idea, receiving the country's first reactor in 1965. Although the U.S. now views Pakistani nuclear weapons with great alarm, this was not so earlier. According to Stephen P. Cohen, who has been an insider with the U.S. establishment for decades, Pakistani military officers were visited by an American nuclear-warfare team in 1957. He says that, 'Present-day Pakistani nuclear planning and doctrine is descended directly from this early exposure to Western nuclear strategizing; it very much resembles American thinking of the mid-1950s with its acceptance of first-use and the tactical use of nuclear weapons against onrushing conventional forces.'²⁴

Mian also gives important details of just how nuclear enthusiasm was created in Pakistan, at a time when the country possessed less than a handful of persons who had at least some understanding of nuclear technology. Although he does not specifically mention Prof. Abdus Salam—who went on to win a Nobel Prize in 1979 for his work in high energy physics—the fact is that Salam had an essential role in convincing policy makers about nuclear energy, and later

nuclear weapons as well. The idea that progress required nuclear development caught on: eventually it created a Pakistan that has nuclear weapons, nuclear power plants, and a nuclear complex that dwarfs all other areas of science and technology.

Pakistan's nuclear trajectory is the subject of the two subsequent chapters. They trace the early development of Pakistan's nuclear weapons; discuss how nuclear philosophy has evolved over time; and go on to discuss the recurrent crises subsequent to their operationalization after the 1998 tests. As a crisis escalates, both countries would walk up a nuclear escalation ladder. What might the rungs of that ladder look like? It is argued that false assumptions, mission creep, and high levels of risk-taking have made deterrence less effective over time. Using publicly available information, the current state of the nuclear arsenal, missiles, and aircraft is presented, together with a discussion of what constrains Pakistan's further nuclear expansion. An intriguing question is addressed: Pakistan has been surprisingly successful in creating a fairly large and diverse intermediate range missile force in a very short time. What made this possible, given its weak industrial and scientific infrastructure?

The third chapter discusses the topic of Kashmir and the bomb. Kashmir has almost always been quoted as a key reason, if not *the* reason, for Pakistan to want the bomb. What has been Pakistan's strategy in this dispute, and what kind of change did Pakistan expect could happen once the bomb came along? This essay argues that while Pakistan botched its chances of securing Kashmir—particularly after Kargil—India has not won either. Today's relative calm along the Line of Control could turn into a blaze of artillery any time. So what could be the long-term solution for Kashmir? An opinion will be found towards the chapter's end.

The essay 'Nationalism and the Bomb' explores whether public enthusiasm for the bomb can be strong enough to create a national identity around it. As a symbol of power, it can be used along with national holidays, anthems, flag carrying airlines, and displays of military might to build a national spirit. But will all this serve as acting positively or negatively towards alleviating Pakistan's multiple

difficulties? Will it heal splits that exist within the country? Pakistanis have been told that if the country had a bomb in 1971, East Pakistan would have never been lost. But this is pure fantasy; the crisis of East Pakistan was fundamentally a political one and had no military solution. The bomb could not have saved Pakistan from breaking up. Certainly, Bangladeshis—who were Pakistanis in 1971 and formed the country's majority—are delighted that Pakistan did not have a bomb at the time! They show little regret at no longer being East Pakistanis. The chapter concludes with steps that would be needed for Pakistan to become a viable nation at peace with itself and the rest of the world.

Religion and the bomb are the focus of the next chapter. When Zulfikar Ali Bhutto introduced the term 'Islamic Bomb' into the nuclear lexicon, he seriously misled everyone. Pakistan had made its bomb to counter India's, not for the glory of Islam. But later, things took an interesting new twist. Pakistan's religio-political parties soon claimed the bomb for Islam, and a means of defending the *ummah* (Islamic Brotherhood).

More significantly, as religion played a greater role in the matters of Muslim states everywhere, the bomb began to acquire a sectarian touch. This may soon acquire even more prominence. Iran is at the threshold of making its own. What then? Certainly, this would be a powerful stimulus pushing the Kingdom of Saudi Arabia to follow and seek the first Sunni bomb.

Although Pakistan is the only Muslim country in the world specifically created in the name of religion, it built its bomb not for Islamic reasons but to counter India's nuclear arsenal. On the other hand, Sunni Saudi Arabia perceives Shi'a Iran as its primary enemy, not Israel. The two theocracies are bitter rivals after the Iranian revolution, and have been vying for influence in the Muslim world. Willy-nilly, Pakistan would then enter into yet another nuclear race, having to decide between two Middle Eastern Muslim countries. It is easy to see which side Sunni Pakistan would choose. Less easy is to guess the kind of assistance it would provide.

The safety and security of Pakistan's nuclear arsenal comes up for scrutiny next. Since 2004, Pakistan military officers, installations, equipment and weapons have been targeted by those it had trained to fight against the Soviet Union and, later, India. Hidden inside the ranks of the Army and ISI (Inter-Services Intelligence) are shadowy groups of various persuasions. It is therefore unsurprising that the hijacking of Pakistan's nuclear weapons, or fissile materials, is considered a serious possibility by much of the world.

The Pakistan Army, that has physical custody of nuclear weapons, and the various secret organizations that participate in their production process, all swear that this is impossible. While one fervently hopes that they are correct, nagging worries remain. The army was indeed a tightly disciplined force in earlier times and such worries could have then been dismissed outright. But its secular culture has dissipated over time, a direct cost of waging covert war against India with the help of religious proxies. This had opened the doors to the barracks of many Islamic organizations, each with its own political agenda. Some—such as the Tablighi Jamaat and Jamaat-i-Islami—operate freely within military ranks. Others, such as the banned Hizb-ut-Tahrir, are underground. They dream of establishing their own version of an Islamic state in Pakistan and have helped kill their own colleagues. Spectacular attacks from extremists, in collusion with inside partners, have forced attention on this issue. One striking example which caused alarm within Pakistan as well as globally, was that of the revenge attack on the Mehran Navy base subsequent to bin Laden's killing. The attack on the Pakistan Air Force base at Kamra in August 2012 reportedly also had support from insiders.

The issue of how nuclear weapons are commanded and controlled is taken up by Zia Mian in the subsequent chapter. At one level, this is a technical matter and involves setting up a military command structure with small response times and the smallest possible signalling error. Mian discusses the extensive, although, not completely foolproof procedures developed by the Americans and Russians over half a century. These embody much thinking and technology and

therefore Pakistan and India have both sought technology, such as Permissive Action Links (PALs), from the other nuclear weapon states. This would reduce the possibility of unauthorised use. But, as the chapter points out, in the fog and friction of war the decision to unleash nuclear destruction ultimately may not be for South Asia's generals or prime ministers to make.

Four subsequent chapters by Zia Mian and his collaborators look at various technical aspects: whether early warning of a nuclear attack is technically possible in the Pakistan–India situation; the implications of introducing tactical (or theatre) nuclear weapons (TNWs) as part of Pakistan's war fighting strategy; the effect of nuclear war in South Asia; and Pakistan's nuclear diplomacy in relation to the fissile material cut-off treaty.

The 'Early Warning' chapter draws from the experience gained during the Cold War. It was extremely challenging, even with satellites stationed overhead, to decide whether a missile attack was imminent. But, on the subcontinent, with missile flight times of 5–10 minutes needed for traversing any two points, the technical challenges are much harder. The authors conclude: 'it appears that early warning satellites in South Asia will serve little useful purpose.' Even if the warning was communicated to decision-makers, there would be almost no time to consult or deliberate after receiving this warning. They note that an early warning system could actually be counter-productive because false alarms, combined with the short decision time involved, could increase the chances of an accidental nuclear war.

Short flight times become still shorter once nuclear weapons are deployed on the battlefield. This has become of high contemporary relevance now that Pakistan plans to deploy *Nasr*, a short-range battlefield missile, in the coming years. Therefore the next chapter considers the scenario where Pakistan deploys tactical nuclear weapons. Indeed, it has already sent signals that, in response to a quick thrust of Indian tanks into Pakistani territory, it may consider using nuclear weapons in response. But, quite apart from asking whether this use would escalate into a full-blown nuclear war, one

can inquire about its efficacy. This is an interesting physics question: tanks are radiation hardened and, therefore, difficult to destroy in large numbers even with a nuclear weapon unless packed together. Using different inter-tank distances, the authors conclude that unless Indian tanks disperse widely—which then reduces their concentration of firepower—Pakistan may be able to destroy a significant proportion of any invading Indian armoured force. However, most of its arsenal would then be exhausted. This, of course, calls for building still more bombs!

The next chapter is on the effects of a nuclear exchange between Pakistan and India. Abstractions can hinder comprehension of reality. Therefore, it is important to have some understanding of what might actually happen. Being explicit is necessary because even generally well-informed people, including political strategists, know surprisingly little about the effects of nuclear weapons. On one end are extreme, apocalyptic views—that such a war would end all life on the subcontinent. The other end sees nuclear weapons as powerful but not catastrophic, and that nuclear war would leave manageable destruction behind.

These extreme views are deeply flawed. Instead, a scientific analysis is needed. Using physics formulas developed in the 1940s, a scientific assessment of casualty estimates is provided by McKinzie et. al. Their figures, clinically presented, do not convey the horrors of a nuclear war—it has to be imagined. They conclude that, ‘The ultimate impact on both societies would extend well beyond the bombed areas in highly unpredictable ways. . . . Nothing would ever be the same again.’

In a more recent study, scientists assess the potential damage and smoke production associated with the detonation of small nuclear weapons in a modern megacity. They find that low yield weapons, roughly Hiroshima-sized, if targeted at city centres, can produce hundred times as many fatalities and hundred times as much smoke from fires per kiloton yield as previously estimated in analyses for full scale nuclear wars using high-yield weapons.²⁵ They also analyze the likely outcome of a regional nuclear exchange involving 100

15-kt explosions, which is roughly what one might expect in an Indo–Pakistan war. They find that such an exchange could produce direct fatalities ‘comparable to all of those worldwide in World War II, or to those once estimated for a “counterforce” nuclear war between the superpowers. Megacities exposed to atmospheric fallout of long-lived radionuclides would likely be abandoned indefinitely.’ Nuclear explosions have global effects because the explosions throw up major concentrations of soot into the stratosphere. These could remain up there long enough to cause unprecedented worldwide climate cooling, with major disruptive effects on global agriculture. While blast effects are relatively easily estimated, it is harder to calculate the impact of fires following an Indo–Pak nuclear war. That collateral damage may be capable of killing substantial parts of the Earth’s population by injecting large quantities of soot into the upper atmosphere. Indeed, global dust storms on Mars and Titan are being studied with this in mind.

More bombs require more fissile materials—highly enriched uranium and weapons-grade plutonium. It appears that Pakistan has dug its heels in and will do all it can to prevent a global agreement for cutting off fissile material production from coming into effect. Its sustained diplomatic efforts to this end are taken up by Mian and Nayyar in their detailed article. They state what is obvious: Pakistan is blocking talks on an FMCT so that it may build up its fissile material stockpile. It wishes to highlight to the international community its concerns about a fissile material gap with India and the consequences of India’s current military build-up, especially India’s search for missile defenses, and the consequences of the U.S.–Indian nuclear deal. Faced with Pakistan’s road-block, other states are exploring possible ways outside the framework of the Conference on Disarmament.

An uncertain situation leads to a cloudy crystal ball. Still, as in the next chapter, an attempt is made to anticipate probable futures of nuclear South Asia. This is increasingly wrapped up in great power politics. As U.S. and India move closer in their strategic partnership, a natural response will be for Pakistan to move towards

China and further away from the U.S. Beijing is considered an ‘all-weather’ friend in Islamabad, while Washington is considered a fickle ally—if at all an ally now. But China has also shown no sign that it is willing to shoulder the financial burden of propping up Pakistan that America has so far been willing to bear. Nor does it want too close a relationship—Pakistan’s usefulness is limited to South Asia, whereas China has global aspirations. One can expect enhanced military and nuclear assistance, but Chinese caution will kick in if it sees the Pakistani state weakening and jihadism gaining strength.

The last chapter on nuclear weapons on the subcontinent takes up the issue of global zero. This is an initiative by a Washington-based group for the total elimination of nuclear weapons and, doubtlessly, an utterly laudable goal. Yet, it encounters deep suspicions. Given massive U.S. supremacy in conventional weapons, is global zero a means by which countries would be deprived of an equalizer? And, given that its proponents include former stalwarts of the American imperium, such as Henry Kissinger, does this announce a renewed desire for empire rather than a more equal world? In the South Asian context, Pakistan would be loath to give up its equalizer against India. Surely it is important to deal with these difficult issues upfront rather than just sweep them under the rug.

The book concludes with two chapters on nuclear electricity generation: one each for Pakistan and India. Although its focus is the bomb, to include the topic of power generation in the book is entirely appropriate. First, both countries built their weapon-making capacity around the civilian nuclear infrastructure. Second, the impetus for increasing the size of the two nuclear arsenals comes, to a large extent, from the two huge national nuclear establishments. Their large budgets were secured by the promise of delivering energy. But how real are these promises? Is nuclear energy cheap, reliable, and safe? While these questions can be asked anywhere in the world, in the subcontinent’s context there are new elements involved that merit a closer look.

CONCLUSION

It is unlikely that this will be a popular book. Books published from Pakistan on the subject generally extol the virtues of the bomb while others, at best, feign to be analytical and neutral. Some are officially sponsored, whether secretly or openly, and others reflect the personal enthusiasm of their authors. They dwell upon the supposedly heroic efforts needed to create the bomb, its role as a stabilizer and strategic equalizer, and the absolute safety it supposedly brings. They also assume that the sleeping nuclear monster shall never wake up, which is a matter of faith and not fact. The inevitable conclusion is that the other side should disarm first. But since nobody believes this will happen, both sides continue to indefinitely possess, and expand their nuclear capabilities.

The perspective here is frankly different. The authors believe in a moral universe, where human life is to be valued and its destruction en masse to be abhorred. They do not, therefore, use the language of strategic double-speak which rarely adds nuance or encourages deeper discussions. Rather, pseudo-academic discourses often serve as a pretext for justifying nuclear weapons, and for increasing their numbers and potency. Depressingly often one sees scholars acting like policemen and soldiers in the service of their respective states instead of providing objective and analytical accounts. Nevertheless, while taking a position against nuclear weapons, it is not our intent to needlessly moralize. Facts are stated exactly as they happen to be. This is a responsibility that we owe both to our profession as scientists, and to our own selves as well.

To conclude, the intent of the book is to provide readers in Pakistan and India with a counter narrative that, hopefully, is well considered and well argued. If it has succeeded in raising questions in the reader's mind and increases self-scrutiny, then it shall have served its purpose.

REFERENCES

1. Notes of the Interim Committee, 31 May 1945, in Martin Sherwin, *A World Destroyed: Hiroshima and the origins of the Arms Race*, (Vintage Books, 1987), Appendix L, p. 303.
2. *A World Destroyed: Hiroshima and the origins of the Arms Race*, Martin Sherwin, (Vintage Books, 1987), p. xvii.
3. I heard Bethe say these words at a meeting organized by the Union of Concerned Scientists at Cornell University, U.S.A., in June 1997. They provoked outrage among some in the audience, myself included. But he responded to me directly saying that more Japanese lives would have been lost if the fire-bombing of cities had continued.
4. *Israel and the Bomb*, Avner Cohen, Columbia University Press, 1998, p. 11.
5. Cited in e.g., Zia Mian, 'Homi Bhabha Killed a Crow', in Zia Mian and Ashis Nandy, *The Nuclear Debate—Ironies and Immoralities*, (RCSS, 1998), pp. 12–13.
6. Nuclear test our biggest achievement: Advani, *India Today*, <http://indiatoday.intoday.in/story/Nuclear+test+our+biggest+achievement:+Advani/1/40388.html>
7. 'Arms Race of India, Pakistan Nothing New', *Los Angeles Times*, 14 May 1998.
8. 'A Science Odyssey: Pakistan's Nuclear Emergence', speech delivered by Dr Samar Mubarakmand at the Khwarizmic Science Society, Lahore, 30 November 1998.
9. *Critical Mass*, by William E. Burrows and Robert Windrem, 1994.
10. 'Undernourishment on the rise in Pakistan again: Oxfam', *The Express Tribune*, 4 August 2011.
11. <http://www.prosperity.com/rankings.aspx>
12. 'Economic meltdown 2012–2013', Farrukh Saleem, *The News* (Islamabad), 20 November 2011.
13. A nuanced history of the Kargil conflict, including discussions of the nuclear dimension, may be found in *Asymmetric Warfare in South Asia—The Causes and Consequences of the Kargil Conflict*, edited by Peter R. Lavoy, Cambridge University Press, 2009.
14. 'The U.S.–Indian Deal and Its Impact', *Arms Control Today*, July/August 2010.
15. 'U.S. works for India's membership in Nuclear Suppliers Group', *Times of India*, 22 June 2011.
16. Pakistan expels 90 U.S. military trainers, *Army Times*, 8 June 2011.
17. YouGov Siraj Survey Results, Pakistan Poll, May 2011, http://cdn.yougov.com/today_uk_import/yg-archives-pakistan-poll_0.pdf
18. Gen. Padmanabhan mulls over lessons of Operation Parakram', Praveen Swami, *The Hindu*, 6 February 2004.
19. 'Coercive Diplomacy: Operation Parakram—an Evaluation', Institute of Peace and Conflict, New Delhi, 30 August 2003.

20. Ibid.
21. India's Controversial New War Doctrine, Harsh V Pant, ISN Security Watch, 25 Jan. 2010.
22. 'India "unlikely" to deploy Cold Start against Pakistan', *Dawn*, 3 December 2010.
23. 'Revisiting Cold Start—Weighing Strategic Shifts in South Asia', CSIS, 12 February 2012.
24. *The Idea of Pakistan*, Stephen P. Cohen, Brookings Institute Press, 2004, p. 103.
25. 'Atmospheric effects and societal consequences of regional scale nuclear conflicts and acts of individual nuclear terrorism', O.B. Toon, R.P. Turco, A. Robock, C. Bardeen, L. Oman, and G. L. Stenchikov, *Atmospheric Chemistry and Physics*, 7, 1973–2002, 2007.