

Tel Aviv University

Deterrence and the Handicap Principle

How nuclear tests have evolved
into effective costly signals

Or Rabinowitz

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הרתעה ועקרון ההכבדה – כיצד הפכו ניסויים גרעיניים למסר יקר אך יעיל אור רבינוביץ'

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Yuval Ne'eman Tel Aviv Workshop for Science, Technology and Security

The workshop was launched in 2002 by Professor Isaac Ben-Israel in conjunction with the Harold Hartog School of Policy and Government and the Security Studies Program with the intention of exploring the link among security policy, technology and science. For this reason the workshop holds an annual series of conferences and conducts research. The workshop covers various topics such as international relations and strategy, missiles and guided weapons, robotics, space policy, cyberspace, nuclear energy, homeland security, the interplay between society and security, force build up policy and government decision-making processes.

סדנת תל אביב למדע טכנולוגיה וביטחון ע"ש יובל נאמן

הסדנה הוקמה בשנת 2002 ע"י פרופסור יצחק בן ישראל, בשיתוף עם בית הספר לממשל ולמדיניות ע"ש הרולד הרטוך והתוכנית ללימודי ביטחון, במטרה לעסוק בממשק שבין המדע והטכנולוגיה לביטחון. לשם כך, הסדנה מקיימת סדרה שנתית של כנסים לצד פעילות מחקרית. בין הנושאים בהם עוסקת הסדנה: יחסים בינלאומיים ואסטרטגיה, טילים ונשק מונחה, מדיניות חלל, רובוטים, המרחב המקוון, אנרגיה גרעינית, ביטחון פנים, יחסי הגומלין בין חברה וביטחון, מדיניות בניין הכוח, תהליכי קבלת החלטות ועוד.

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This paper is dedicated to the loving memory of my brother,
Corp. Oded Rabinowitz, whose persistent inquisitiveness, never-ending
curiosity and abiding passion for American war movies became an everlasting
source of inspiration for me.

Gratitude

This work is based on the thesis submitted as a part of an M.A. degree in Security Studies at the Gordon Faculty of Social Sciences, Tel-Aviv University, completed in March 2008 under the supervision of Professors Joseph Agassi and Isaac Ben-Israel.

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Or Rabinowitz,

London

Introductory Remarks

This working paper is based on a dissertation presented by Ms. Or Rabinowitz as part of her M.A. degree in the Tel-Aviv University Security Studies Program. The research focuses on nuclear tests and how they are utilized in the international system. By applying the handicap principle, a concept adapted from the field of evolutionary biology, and the correlated costly signals theory, the research offers a new analytical framework through which it explains what motivates countries to break the international norms against nuclear testing.

This new framework aptly explains why nuclear capable actors, which experience a credibility deficit in their deterrence posture, are motivated to break the international legal and political norms against nuclear testing, as in the cases of India, Pakistan and North Korea. The costs incurred in the short term are translated into long term security benefits, embodied in improved and more credible deterrence, since they are successfully used as costly signals.

The significance of this research is in the fact that nuclear tests present a threat to global international security and have the potential to further destabilize ongoing regional conflicts. Shedding light on what motivates countries to carry out nuclear tests may improve our ability to prevent and curtail them in the future, by understanding the processes behind them. For a state like Israel, which prioritizes the prevention of the spread of nuclear weapons to neighbouring states like Iran, research into the dynamics of nuclear behaviour is both relevant and beneficial.

Professor Isaac Ben-Israel, Director

Yuval Ne'eman Tel-Aviv Workshop for Science, Technology and Security

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1. Introduction

The main purpose of this paper is to offer a new perspective on why nuclear capable states choose to carry out nuclear tests despite the perceived international political costs, sanctions and penalties they incur. Initially, the costs the testing states incur portray the decision to test as potentially inefficient and rationally lacking. By viewing the test as a form of communication aimed at credibility boosting, in effect a "costly signal", the decision to test becomes a logical, cost-efficient method of increasing the state's credibility, and stressing its determination in general and especially within a deterrence equation.

This is exemplified in the cases of India, Pakistan and North Korea, the only countries to test after the adoption of the Comprehensive Test Ban Treaty [CTBT] by the UN General Assembly in 1996. All three countries are not Permanent Members of the UN Security Council [P-5] and are nuclear capable states. These three states decided to publicly defy the international norms against nuclear testing, in spite of the anticipated barrage of harsh reactions, criticism and global sanctions orchestrated by the United States and its allies. All three expected these measures against them for the most part, and nonetheless decided to test.

The main conclusion of this research is that nuclear tests since 1996 have become an effective diplomatic, costly signal, capable of boosting a country's deterrence by increasing its credibility. In addition to improving a country's immediate deterrence posture in the regional context, nuclear tests are used to send a signal to Washington, which spearheads the international Non-Proliferation Treaty [NPT] regime and is the major relevant mediator in any nuclear dialogue. They are also used to validate nuclear designs and serve internal political agendas; however their international aspect is paramount.

2. Nuclear testing: induction, development, legal status and detection

At the start of the Cold War, nuclear tests were considered prestigious and legitimate, a popular tool to advance a country's status and influence in the international arena and demonstrate nuclear capability. This popular trend reached a peak during the 1960s, with the U.S. alone carrying out 433 tests

between 1960 and 1969.¹ Gradually, with the acceptance of the Partial Test Ban Treaty (PTBT)² in 1963 and the Non-Proliferation Treaty (NPT)³ in 1968, the normative de-legitimization of nuclear weapons was expanded to cover atmospheric nuclear tests. This trend intensified in 1996, when the UN General Assembly adopted the CTBT,⁴ and by the calls made by the international community for its ratification.⁵

Relevant questions for the purposes of this paper are: Are nuclear tests essentially necessary in the development of a nuclear arsenal, and to what degree? Can a state induct nuclear weapons without testing them, and can a state create a credible nuclear deterrence without testing? If nuclear tests are not obligatory and absolutely necessary in nature, then the tests and their timing are a politically motivated diplomatic currency used for political reasons, and not an act motivated by purely technological considerations.

While the P-5 states historically relied on demonstrated nuclear abilities to deter and project power, some states chose the path of undemonstrated abilities and ambiguous deterrence. Israel, for example, is widely perceived to have a credible nuclear deterrence without ever publicly admitting the existence of its nuclear arsenal and without ever carrying out an overt nuclear test, with the sole exception of the mysterious 1979 explosion in the Indian Ocean.^{6,7,8} Pakistan had nuclear weapons technology since the early 1980s, and successfully managed to deter India from striking its nuclear facilities during that decade, and refrained from carrying out tests until 1998.^{9,10}

¹ Jonathan Medalia, "Nuclear Weapons: Comprehensive Test Ban Treaty," in *CRS Report For Congress* (CRS issue brief for Congress, 2006), 7.

² Lawrence Freedman, *Kennedy's Wars: Berlin, Cuba, Laos, and Vietnam* (New York: Oxford University Press, 2000), 274-75.

³ Steve Fetter, *Toward a Comprehensive Test Ban*, (Cambridge, MA: Ballinger Publishing Company 1988), 11.

⁴ George Bunn, "The Status of Norms against Nuclear Testing," *The Non-proliferation Review* 6, no. 2 (1999).

⁵ Hilary Synnott, *The Causes and Consequences of South Asia's Nuclear Tests*, vol. 332, Adelphi Papers (Oxford: Oxford University Press for the International Institute for Strategic Studies, 1999), 27-30.

⁶ Joseph Cirincione, Jon B. Wolfsthal and Miriam Rajkumar, *Deadly Arsenals: Nuclear, Biological, and Chemical Threats* (Washington: Carnegie Endowment for International Peace, 2005), 259-76.

⁷ Jeffrey T. Richelson, *Spying on the Bomb: American Nuclear Intelligence from Nazi Germany to Iran and North Korea* (New York: W.W. Norton, 2006), 283-316.

⁸ Yosi Melman, "Did Israel Play a Role in the 1979 South Africa Nuclear Test?" *Ha'aretz*, August 2, 2009.

⁹ Adrian Levy and Catherine Scott-Clark, *Deception; Pakistan, the United States and the*

Thus, though nuclear tests are often used to establish nuclear deterrence, they are not the only path available towards reaching that goal. Furthermore, it is generally accepted that first generation nuclear devices can be designed and built with a high level of confidence in their reliability without testing.¹¹ According to experts, any nation that is capable of obtaining weapons-grade fissile material is most probably capable of building a nuclear bomb without carrying out nuclear testing.¹² Naturally, the quality of the untested designs also depends on the level of scientific expertise and the use of alternatives to tests, and therefore a less technologically developed state is more likely to test due to a lower credible scientific level.

Another relevant matter is the issue of detecting nuclear tests. If nuclear tests can be carried out undetected, American and international policies against testing would be all but irrelevant, and testers could potentially carry out clandestine tests, without incurring the costs of breaking international norms.

In the beginning of the Cold War, the issue of detection was still undeveloped and complicated, and often the cause of conflicts related to verification issues.¹³ Since the 1960s, technological advances like satellite imaging and seismic monitoring have changed the situation dramatically, and made detection of nuclear tests around the world possible with a high degree of accuracy.¹⁴ The American long-range detection system, using its own resources and data from international sources, was developed enough to detect and accurately assess the tests conducted by India, Pakistan and North Korea in 1998 and 2006¹⁵ and again in 2009.¹⁶

Global Nuclear Weapons Conspiracy, (London: Atlantic Books, 2007).

¹⁰ Dennis Kux, *The United States and Pakistan, 1947-2000: Disenchanted Allies*, (Baltimore: Johns Hopkins University Press 2001).

¹¹ Steve Fetter, "Stockpile Confidence under a Nuclear Test Ban," *International Security* 12, no. 3 (1987): 132-67.

¹² *Ibid.*

¹³ Benjamin P. Greene, *Eisenhower, Science Advice, and the Nuclear Test-Ban Debate, 1945-1963* Stanford Nuclear Age Series (Stanford, California: Stanford University Press, 2007), 4.

¹⁴ David Hafemeister, *Effective CTBT Verification: The Evidence Accumulates*, ed. Trevor Findlay, Verification Yearbook 2004 (London: Vertic, 2004), 40-41.

¹⁵ Richelson, *Spying on the Bomb: American Nuclear Intelligence from Nazi Germany to Iran and North Korea*.

¹⁶ BBC World News, "North Korea Conducts Nuclear Test," <http://news.bbc.co.uk/1/hi/8066615.stm>.

The first efforts to detect nuclear activity took place during World War II, when the U.S. was trying to collect intelligence on German nuclear efforts.¹⁷ At the start of the Cold War these efforts were redirected towards the U.S.S.R., and the American detection system was successful in detecting radioactive evidence of the first Soviet nuclear test in August 1949.¹⁸ Over the next decade, American detection capabilities continued to develop; the famous U-2 reconnaissance flights over soviet territory were initiated and halted, and on August 18-19, 1960, the U.S. launched its first photographic reconnaissance satellite, Corona.¹⁹ During that decade, the U.S. developed and launched newer and more advanced satellites. Among these was the Vela model, which was launched in April 1967, and was equipped with detectors that could measure light intensity, x-rays, gamma rays, radioactivity, ultraviolet radiation and electromagnetic pulses.²⁰

That decade also saw two major normative shifts with regards to nuclear testing. In July 1963, a PTBT draft which banned all nuclear tests other than underground tests was agreed on by Washington and Moscow.²¹ The second normative transformation took place in 1968 with the introduction of the NPT,²² which India, Pakistan and Israel famously refused to sign. In 1974, a Threshold Test Ban Treaty (TTBT) was signed by Washington and Moscow, limiting underground nuclear tests to 150 kilotons – the equivalent of ten Hiroshima bombs.²³ In 1976, the two powers signed a treaty which extended the 150 kilotons limit to Peaceful Nuclear Explosions (PNE).²⁴ Both treaties were ratified during the Reagan administration. On September 22, 1979, the American Vela satellite detected a double flash in the Indian Ocean which had the features of a nuclear test of a small yield of about 3 kilotons; the nature of this suspected flash is still disputed.^{25,26,27}

¹⁷ Richelson, *Spying on the Bomb...* 49-61.

¹⁸ Michael S. Goodman, *Spying on the Nuclear Bear: Anglo-American Intelligence and the Soviet Bomb*, (Stanford, CA: Stanford University Press, 2007), 89.

¹⁹ Richelson, *Spying on the Bomb...*, 129.

²⁰ *Ibid.*, 193.

²¹ Freedman, *Kennedy's Wars: Berlin, Cuba ...*, 274-75.

²² Fetter, *Toward a Comprehensive Test Ban*, 11.

²³ *Ibid.*, 13-15.

²⁴ *Ibid.*

²⁵ Cirincione, Wolfsthal, and Rajkumar, *Deadly Arsenals*, 259-76

²⁶ Richelson, *Spying on the Bomb...*, 283-316.

²⁷ Yosi Melman, "Did Israel Play a Role...".

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The end of the Cold War marked the beginning of an era of advancement in nuclear arms control and nuclear non-proliferation.²⁸ This trend of perceived nuclear marginalisation saw the U.S. and the U.S.S.R. (later Russia) reshape their strategic doctrines and military practices to accommodate a relationship based on cooperation.²⁹ During this period, nuclear forces were withdrawn from Europe, and treaties regarding the reduction of nuclear stockpiles were brokered.³⁰ Many new members joined the NPT, the most important being China in March 1992 and France in August 1992.³¹ In 1991, South Africa announced that it was terminating its nuclear weapons programme and acceding to the NPT, and thus became the first and only nuclear state so far to complete a full roll-back.³² From 1991 to 1996 all P-5 states declared a unilateral moratorium on testing.³³

In February 1994, negotiations on a draft CTBT began in the UN Conference on Disarmament (CD), but the draft that was eventually negotiated was blocked by India in a vote in the CD on August 14, 1996.³⁴ However, a month later the draft was voted on in the General Assembly. India, Libya and Bhutan were the only three members who opposed it; the test ban treaty was backed by 158 of the 185 UN member states, with five abstentions.³⁵ President Clinton signed the treaty soon after, stressing his administration's commitment to advance non-proliferation issues.³⁶ The Republican-controlled Senate dealt the treaty a severe blow when it rejected its ratification on October 13, 1999, in a vote of 48 for and 51 against – a far cry from the required 66 votes, bringing the encouraging trend to a screeching halt.³⁷

The Senate's vote had a negative impact on the prospect of the CTBT entering into force; article XIV of the treaty states that it will enter into force 180 days

²⁸ William Walker, "Nuclear Order and Disorder," *International Affairs*, (Royal Institute of International Affairs 1944) 76, no. 4 (2000): 710-11.

²⁹ Ibid.

³⁰ Ibid.

³¹ International Atomic Energy Agency, "Nuclear Non-Proliferation: Chronology of Key Events," http://www.iaea.org/Publications/Factsheets/English/npt_chrono.html.

³² Cirincione, Wolfsthal, and Rajkumar, *Deadly Arsenals*, 407-09.

³³ Daryll Kimball, "The Status of the Comprehensive Test Ban Treaty: Signatories and Ratifiers," (Arms Control Association).

³⁴ Stephen Young, "India Scuppers Test Ban Treaty," *The Guardian*, August 15, 1996.

³⁵ Praful Bidawi, "India-Disarmament; CTBT Rejection Setback for Avowed Goal," *Inter Press Service*, September 18, 1996.

³⁶ Allison Mitchell, "Clinton, at U.N., Signs Treaty Banning All Nuclear Testing," *New York Times*, September 25, 1996.

³⁷ David Stout, "Defeat of a Treaty: The Reaction; a Disappointed Clinton Says the Fight Is 'Far from over'," *New York Times*, October 14, 1999.

after the 44 states listed in Annex 2 to the Treaty have all ratified it.³⁸ Since Annex 2 includes the U.S., the Senate's rejection meant that the treaty will not come into force even if all the other 43 states sign and ratify it. Nevertheless, the mere adoption of the draft by the General Assembly transformed and fortified the status of international legal norms against nuclear tests.³⁹ In essence, the adoption of the draft treaty reshaped the costs of nuclear tests in the minds of decision-makers worldwide.⁴⁰

Thus, when India and Pakistan carried out their tests in May 1998, the matter of legality and detection was dramatically different than it had been previously. American nuclear intelligence analysts had access to classified and unclassified data, seismic and other, which enabled them to confirm the tests – and in both cases the data suggested lower yields than claimed by both countries.⁴¹

In addition, there was a shift in the status of the norms against testing, an indication of which appeared in Security Council Resolution 1172, adopted on June 6, 1998. The text of the resolution states that the council “...demands that India and Pakistan refrain from further nuclear tests and in this context calls upon all states not to carry out any nuclear weapon test explosion or any other nuclear explosion in accordance with the provisions of the CTBT”.⁴²

According to George Bunn, this resolution indicates the existence of an international legal and political norm against nuclear testing, one which also obligates states that have not joined the CTBT, like India and Pakistan.⁴³ North Korea's two tests of 2006 and 2009 were similarly both well detected^{44,45,46} (despite the very low yield of the first one), and both were condemned by correlating Security Council Resolutions.⁴⁷

³⁸ "CTBT Full Text," <http://www.ctbto.org/the-treaty/treaty-text/>.

³⁹ Bunn, "The Status of Norms against Nuclear Testing."

⁴⁰ Nina Tannenwald, "Stigmatizing the Bomb: Origins of the Nuclear Taboo," *International Security* 29, no. 4 (2005): 5-20.

⁴¹ Richelson, *Spying on the Bomb*....338-440.

⁴² United Nations Security Council, Resolution 1172 (S/Res/1172)

⁴³ Bunn, "The Status of Norms against Nuclear Testing."

⁴⁴ CTBTO Preparatory Commission, "The CTBT Verification Regime out to Test the Event in the DPRK on October 9, 2006" <http://www.ctbto.org/press-centre/highlights/2007/the-ctbt-verification-regime-put-to-the-test-the-event-in-the-dprk-on-9-october-2006/page-1/>.

⁴⁵ Katherine Shrader, "U.S. Agencies Confirm N. Korea Nuke Test", Associated Press, October 17, 2006, 12:35 AM

GMT

⁴⁶ BBC World News, "North Korea Conducts Nuclear Test."

⁴⁷ United Nations Security Council, Resolutions 1718 (S/Res/1718) and 1874, (S/Res/1874),

3. Costly signalling, the handicap principle and deterrence theory

"Signalling theory" is a field of game theory that explores the nature of signals, both human and non-human, and as such is relevant to different disciplines like biology, economics, international relations, etc. "Costly signalling" is a model of signalling which takes a biological principle called "the handicap principle" and translates it into the mathematical terms of the signalling theory. Costly Signalling tries to explain the pervasive use of signals which are difficult and costly to produce for the signaller in a variety of situations, and essentially attempts to explain why signallers invest in costly and expensive signals instead of investing in simple ones.

One possible explanation of this phenomenon was offered in the early 1970's by biologist Amotz Zahavi, who tried to explain the existence of extravagant and energy consuming displays in the natural world, like the spectacular plumage of peacocks.⁴⁸ According to the concept that Zahavi developed, which he dubbed "the handicap principle", a direct correlation exists between the costs of a signal, meaning the extent of the handicap that it poses to the signaller, and the signal's credibility.⁴⁹ In his 1975 article, Zahavi posited that handicap traits benefit the individual since they testify to its qualities and abilities: "*These handicaps are of use to the selecting sex since they test the quality of the mate. The size of characters selected in this way serve as marks of quality*".⁵⁰

According to Zahavi, the existence of such handicaps are explained by the fact that there is no direct reward for using a costly signal, only a price, and since the signaller exhibits an ability to incur that price, it manages to communicate a message to the receiver regarding its own abilities, qualities, and intentions.⁵¹ The receiver could be a female looking for a mate, a predator scouting for dinner,⁵² or as far as security considerations are involved, a state leader considering invading a neighbouring country. The signal is perceived as reliable and credible exactly because it is costly and does not provide direct

(2009).

⁴⁸ Amotz Zahavi, "Mate Selection – a Selection for a Handicap," *Journal of Theoretical Biology*, 53 (1975): 205-41.

⁴⁹ Ibid.

⁵⁰ Ibid.: 207.

⁵¹ Amotz Zahavi and Avishag Zahavi, *The Handicap Principle: A Missing Piece of Darwin's Puzzle*, (Oxford: Oxford University Press, 1997), xiv.

⁵² Ibid.

reward, and thus there is a correlation between the cost of a signal's production and its credibility.⁵³

Originally, Zahavi's 1975 article was rather vague and failed to explain why costly signals were perceived as credible and reliable by the receivers. It received sceptical reviews in scientific literature and a number of attempts were made to dispute and refute it. The biologist John Maynard Smith designed a simple model which he claimed disproved Zahavi's idea, in which he suggested that the handicap principle is not a principle since it is not general.⁵⁴

More criticism came from the researchers J. Davis and P. O'Donald, who maintained that Zahavi was flatly wrong.⁵⁵ They argued that Zahavi had based his idea on two false assumptions; the first is that the handicap trait is beneficent to the signaller, the second is that handicapped and non-handicapped individuals stand to benefit from the same traits.⁵⁶ In light of the criticism, Zahavi decided to elaborate and expand the principle from the domain of sexual selection to a more general concept, and in 1977 he published an article which maintained that the handicap principle is relevant to all forms of communications, stressing that the credibility of the message directly correlates to its cost.⁵⁷ The researchers Nadav Nur and Oren Hasson were the first to develop quantitative models of the handicap principle, models which were able to express the flexibility of the handicap.⁵⁸ In an article published in 1984, they argued that an optimal development of a handicap would enable the signaller to accurately convey its condition to the signal's receiver.⁵⁹

For several years the handicap principle remained a rather vague theoretical concept. However, this changed in a landmark paper published by Alan Grafen in 1990; this paper placed the handicap principle firmly in the sphere of game

⁵³ Richard Dawkins, *The Selfish Gene*, 2nd ed. (Oxford: Oxford University Press, 1976), 309.

⁵⁴ John Maynard Smith, "Sexual Selection and the Handicap Principle," *Journal of Theoretical Biology* 57 (1976): 239-42.

⁵⁵ J.W.F. Davis and P. O'Donald, "Sexual Selection for a Handicap: A Critical Analysis of Zahavi's Model," *Journal of Theoretical Biology*, 57 (1976): 345-54.

⁵⁶ Ibid.

⁵⁷ Amotz Zahavi, "The Cost of Honesty (Further Remarks on the Handicap Principle)," *Journal of Theoretical Biology*, 67 (1977): 345-54.

⁵⁸ Nadav Nur and Oren Hasson, "Phenotypic Plasticity and the Handicap Principle," *Journal of Theoretical Biology*, 110 (1984): 275-97.

⁵⁹ Ibid.

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theory and translated it into mathematical terms.⁶⁰ Grafen's innovation was to inspect the handicap principle scenario as a communication game within the field of game theory, and ask the question: "Under which conditions would costly signals constitute an Evolutionary Stable Strategy (ESS)" i.e. a strategy which, if adopted by most members of any given population, cannot be outdone by a rival strategy.⁶¹ Grafen managed to mathematically prove the viability of the handicap principle under plausible and convincing conditions.⁶² Consequently, costly signalling theory was born and Grafen concluded that "Zahavi's major claims for the handicap principle are thus vindicated".⁶³

As a result of Grafen's paper, the tides have turned on Zahavi's principle, and his idea was enthusiastically accepted by former critics. Mynard Smith had a change of heart and decided to embrace and develop the concept with a specific scenario he named "the Philip Sidney Game".⁶⁴ According to this model, if there is a conflict of interests between the sender and the receiver, the signals must be costly to be credible, but if there is no conflict, the signals can be cheap.⁶⁵ Ethologist⁶⁶ Richard Dawkins, who was among those who disapproved of the concept when it was first published, also had a change of heart in light of Grafen's model. According to Dawkins, Zahavi's suggestion that evolution would prefer a handicap because it is costly, is significant to all forms of animal communication.⁶⁷

In a later work published in 1997, Amotz and Avishag Zahavi expressed the concept in clearer terms.⁶⁸ According to the Zahavis "...in order to be effective, signals have to be reliable; in order to be reliable, signals have to be costly".⁶⁹ Signals are never random or accidental, and a correlation exists between the message conveyed and the signal itself. Hence, through its flamboyant tail, the peacock can demonstrate strength and agility to potential mates, and through its stotts⁷⁰, the gazelle can demonstrate its athletic abilities to predators.⁷¹

⁶⁰ Alan Grafen, "Biological Signals as Handicaps," *Journal of Theoretical Biology*, 144 (1990): 517-46.

⁶¹ Dawkins, *The Selfish Gene*, 69.

⁶² *Ibid.*, 312.

⁶³ Grafen, "Biological Signals as Handicaps," 517-46.

⁶⁴ John Maynard Smith, "Honest Signalling: The Philip Sidney Game," *Animal Behavior* 42: 1034-35.

⁶⁵ *Ibid.*

⁶⁶ An ethologist is a researcher of animal behaviour.

⁶⁷ Dawkins, *The Selfish Gene*, 309.

⁶⁸ Zahavi and Zahavi, *The Handicap Principle: A Missing Piece of Darwin's Puzzle*.

⁶⁹ *Ibid.*, xiv.

⁷⁰ Stotts are vertical jumps with all four legs.

Notably, one of the main issues that the costly signals theory addresses is how to ensure the credibility of the signal. According to the logic of natural selection, the costly signals must be truthful, at least on average, otherwise the receivers would have adapted to ignoring them over time, rendering them useless.

Obviously, in some short-term situations, a signaller would benefit from sending a dishonest signal, and deceive the receiver. Thus, the following question arises: Why did costly signals remain honest? The answer offered by costly signalling theory is that of a convergence of interests; if sharing the information benefits both sender and receiver, the communication will remain honest in spite of the conflict of interests.⁷² The Zahavis explained that communication is a form of cooperation which requires collaboration. "In order for communication to take place, both the signaller and the receiver must benefit from it" and two conditions are necessary: "The parties must have a common interest, and the signals used must be ones that cannot be faked".⁷³

When applying the reasoning behind the costly signalling theory to the cases of the deterrence posture adopted by nuclear capable states that chose to test, it is apparent that the willingness to incur a price for breaking international norms against testing increased the credibility of their immediate and general deterrence, independently of any possible technological or domestic gains, or possible gains of any other forms of power demonstrations which would not entail breaking norms. As far as nuclear tests are concerned, the adoption of the CTBT by the General Assembly in 1996 has qualified them as a form of costly signalling. The next chapter will analyse how India, Pakistan and North Korea have engaged in costly signalling through nuclear testing, and how all three have profited from demonstrating the willingness to pay the price.

⁷¹ Ibid.

⁷² Ibid., 12..

⁷³ Ibid.

4. The Three States that Performed Nuclear Tests

A. The Indian Tests

In May 1998, India carried out a series of five nuclear tests, 24 years after it detonated its first nuclear device, both at the same test site in the Pokhran desert.⁷⁴ The motives for India's decision to test were mixed; they included security considerations like deterring Pakistan and China, and demonstrating independence of American pressure, in addition to internal political/domestic goals and technological benefits.⁷⁵ Though these three elements contributed jointly to the decision to test, this paper will limit its scope to the examination of the external aspects of the tests.

The Indian nuclear program was conceived in the aftermath of the Second World War by India's first Prime Minister, Jawaharlal Nehru, and the country's leading scientist, Homi Bhabha.⁷⁶ Nehru and Bhabha decided together to establish an Indian atomic energy program,⁷⁷ and in 1956 India became a beneficiary of the American Atoms for Peace plan.⁷⁸ In the late 1960s, India engaged in the NPT discussions but eventually withdrew from them, stating that there should be a just and equitable nuclear order in which the nuclear states should be obligated to disarm if the non-nuclear states were to be asked not to arm as well.⁷⁹

In the early 1970s, Indian decision-makers started to plan a nuclear test under the auspices of a Peaceful Nuclear Explosion (PNE).⁸⁰ P.K. Iyengar, then a leading scientist on the team which prepared the nuclear test said, "We told her [Premier Indira Gandhi] that a PNE was a good excuse.... It would help us to mask our intentions of making a weapon".⁸¹ And indeed, on May 18, 1974, India conducted its first nuclear explosion.⁸² Gandhi herself declared it was a

⁷⁴ George Perkovich, *India's Nuclear Bomb*, (Berkeley: University of California Press, 1999), 1.

⁷⁵ Synnott, *The Causes and Consequences of South Asia's Nuclear Tests*, 22-32.

⁷⁶ Perkovich, *India's Nuclear Bomb*, 21.

⁷⁷ Sumit Ganguly, "India's Pathway to Pokhran II: The Prospects and Sources of New Delhi's Nuclear Weapons Program," *International Security* 23, no. 4 (1999): 150.

⁷⁸ Joseph Cirincione, Jon Wolfsthal, Miriam Rajkumar, *Deadly Arsenal*, 225

⁷⁹ Ganguly, "India's Pathway to Pokhran II: ...", 152.

⁸⁰ Perkovich, *India's Nuclear Bomb*, 171-73.

⁸¹ Bharat Karnad, *Nuclear Weapons and Indian Security; the Realist Foundation of Strategy*, (New Delhi: Macmillan India, 2002), 299.

⁸² Rikhi Jaipal, "The Indian Nuclear Explosion," *International Security* 1, no. 4 (1977): 44.

"Peaceful Nuclear Explosion", and Defense Minister Rajivian Rab went on record saying that the test will wield "no military implications".⁸³

During the following two decades, Indian decision-makers continued India's nuclear development, keeping the nuclear option ambiguous and open, though some governments were more supportive than others.⁸⁴ In 1995, India was faced with the indefinite extension of the NPT and a vastly popular CTBT initiative.⁸⁵ India opposed the CTBT when it was discussed at the UN Conference on Disarmament (CD) and voted against it when the vote was held on August 14, 1996.⁸⁶ As noted, the draft was transferred to a vote in the General Assembly on September 8, 1996 where it was supported by 158 of the 185 UN member states, with five abstentions.⁸⁷

In the run-up to the 1998 elections, the nationalist Indian BJP party sought to use its nuclear policy agenda as a tool to differentiate itself politically from rival parties. The party's agenda was stressed in its official manifesto, which mentioned India's subjugation to other powers, a "tendency to bend under pressure"... and "a loss of national self-confidence and resolve".⁸⁸ With regards to India's nuclear posture, the BJP's manifesto was quite clear: in addition to rejecting the nuclear regime designed by the CTBT and the proposed Fissile Material Cut-off Treaty [FMCT], the BJP also promised to "re-evaluate the country's nuclear policy and exercise the option to induct nuclear weapons".⁸⁹ The BJP went on to win 26% of the votes⁹⁰ and on March 19, 1998, Atal Bihari Vajpayee was sworn in as India's PM.⁹¹

On April 6, 1998, Pakistan tested a Gahuri missile, a mobile medium range missile which flew 800 km., and had a reported range of 1,500 km.⁹² The test surprised India, since for the first time, it gave Pakistan an apparent capacity to target India's largest cities.⁹³ This gave Vajpayee the impetus he needed; he

⁸³ Bernard Weinraub, "India Rules out Atomic Arms," *New York Times*, May 23, 1974.

⁸⁴ Perkovich, *India's Nuclear Bomb*, 190-353.

⁸⁵ *Ibid.*, 361.

⁸⁶ Young, "India Scuppers Test Ban Treaty."

⁸⁷ Bidawi, "India-Disarmament; CTBT Rejection Setback for Avowed Goal."

⁸⁸ The BJP 1998 manifesto, "Protecting India's National Interest," <http://www.bjp.org/>

⁸⁹ *Ibid.*

⁹⁰ Suzanne Goldenberg, "India's Election Results Unleash a Race for Power", *The Guardian*, March 4, 1998, p. 13

⁹¹ John F. Burns, "Man in the News: Atal Bihari Vajpayee Sworn In as India's Leader, Ambiguity in his Wake", *New York Times*, March 20, 1998.

⁹² Levy and Scott-Clark, *Deception*, 267.

⁹³ Perkovich, *India's Nuclear Bomb* 410.

called his top two scientists to an urgent discussion and asked them to prepare to test; the date chosen shortly thereafter was May 11, 1998.⁹⁴

On Monday, May 11, 1998, India conducted three underground nuclear tests.⁹⁵ Afterwards, Vajpayee made the following announcement to the media: "Today, at 15:45 hours, India conducted three underground nuclear tests in the Pokhran range. The tests conducted were with a fission device, a low-yield device, and a thermonuclear device.... I warmly congratulate the scientists and engineers who have carried out the successful test".⁹⁶

Immediately after the May 11 tests, Vajpayee sent a letter to American President Bill Clinton, in which he detailed the motivations for the tests. According to the letter, published in full in the world media, Vajpayee decided to perform the tests in order to strengthen India's deterrence, though he did not use this term specifically.⁹⁷ In his letter, he stipulated that India had decided to test because of a "deteriorating security environment, especially the nuclear environment, faced by India for some years past".⁹⁸ Approximately 48 hours after the first series of tests, while President Clinton and other world leaders were still considering whether and how to implement punitive sanctions against New Delhi, India carried out two more nuclear tests at the same site.⁹⁹

India's nuclear tests¹⁰⁰ outraged the international community and were widely condemned.¹⁰¹ Several multilateral coordinated steps and sanctions against India (and Pakistan) were taken after the tests. The first such reaction was decided upon on May 17-18, 1998, during a meeting of the G-8 forum in Birmingham, England; the G-8 declared that it would oppose multilateral

⁹⁴ Raj Chengappa, *Weapons of Peace: Secret Story of India's Quest to Be a Nuclear Power*, (New Delhi: Harper Collins India, 2000), 50.

⁹⁵ Perkovich, *India's Nuclear Bomb* 1.

⁹⁶ John F. Burns, "India Sets 3 Nuclear Blasts, Defying Worldwide Ban," *New York Times*, May 12, 1998

⁹⁷ Atal Bihari Vajpayee, "Letter to President Bill Clinton," *New York Times*, May 13, 1998.

⁹⁸ *Ibid.*

⁹⁹ Perkovich, *India's Nuclear Bomb*, 415-20.

¹⁰⁰ The Indians claimed that the May 11 tests consisted of a 12 kiloton fission device, a 43 kiloton thermonuclear device and a sub-kiloton device, and that the May 13 tests included two more sub-kiloton devices. These claims are disputed, especially with regards to the thermonuclear device. See: Richelson, *Spying on the Bomb: American Nuclear Intelligence from Nazi Germany to Iran and North Korea*.

¹⁰¹ Synnott, *The Causes and Consequences of South Asia's Nuclear Tests*, 28-30.

lending to India.¹⁰² On June 6, 1998, the UN Security Council adopted resolution 1172 which demanded that India and Pakistan refrain from further nuclear tests, and set out guidelines intended to restore stability and encourage the states to join the NPT regime.¹⁰³ Furthermore, on June 11th and 12th 1998, a new task force of senior officials from a wide range of countries was established, to coordinate the international community's efforts on the matter.¹⁰⁴

Unilateral punitive measures were also taken around the world and some 14 countries adopted measures against India and Pakistan to stress their concern. The most comprehensive sanctions were declared by Washington, which on June 16, 1998 instituted a range of sanctions against both countries stemming from the Glenn Amendment to the Arms Control Act.¹⁰⁵ These sanctions included halting development aid, suspending the sales of military equipment, halting new commitments of credit and credit guarantees, seeking the support of other countries for postponing loans in international institutions, prohibiting American banks from extending loans and credit, and toughening the control on exports of dual-use equipment.¹⁰⁶

Toward the end of the Clinton administration, the sanctions against India were eased, despite the fact that the declared benchmarks had not been met.¹⁰⁷ This thawing process was demonstrated in March 2000, when President Clinton arrived in India for an official state visit, and continued with the Bush administration.¹⁰⁸ When the Bush administration came to power in the beginning of 2001, the newly forged friendship between India and the US grew even stronger.¹⁰⁹

In the months before the 9/11 attacks, Washington crowned India as its chief strategic ally in Asia, and a key asset in the American attempts to balance China and Russia.¹¹⁰ After the attacks, Washington's eagerness to strengthen

¹⁰² Kux, *Disenchanted Allies*, 345.

¹⁰³ UN Security Council, Resolution 1172 (S/Res/1172).

¹⁰⁴ Synnott, *The Causes and Consequences of South Asia's Nuclear Tests*, 28-30.

¹⁰⁵ *Ibid.*

¹⁰⁶ *Ibid.*

¹⁰⁷ Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenal*, 224.

¹⁰⁸ *Ibid.*

¹⁰⁹ Edward Alden and Edward Luce, "A New Friend in Asia", *Financial Times*, August 21, 2001

¹¹⁰ Cirincione, Wolfsthal, and Rajkumar, *Deadly Arsenal*, 224.

its strategic position in Asia grew, and the U.S. lifted all remaining sanctions on both India and Pakistan.¹¹¹

In December 2001, high level meetings produced a joint American-Indian statement to counter nuclear proliferation, in addition to terrorism, narcotics and piracy.¹¹² This strategic partnership grew closer in 2004 with the implementation of the Next Step in Strategic Partnership (NSSP) plan. The agreement paved the way to the expansion of bilateral cooperation in three specific areas: civilian nuclear activities, civilian space programs, and high-technology trade. In addition, the two countries agreed to expand dialogue on missile defence.¹¹³

This paved the way to the acceptance of the United States-India Peaceful Atomic Cooperation Act in December 2006, legislation which cleared the way for India to buy U.S. nuclear reactors and fuel for civilian use.¹¹⁴ In July 2007, Washington and New Delhi concluded negotiations on the bilateral nuclear agreement known as the "123 Agreement" which facilitates civil nuclear trade between the two countries; it was accepted by the Nuclear Suppliers Group (NSG) and later approved by the Senate.¹¹⁵

A clear testament to India's strategic importance is the wording chosen to describe the American objection to the Indian nuclear program on the State Department's website, as they were published in November 2008.¹¹⁶ The original censure is described there as a mere difference of opinion and a thing of the past between "the world's largest democracies", a far cry from the 1998 American opposition to the Pokhran II tests: "*...there were some differences; however, including over India's nuclear weapons programs.... In the past, these concerns may have dominated U.S. thinking about India, but today the U.S. views India as a growing world power with which it shares common strategic interests.*"¹¹⁷

¹¹¹ Amit Gupta, "India's Third-Tier Nuclear State Dilemma: N Plus 20?," *Asian Survey*, 41, No. 6 (2001): 1060.

¹¹² Celia Dugger, "U.S Beats Path to India", *New York Times*, December 6, 2001.

¹¹³ Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenals*, 224.

¹¹⁴ United States Department of State, "Background Note: India," ed. Bureau of Public Affairs, (Washington D.C: Electronic Information and Publications Office 2008).

¹¹⁵ Jeremy Page, "India Joins World Nuclear Club Amid Warnings Over Spread of Weapons", *The Times*, September 8, 2008.

¹¹⁶ U.S. Department of State, "Background Note: India."

¹¹⁷ *Ibid.*

Analysis:

Externally, India had two main goals which pertain to its foreign policy on its testing agenda: to deter Pakistan and China, and to send a message of independence and defiance to Washington. While some analysts argue that the tests actually neutralized India's conventional advantage over Pakistan, strengthened Sino-Pak ties and emboldened the Pakistanis to instigate the 1999 Kargil conflict,¹¹⁸ it is generally accepted that India's ties with Washington only improved as a result.

The tests successfully signalled to Washington that the new government in New Delhi was adamant about maintaining its independence regarding national security matters, despite any potential damage to bilateral relations. From India's point of view, the nuclear tests increased its visibility and status in the developing post Cold War system. Many Indian strategists argue that getting the attention of the world's only remaining super-power proved that nuclear weapons are the only way to achieve global relevance, and that "[I]f U.S. attention is a measure of respect and status, then the nuclear tests have ultimately achieved India's objective".¹¹⁹

Apparently, India's biggest gain internationally was that it had managed to get away with becoming overtly nuclear, after incurring the initial costs for testing. It withstood the sanctions and the measures taken against it and came up on the winning side as an important American ally after the reactions had subsided. India basically managed to have its cake and eat it too, since instead of becoming a pariah state, it secured its own special nuclear status with Washington. In the Indian case, the handicap incurred by New Delhi through the decision to test was an efficient costly signal received by Washington, which was convinced to drop its non-proliferation agenda as far as India was concerned.

¹¹⁸ Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenal*, 223.

¹¹⁹ Ibid.

B. Pakistan

Pakistan's incentives to test were simply framed as early as 1988, ten years before the tests took place, in an article published in the *Middle East Report*, and they were still relevant ten years later. "There are real fears... that any future regime threatened internally or by its neighbours, might test a nuclear bomb. This would be popular, would rally the Pakistani public around the government, would serve as a warning to India, and would boost Pakistan's image in the Islamic world".¹²⁰ As in the Indian case, Pakistan's motivations to test were also mixed, and this chapter will only focus on the external elements.

Pakistan's nuclear program was established in the 1950s, when Pakistan became a beneficiary of the Atoms for Peace program, but until the early 1970s it did not make any substantial progress.¹²¹ Pakistan essentially launched its nuclear program in 1973, after its defeat to India over the establishment of Bangladesh in 1972, and was further motivated after the Indian nuclear test of 1974.¹²²

Pakistan's clandestine nuclear program focused on enriching uranium, which relied on a massive smuggling scheme. These efforts were led by Pakistani scientist Abdul Kadeer Khan, who returned to Pakistan in 1975 and had a unique role in Pakistan's nuclear program.¹²³

From 1979 on, Islamabad was repeatedly censured by Washington for its nuclear development, but the sanctions imposed were intermittently waived due to the two wars that America waged in Afghanistan. The first of these was the covert war against the Soviets and the second was the more recent War on Terror waged on Al-Qaeda and the Taliban.¹²⁴

In 1977, the Glenn-Symington Amendments to the U.S. Foreign Assistance Act demanded that economic and military aid be cut off to any state that imported enrichment technology and has refused inspection by the IAEA.¹²⁵ President Carter enacted the Glenn-Symington sanctions in 1979, and though

¹²⁰ Ahmed Rashid, "Pakistan after Reagan", *Middle East Report*, (November-December 1988), p. 33

¹²¹ Levy and Scott-Clark, *Deception*, 18.

¹²² Kux, *Disenchanted Allies*, 14.

¹²³ For a detailed description of the role A.Q. Khan played in Pakistan's nuclear program see: Levy and Scott-Clark, *Deception*.

¹²⁴ Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenal*, 244-46.

¹²⁵ *Ibid.*, 244.

the economic blow to Pakistan was not severe, the political blow to the ties between Washington and Islamabad was acute.¹²⁶

In July 1979, a small-scale covert assistance program to the Afghans was authorized by the Carter administration. The funding level was modest, less than one million dollars, but the joint operation symbolized the beginning of a long, expensive, beautiful friendship.¹²⁷ Between 1978 and 1988, Washington funnelled 2.5 billion dollars in economic aid and 1.7 billion dollars in military assistance to Pakistan; this was significantly larger than the sum of 937 million dollars in economic assistance and 1.7 million dollars in military sales given in the previous decade.¹²⁸

After President Reagan was sworn in on January 21, 1981, Pakistan was immediately elevated to the position of a key strategic ally. The administration put together a five year plan worth 3.2 billion dollars, which was indeed very attractive to the Pakistanis.¹²⁹ Pakistan's nuclear proliferation was marginalised in favour of the war in Afghanistan, the Glenn-Symington sanctions were suspended for six years and the Pakistanis got a clear sign that Washington was willing to live with a nuclear Pakistan as long as the bombs stay in the Pakistani basement.^{130,131}

Meanwhile, Pakistan was making considerable progress on its nuclear program. As early as 1978, A. Q. Khan managed to enrich uranium for the first time, and in 1981 he managed to enrich a small quantity of uranium to weapons-grade level.¹³² In Kahuta, the location of Khan's labs, momentum was building towards a series of cold tests which took place on March 11, 1983, in the tunnels near the Sargodha air base in the Kirana hills.¹³³

In March 1984, the Indians learned that China appeared to have carried out a nuclear test using a Pakistani device at its test site in Lop Nor, an event witnessed by Pakistan's Foreign Minister; Israeli intelligence sources indicated

¹²⁶ Kux, *Disenchanted Allies*, 235.

¹²⁷ *Ibid.*, 241-42.

¹²⁸ Hussain Haqqani, *Pakistan: Between Mosque and Military*, (Washington: Carnegie Endowment for International Peace, 2005), 152.

¹²⁹ Kux, *Disenchanted Allies*, 253.

¹³⁰ Levy and Scott-Clark, *Deception*, 81-81.

¹³¹ Kux, *Disenchanted Allies* 257.

¹³² Levy and Scott-Clark, *Deception*, 84-85.

¹³³ Rai Muhammad Saleh Azam, "When Mountains Move: The Story of Chagai," *Defence Journal*, (2000), <http://www.defencejournal.com/2000/june/chagai.htm>.

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the same.¹³⁴ On December 10, 1984, Khan wrote Pakistani President Zia and advised him that Kahuta was ready to carry out a hot, real nuclear test. Zia was delighted but ambivalent about losing American aid money, and the test option was rejected.¹³⁵

The American response to the growing intelligence about Pakistan was to turn a blind eye; in 1984, the American Senate approved the Pressler Amendment which required the president to certify that Pakistan had no nuclear device and that the U.S. would act to reduce the likelihood of it acquiring one.¹³⁶ President Reagan (and later President H. W. Bush) consecutively certified this despite mounting intelligence that indicated otherwise – until October 1990.¹³⁷

In the fall of 1986, tensions on the border between Pakistan and India intensified. In an interview with Indian journalist Kuldip Nayar at his home in Islamabad, Khan exclaimed that Pakistan had the bomb and that “You don't have to test in the ground anymore. You can test in the lab. Let me assure you, we have tested....We have it and we have enriched uranium. [We've] weaponized the thing, put it all together....If you ever drive us to the wall, we will use the bomb”.¹³⁸

On October 1, 1990, President H. W. Bush announced he could no longer certify that Pakistan did not possess a nuclear weapon as required by the Pressler Amendment, and Pakistan was sanctioned; the U.S. froze 564 million dollar in economic and military aid that Congress had already approved, and the transfer of 30 F-16 jets for which Pakistan had already partially paid.¹³⁹ Some improvement in the relations between Washington and Islamabad

¹³⁴ Levy and Scott-Clark, *Deception*, 105, 481n30.

¹³⁵ *Ibid.*, 112.

¹³⁶ Kux, *Disenchanted Allies*, 277-78.

¹³⁷ The history of the Pressler amendment is rather complicated. Democratic Congressman Stephen Solarz sponsored an amendment to the Foreign Assistance Act, prohibiting aid to countries that attempt to illegally export nuclear components from the U.S. Democratic Senators Glenn and Cranston proposed amending the wording of the law to include countries that possess 'nuclear components' in addition to 'nuclear devices'. Glenn and Cranston's amendment was adopted for debate. To sabotage this move, three Republican senators, Charles Percy, Charles Mathias and Larry Pressler, sponsored a substitute amendment. This amendment only required the president to certify that Pakistan had no nuclear device and that the U.S. would act to reduce the likelihood of it acquiring one. The Pressler amendment was a pro-Pakistani move that was happily received in Pakistan. See Levy and Scott-Clark, *Deception*, 115-16; and Kux, *Disenchanted Allies*, 277-78.

¹³⁸ Kux, *Disenchanted Allies*, 284-85.

¹³⁹ *Ibid.*, 305-06.

transpired with the adoption of the Brown Amendment in September 1995, which allowed for the resumption of American aid.¹⁴⁰ In March 1998, the nationalistic Indian BJP party won the general elections in India. Consequently, on April 3, 1998, Pakistani Prime Minister Sharif wrote President Clinton a letter in which he warned him about India's nuclear intentions.¹⁴¹ On April 6 1998, Pakistan test-launched its Gahuri missile, a nuclear-capable long range missile.¹⁴²

After the Indian tests, the Clinton administration tried to convince Pakistan not to follow in India's footsteps and not to test on its own. Clinton called Pakistani PM Nawaz Sharif five times and offered the delivery of the undelivered F-16 jets, foreign aid, and an invitation to the White House.¹⁴³ Furthermore, a high-level delegation made its way to Islamabad, to try and convince the Pakistanis not to test.¹⁴⁴

On May 15th, Sharif called a secret meeting of the Cabinet Defence Committee to discuss the testing issue.¹⁴⁵ Only one person there rejected the notion of testing, and that was Finance Minister Sartaj Aziz, who warned that "testing would cripple Pakistan's economy by invoking sanctions", given the economic recession in Pakistan and its low foreign exchange reserves.¹⁴⁶ Sharif did not express a specific opinion, and the other officials present supported the tests.¹⁴⁷ The order to conduct the tests was given three days later, on May 18, 1998.¹⁴⁸ On May 19, 1998, Pakistani teams started to prepare the site for the tests, and on May 27th, Sharif called Clinton to inform him of Pakistan's intention to test – and to apologize for disappointing him, blaming the heavy pressure he [Sharif] was under.¹⁴⁹

¹⁴⁰ Republican Senator Hank Brown proposed an amendment which allowed the renewal of economic aid to Pakistan and permitted the resumption of training of Pakistani military personnel. Although the amendment passed, the Clinton administration chose not to re-establish a bilateral aid program and gave only a very modest amount of aid money to Pakistani NGO's, amounting to 2 million dollars a year. *Ibid.*, 331.

¹⁴¹ *Ibid.*, 344.

¹⁴² The Gahuri, which was supposedly a Pakistani missile based on the North Korean No-dong missile, but in fact was an actual No-Dong missile, was the outcome of years of covert cooperation with Pyongyang, cooperation that reached its peak in Benazir Bhutto's trip in December 1993. See: Levy and Scott-Clark, *Deception*, 267.

¹⁴³ Kux, *Disenchanted Allies*, 345.

¹⁴⁴ Levy and Scott-Clark, *Deception*, 269.

¹⁴⁵ *Ibid.*, 271-72.

¹⁴⁶ Azam, "When Mountains Move: The Story of Chagai."

¹⁴⁷ *Ibid.*

¹⁴⁸ *Ibid.*

¹⁴⁹ Levy and Scott-Clark, *Deception*, 273.

Deterrence and the Handicap Principle
How nuclear tests have evolved into effective costly signals

On May 28, 1998, at 15:16, Pakistan carried out what it claimed were five simultaneous nuclear tests.¹⁵⁰ The following day, on May 29, 1998, the UN Security Council declared that it "deplores" Pakistan's tests, and it urged both Pakistan and India to show restraint.¹⁵¹ A day later, on May 30, 1998, Pakistan claimed it carried out another test.¹⁵²

In Washington, President Clinton called an urgent press conference in which he described the tests as "self defeating, wasteful and dangerous", since they would make the people of both India and Pakistan "poorer and less secure".¹⁵³ In Pakistan, in a stark difference from the sombre mood in Washington, people were celebrating in the streets, and Nawaz Sharif himself appeared on national television and declared: "Today we have settled the score!".¹⁵⁴ The Pakistani Institute for Public Opinion published an opinion poll that showed that 97 percent of the respondents approved of the tests.¹⁵⁵

As detailed in the previous chapter, the Indian and Pakistani tests prompted immediate reaction and condemnation world wide, the strongest of which was Security Council Resolution 1172 and the sanctions declared by Washington.¹⁵⁶

However, even as the Clinton administration was finalizing the details of the sanctions against Pakistan, efforts to narrow them down were under way, and by mid-July 1999, only two months after the tests, Congress approved an exemption from the sanctions for agricultural credits, and passed a second piece of legislation, giving the president the authority to waive all sanctions including those related to the Pressler Amendment, at his discretion.¹⁵⁷ Also, in light of Pakistan's dire financial situation, Washington decided to give it some fiscal breathing space, and announced in July that it would not oppose IMF loans to Pakistan.¹⁵⁸

By the autumn of 1998, it was clear that sanctions alone would be insufficient to compel Pakistan to adhere to the NPT regime. Sharif and Clinton met at the UN General Assembly in New York, and Clinton invited Sharif to Washington

¹⁵⁰ Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenals*, 246.

¹⁵¹ Kux, *Disenchanted Allies*, 346.

¹⁵² Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenals*, 246.

¹⁵³ Peter Popham and Raymond Whitaker, "Pakistan Defies Impotent West," *The Independent*, May 31, 1998.

¹⁵⁴ Levy and Scott-Clark, *Deception*, 275.

¹⁵⁵ Kux, *Disenchanted Allies*, 345-46.

¹⁵⁶ Synnott, *The Causes and Consequences of South Asia's Nuclear Tests*, 28-30.

¹⁵⁷ Kux, *Disenchanted Allies*, 347.

¹⁵⁸ David E. Sanger, "Despite A-Test, U.S. Won't Bar Pakistan Bailout," *New York Times*, July 22, 1998.

for an official visit.¹⁵⁹ In October 1998, the U.S. decided to ease the sanctions on India and Pakistan under the provisions of the India-Pakistan Relief Act, (the so-called Brownback Amendment).¹⁶⁰

The remaining sanctions against Pakistan remained in place until September 2001, when Washington lifted all outstanding sanctions, in recognition of Pakistan's support of the American war on terror in Afghanistan.¹⁶¹ Pakistan's military ruler, Pervez Musharaf, gave that support in return for U.S. assurances of revived economic and military aid.¹⁶²

Analysis

Pakistan's main motivation to test was to strengthen the credibility of its deterrence posture towards India; other considerations were marginal in relation to this. For the Pakistani military establishment, "nuclear testing offered an opportunity to rectify strategic imbalance in the region and restore minimal deterrence, which it viewed as critical to its security".¹⁶³ Pakistan felt that the international reaction to the Indian tests was not strong enough, and that commercial pressures would quickly mitigate any such sanctions. It saw the tests as a tool for achieving prestige and boosting the credibility of its deterrence.¹⁶⁴

It is quite possible that under a different set of international norms, where nuclear tests are not condemned, Pakistan would have also opted to test, but the fact that the existing international norms forbade testing made it possible for Pakistan to use the price it incurred – the costs of the signal – to increase the honesty factor, or the credibility of its message, and to create a much amplified deterrent effect.

In fact, Pakistan was so confident in the credibility of its nuclear deterrence, it did not hesitate to instigate the 1999 Kashmir conflict.¹⁶⁵

¹⁵⁹ Kux, *Disenchanted Allies*, 350.

¹⁶⁰ Farzana Shaikh, "Pakistan's Nuclear Bomb: Beyond the Non-Proliferation Regime," *International Affairs (Royal Institute of International Affairs 1944-)*, 78, no. 1 (2002): 30.

¹⁶¹ *Ibid.*

¹⁶² Haqqani, *Pakistan: Between Mosque and Military*, 302.

¹⁶³ Hasan-Askari Rizvi, "Pakistan's Nuclear Testing," *Asian Survey* 41, no. 6 (2001): 955.

¹⁶⁴ *Ibid.*: 952.

¹⁶⁵ Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenals*, 242.

C. North Korea

The North Korean test of 2006 demonstrates the use of a nuclear test as a costly signal directly aimed at Washington, with the goal of convincing the White House to engage in bilateral dialogue. In that case, the goal was achieved and the Democratic People's Republic of Korea [DPRK] also managed to secure a deal which turned a blind eye to its existing nuclear arsenal. However, this utility was not replicated in the 2009 test. This chapter will only focus on North Korea's external motivations to test, though other domestic, political and organizational motivations played their part.

In the late 1980s, Western intelligence agencies gathered data which indicated that North Korea was developing nuclear capabilities by building nuclear infrastructure, including a reactor and a suspected plutonium reprocessing plant.¹⁶⁶ Concerned by these developments, the incoming administration of President George H. W. Bush decided to pursue a more activist policy, offering to improve relations with Pyongyang if it fulfilled its commitments regarding NPT safeguards and refrained from pursuing its nuclear program.¹⁶⁷

As the Cold War ended, the strategic situation in the Korean peninsula changed and on September 27, 1991, Bush announced the removal of American nuclear weapons from the peninsula. Consequently, on December 31, 1991, Pyongyang and Seoul published the North-South Denuclearization Declaration (NSDD) which banned the development and possession of nuclear weapons as well as enrichment and reprocessing facilities and called for a North-South inspection regime to verify the agreement.¹⁶⁸ In early 1992, at an historic meeting between U.S. Under Secretary of State Arnold Kanter and North Korean Party Secretary Kim Young Sun, North Korea signed a full-scope safeguards agreement with the IAEA, which entered into force on April 10, 1992.¹⁶⁹

This process of American engagement with North Korea continued during President's Clinton term, intermittently riddled with conflicts and clashes including one which eventually ended with the completion of the 1994 Agreed

¹⁶⁶ International Institute for Strategic Studies, "North Korea's Weapons Programmes: A Net Assessment," in *Strategic Dossiers*, (London: IISS, 2004), 7.

¹⁶⁷ Ibid.

¹⁶⁸ Ibid.

¹⁶⁹ Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenals*, 281.

Framework.¹⁷⁰ The Agreed Framework, which froze the DPRK's nuclear material production for eight years, became increasingly politically challenging for the Clinton administration and towards the end of his term, Clinton abandoned the North Korean issue in favour of the Middle East peace process.¹⁷¹

Despite the fact that the new Bush administration was critical of the Agreed Framework, it issued a policy statement on June 6, 2001, which stipulated that Washington would remain committed to it as long as North Korea fulfilled its obligations.¹⁷² Notwithstanding this statement, bilateral relations deteriorated and after the September 11 attacks, North Korea was mentioned as one of the three members of President's Bush "axis of evil" as described in his State of the Union Speech in 2002.¹⁷³ Other statements emanated from the Bush administration which indicated its interest in a regime change in Pyongyang.¹⁷⁴

In the summer of 2002, American intelligence estimates indicated that North Korea was developing a clandestine uranium enrichment program based on Pakistani technology, violating both the Agreed Framework Agreement and the Korean Peninsula Denuclearization Agreement.¹⁷⁵ The multilateral body created to provide energy assistance to North Korea under the Agreed Framework (KEDO) halted its energy aid to North Korea in November 2002, and thirteen months later it suspended construction of the two light-water reactors it had been building.¹⁷⁶

At the end of December 2002, North Korea ordered IAEA inspectors to leave the country, and declared its intentions to resume nuclear activities; on January 10, 2003, it announced its withdrawal from the NPT.¹⁷⁷ In August 2003, Russia, China, Japan, the United States, and the two Koreas launched a multilateral diplomatic process, known as the Six-Party Talks.¹⁷⁸ The parties

¹⁷⁰ Ibid.

¹⁷¹ International Institute for Strategic Studies, "North Korea's Weapons Programmes: A Net Assessment," 16.

¹⁷² Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenal*, 281. International Institute for Strategic Studies, "North Korea's Weapons Programmes: A Net Assessment," 16.

¹⁷³ Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenal*, 281.

¹⁷⁴ Ibid.

¹⁷⁵ Alex Bollfrass, "Arms Control and Proliferation Profile: North Korea," (Arms Control Association).

¹⁷⁶ Ibid.

¹⁷⁷ Cirincione, Wolfsthal and Rajkumar, *Deadly Arsenal*, 282.

¹⁷⁸ Ibid., 283.

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initially failed to resolve their conflicts. This led North Korea to declare, on February 10, 2005, that it had assembled nuclear warheads.¹⁷⁹ In September 2005, the Six-Party Talks realized their first major success with the adoption of a joint statement in which North Korea pledged to abandon its nuclear weapons program and return to the NPT.¹⁸⁰

In the summer of 2006, having failed to achieve progress through diplomatic channels, Pyongyang decided to adopt a provocative approach; this was in light of the fact that it viewed the Bush administration as hostile in its intentions, one which refrained from holding bilateral talks with North Korea.¹⁸¹ While Washington insisted that North Korea should return to the Six-Party Talks, Pyongyang insisted on bilateral talks and the removal of U.S. financial sanctions on North Korean bank accounts in Macau.¹⁸²

On July 4, 2006, North Korea launched no less than seven missiles, one of them a long range missile.¹⁸³ The launches were internationally condemned and on July 15, 2006, the UN Security Council adopted resolution 1695 which demanded that the DPRK halt its missile activity.¹⁸⁴ The DPRK rejected the resolution and on the next day, a foreign ministry spokesman stated that “our Republic will bolster its war deterrent for self-defence in every way, by all means and methods....”¹⁸⁵

In August 2006, American intelligence sources gathered data which suggested that North Korea was preparing to conduct a nuclear test. These actions, according to some experts, were meant to signal to Washington that Pyongyang would not bow down to external pressure.¹⁸⁶ On October 3, 2006, North Korea declared its intention to carry out a nuclear test; the official

¹⁷⁹ Ibid.

¹⁸⁰ "U.S. And Other Powers Reach Tentative Understanding on North Korea's Nuclear Program," *The American Journal of International Law*, 99, no. 4 (2005).

¹⁸¹ Mike Chinoy, *Meltdown: The Inside Story of the North Korean Nuclear Crisis* (London: St Martin's Press 2008), 275-76.

¹⁸² Ibid.

¹⁸³ Charles Pritchard, *Failed Diplomacy: the Tragic Story of How North Korea Got the Bomb*, (Washington: Brookings Institution Press, 2007), 146.

¹⁸⁴ United Nations Security Council, Resolution 1695 (S/Res/1695)

¹⁸⁵ Chinoy, *Meltdown*, 287.

¹⁸⁶ Ibid.

declaration stated that the growing threat posed by Washington and its efforts to isolate North Korea are the reasons behind the test.¹⁸⁷

The Bush administration was intent on avoiding bilateral talks with Pyongyang, and it was so rigid in its actions that the head of the North Korea desk in the State Department in Washington delivered a warning to the North Korean UN delegation based in New York over the phone rather than face to face.¹⁸⁸ On October 6, 2006, one of Kim Jong Il's unofficial spokesmen, Kim Myong Chol, published an article in which he stated that North Korea was willing to bring war to American soil and that it had nothing to lose should a nuclear war break out.¹⁸⁹

On October 9, 2006, North Korea declared that it had conducted an underground nuclear test¹⁹⁰. The detected yield was relatively very small, and was estimated to be between 0.2 to 0.05 kiloton.¹⁹¹ American intelligence later confirmed the North Korean claim, using air samples which showed evidence of radioactivity.¹⁹² The test was widely criticized around the world. On October 15, 2006, the UN Security Council responded by adopting resolution 1718, enacting a variety of multilateral sanctions and demanding that Pyongyang return to the NPT.¹⁹³

However, in the wake of the test, even leading conservative Republicans called upon President Bush to change his policy towards North Korea and hold bilateral talks. James Baker, former Secretary of State, commenting on Bush's policies said "It is not appeasement to talk with your enemies".¹⁹⁴ Shortly after the test, (the precise date is unknown) President Bush authorized bilateral

¹⁸⁷ Yosi Melman, "North Korea Declared: 'We Will Hold a Nuclear Test in the Future'," *Ha'aretz*, October 4, 2006. Pritchard, *Failed Diplomacy: the Tragic Story of How North Korea Got the Bomb*, 150-51.

¹⁸⁸ Chinoy, *Meltdown*, 291.

¹⁸⁹ Kim Myong Chol, "Kim's Message: War Is Coming to U.S. Soil," *Asia Times on-line*, October 6, 2006.

¹⁹⁰ "White House Casts Doubt on N. Korean Nuclear Arms", Reuters news wire, October 10 2006.

¹⁹¹ Medalia, "Nuclear Weapons: Comprehensive Test Ban Treaty," 7.

¹⁹² Katherine Shrader, "U.S. Agencies Confirm N. Korea Nuke Test," *Associated Press*, October 17, 2006, 12:35 AM GMT

¹⁹³ Security Council Resolution 1718 (S/Res/1718).

¹⁹⁴ David E. Sanger "G.O.P.'S Baker Hints Iraq Plan Needs Change," *New York Times*, October 9, 2006.

talks with North Korea and thus American negotiator Christopher Hill secretly met North Korean envoy Kim Gye Gwan in Beijing during the last week of October, 2006.¹⁹⁵

Consequently, North Korea agreed to resume the Six-Party Talks. Four months after the test, on February 13, 2007, the parties agreed to an action plan detailing initial steps to implement the September 2005 Joint Statement.¹⁹⁶ That action plan included shutting down the Yongbyon reactor in return for energy aid and cash. Of note is the fact that the agreement contained no reference to the North's alleged uranium enrichment efforts or to existing weapons.¹⁹⁷

In June, the money in the Macau accounts was transferred and less than a month later, on July 18, 2007, IAEA inspectors confirmed that the Yongbyon reactor had been shut down.¹⁹⁸ The Six Parties concluded a follow-up agreement on October 3, 2007, in which North Korea agreed to disable its plutonium-production program and provide a full account of all nuclear activities.¹⁹⁹ In exchange for these actions, North Korea received the remaining energy aid pledged in the 2007 agreement.²⁰⁰ The United States also proceeded, as agreed, to remove North Korea from its list of state sponsors of terrorism in October 2008.²⁰¹

However, consequent developments were less than positive; North Korea refused to allow international inspectors to conduct sampling at its nuclear sites, and the Six-Party Talks stalled.²⁰² In December 2008, shortly after the American presidential elections, Pyongyang slowed down work on dismantling its nuclear programme after an American decision to suspend energy aid, and in January 2009, the same month President Obama took office, the North announced it was scrapping all military and political deals with the South, accusing it of "hostile intent".²⁰³

¹⁹⁵ Chinoy, *Meltdown*, 305.

¹⁹⁶ *Ibid.*, 328.

¹⁹⁷ *Ibid.*

¹⁹⁸ *Ibid.*, 329.

¹⁹⁹ Bollfrass, "Arms Control and Proliferation Profile: North Korea."

²⁰⁰ *Ibid.*

²⁰¹ "Brief Notes," *The American Journal of International Law* 103, no. 1 (2009).

²⁰² Peter Crail, "Six Party Talks Stall over Sampling," *Arms Control Today*, January-February 2009 (January 16, 2009), http://www.armscontrol.org/act/2009_01-02/sixpartytalksstall.

²⁰³ BBC World News, "North Korea Conducts Nuclear Test."

Similar to the launch that preceded the 2006 test, in April 2009 Pyongyang launched a missile carrying what it claimed was a communications satellite, but which several nations viewed as a cover for a long-range missile test.²⁰⁴ The launch was condemned internationally, and the UN Security Council adopted a statement calling on North Korea to comply with a 2006 resolution banning missile tests. Pyongyang's reaction was to pull out of the Six-Party Talks in protest.²⁰⁵ On May 25, 2009, North Korea conducted its second nuclear test. The test's seismic signature was detected around the world and was estimated to have the yield of between 10 and 20 kilotons.²⁰⁶ An official announcement on North Korean state radio said the test came "... as part of measures to enhance the Republic's self-defensive nuclear deterrent in all directions".²⁰⁷

The test was condemned around the world, and on June 12, 2009, the Security Council unanimously adopted Resolution 1874, which broadly expanded sanctions and measures against North Korea. The resolution contains an intensified inspection regime to prevent proliferation to and from North Korea, and calls for enhanced financial restrictions against North Korea.²⁰⁸ On July 16, 2009, in a major move aimed at implementing the June sanctions resolution, the UN Security Council blacklisted 10 North Korean organizations and individuals connected to Pyongyang's nuclear and missile programs.²⁰⁹

²⁰⁴ William J Broad, "North Korean Missile Launch Was a Failure, Experts Say," *New York Times*, April 6, 2009.

²⁰⁵ Mark Landler, "North Korea Says It Will Halt Talks and Restart Its Nuclear Program " *New York Times*, April 15' 2009.

²⁰⁶ BBC World News, "North Korea Conducts Nuclear Test."

²⁰⁷ Ibid.

²⁰⁸ UN Security Council, Resolution 1874 (S/Res/1874).

²⁰⁹ Crail, "Six-Party Talks Stall over Sampling."

Analysis

Speculation regarding Pyongyang's motivation to test in 2006 range from appeasing its military elite to rallying public support, but the strongest motivation seemed to be its desire to send a blunt message to Washington. In addition to deterring Washington from pursuing a hard-line policy, Pyongyang signalled it would not bow down to pressure, whether it was the hostile Americans or the friendly Chinese, and essentially sent a message to Washington which read, "We don't care about your threats or sanctions".²¹⁰

For Pyongyang, a bilateral channel with Washington is an important foreign policy goal which serves as a means to ensure that Pyongyang stays relevant and gets the attention it believes it deserves. In this respect, the handicap incurred and the cost of the signal proved to be a highly efficient tool of getting American attention, especially given the failure of its missile diplomacy. Thus, the 2006 test was in fact a very costly signal which proved to be highly efficient: within four months of it, a deal was reached that ignored Pyongyang's existing arsenals.

By contrast to the 2006 test, the motivations behind the 2009 test were more mixed and were aimed domestically and externally,²¹¹ but they served the same attention-grabbing purpose. The test's aim was mainly to get Washington's attention, given the North Koreans' perception that their nation has been a lower priority for the new Obama administration; it also served to signal that the government is still very much in charge, and to deter attempts at international intervention.²¹²

²¹⁰ Chinoy, *Meltdown*, 297.

²¹¹ Martin Fackler, "Test Delivers Message for Domestic Audience," *New York Times*, May 26, 2009.

²¹² *Ibid.*

5. Conclusions

The decision to carry out nuclear tests is a highly political decision aimed at achieving foreign policy goals, in addition to domestic and technological benefits. Owing to the development of detection methods, the development of technological alternatives to testing and the reinforced status of the international norms against nuclear testing, nuclear tests have become a unique diplomatic currency. Externally, nuclear tests have become an efficient costly signalling method used in situations where a credibility deficit exists, for communications purposes and especially where deterrence is involved.

For the non P-5 nuclear capable states that chose to test, the decision proved to be cost efficient. As all three study cases demonstrate, despite the high costs incurred in the short term, in the long term these costs are marginalized in light of the rewards offered. These rewards could come in the shape of improved cooperation with Washington and the international community, reinforced international status and prestige, improved financial and commercial standing, and a de-facto acceptance of their nuclear status.

Though it is impossible to quantify an obscure concept such as deterrence, it seems that the tests have boosted the testers' immediate deterrence posture and bought them credibility in communicating messages. Of note is the fact that all three states have secured their position as de-facto nuclear states with different degrees of American and global acceptance. India became an important strategic ally and a legitimate client of nuclear technologies. Pakistan, along with its nuclear arsenal post-9/11 was also embraced by Washington, and North Korea managed to reach an agreement which completely ignores its existing nuclear arsenals.

A non P-5 nuclear capable state, such as Iran might be soon, contemplating the option of nuclear testing, would be wise to learn the lessons offered by the three testers, and especially North Korea. That lesson being that nuclear tests can pave the way to bilateral negotiations with Washington and improved international standing, and that demonstrated nuclear ability in the long term will be accepted and overlooked. These lessons are even stronger, given the failure of the international community to motivate non P-5 nuclear capable states to completely rollback their nuclear programmes, after South Africa did so in the early 1990s.

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Another possible handicap component which could contribute to a state's deterrent ability is its insistence on publicly proceeding with nuclear development in spite of international sanctions in the pre-testing phase, similar to the Iranian behaviour in recent years. Another option a nuclear capable state could choose is not to develop actual nuclear weapons but rather maintain the know-how and ability to do so through mastery of the nuclear technology, while publicly publishing its technological abilities for deterrence purposes. Such a move could possibly deter without incurring the costs of sanctions for testing.

As for Washington and its allies in the international community interested in upholding the NPT regime, the situation is more complicated. In order to change the cost equations and make testing too costly and devastating to be effective, the costs incurred must be sustained over the long term. More cooperation is needed with major actors like China and Russia to ensure the efficiency of the sanctions and their enforcement. It would also be prudent to open a channel of communication before a suspected test and attempt negotiations to prevent it, using similar negotiating parameters to the ones that are likely to be used after the test. Since other non P-5 states like Iran are looking at how Washington deals with North Korea, and the road to Tehran seems to be going through Pyongyang, it seems advisable for any American administration to attempt to disarm North Korea through diplomacy and use it to set an example.

References

- Azam, Rai Muhammad Saleh, "When Mountains Move: The Story of Chagai." *Defence Journal* (2000), <http://www.defencejournal.com/2000/june/chagai.htm>.
- Bidawi, Praful, "India-Disarmament; CTBT Rejection Setback for Avowed Goal." *Inter Press Service*, September 18, 1996.
- BJP 1998 Manifesto, "Protecting India's National Interest", <http://www.bjp.org/>
- Bollfrass, Alex, "Arms Control and Proliferation Profile: North Korea." Arms Control Association.
-"Brief Notes" *The American Journal of International Law*, 103, no. 1 (2009): 164-69.
- Broad, William J. "North Korean Missile Launch Was a Failure, Experts Say." *New York Times*, April 6, 2009.
- Bunn, George, "The Status of Norms against Nuclear Testing." *The Non-proliferation Review* 6, no. 2 (1999): 12.
- Burns, John F., "India Sets 3 Nuclear Blasts, Defying Worldwide Ban." *New York Times* May 12, 1998 1.
- Chengappa, Raj, *Weapons of Peace: Secret Story of India's Quest to Be a Nuclear Power*, New Delhi: Harper Collins India, 2000.
- Chinoy, Mike. *Meltdown: The Inside Story of the North Korean Nuclear Crisis*, London: St Martin's Press, 2008.
- Cirincione, Joseph, Rajkumar, Miriam, Wolfsthal, Jon B., . *Deadly Arsenal: Nuclear, Biological, and Chemical Threats*, Washington: Carnegie Endowment for International Peace, 2005.
- Council, United Nations Security, Resolution 1874 (S/Res/1874), 2009.
- Crail, Peter, "Six-Party Talks Stall Over Sampling." *Arms Control Today*, (January 16, 2009), http://www.armscontrol.org/act/2009_01-02/sixpartytalksstall.
- "CTBT Full Text" <http://www.ctbto.org/the-treaty/treaty-text/>.
- CTBTO Preparatory Commission, "The CTBT Verification Regime out to Test the Event in the DPRK on October 9, 2006" <http://www.ctbto.org/press-centre/highlights/2007/the-ctbt-verification-regime-put-to-the-test-the-event-in-the-dprk-on-9-october-2006/page-1/>.
- Davis, J.W.F. , and O'Donald, P. "Sexual Selection for a Handicap: A Critical Analysis of Zahavi's Model", *Journal of Theoretical Biology*, 57 (1976): 345-54.
- Dawkins, Richard, *The Selfish Gene* 2nd ed. Oxford: Oxford University Press, 1976.

- Department of State, United States, "Background Note: India", edited by Bureau of Public Affairs, Washington D.C.: Electronic Information and Publications Office, 2008.
- Fackler, Martin. "Test Delivers Message for Domestic Audience." *New York Times*, May 26, 2009.
- Fetter, Steve, "Stockpile Confidence under a Nuclear Test Ban," *International Security* 12, no. 3 (1987): 132-67.
- . *Toward a Comprehensive Test Ban*, Cambridge, MA: Ballinger Publishing Company 1988.
- Freedman, Lawrence. *Kennedy's Wars: Berlin, Cuba, Laos, and Vietnam*, New York: Oxford University Press, 2000.
- Ganguly, Sumit, "India's Pathway to Pokhran II: The Prospects and Sources of New Delhi's Nuclear Weapons Program", *International Security* 23, no. 4 (1999): 148-77.
- Goodman, Michael S., *Spying on the Nuclear Bear: Anglo-American Intelligence and the Soviet Bomb*, Stanford, CA: Stanford University Press, 2007.
- Grafen, Alan, "Biological Signals as Handicaps" *Journal of Theoretical Biology* 144 (1990): 29.
- Greene, Benjamin P., *Eisenhower, Science Advice, and the Nuclear Test-Ban Debate, 1945-1963* Stanford Nuclear Age Series, Stanford, CA: Stanford University Press, 2007.
- Gupta, Amit, "India's Third-Tier Nuclear State Dilemma: N Plus 20?", *Asian Survey*, 41, no. 6 (2001): 1044-63.
- Hafemeister, David, *Effective CTBT Verification: The Evidence Accumulates*, Findlay, Trevor (ed.), Verification Yearbook 2004. London: Vertic, 2004.
- Haqqani, Hussain. *Pakistan: Between Mosque and Military*. Washington: Carnegie Endowment for International Peace, 2005.
- International Atomic Energy Agency, "Nuclear Non-Proliferation: Chronology of Key Events" http://www.iaea.org/Publications/Factsheets/English/npt_chrono.html
- International Institute for Strategic Studies, "North Korea's Weapons Programmes: A Net Assessment," In: *Strategic Dossiers*, London: IISS, 2004.
- Jaipal, Rikhi, "The Indian Nuclear Explosion", *International Security* 1, no. 4 (1977): 44-51.
- Karnad, Bharat, *Nuclear Weapons and Indian Security: the Realist Foundation of Strategy*, New Delhi: Macmillan India, 2002.

- Kimball, Daryl, "The Status of the Comprehensive Test Ban Treaty: Signatories and Ratifiers", Arms Control Association
- Kux, Dennis, *The United States and Pakistan, 1947-2000: Disenchanted Allies*, Baltimore: Johns Hopkins University Press, 2001.
- Landler, Mark, "North Korea Says It Will Halt Talks and Restart Its Nuclear Program", *New York Times*, April 15, 2009.
- Levy, Adrian, and Catherine Scott-Clark, *Deception; Pakistan, the United States and the Global Nuclear Weapons Conspiracy* London: Atlantic Books, 2007.
- Medalia, Jonathan, "Nuclear Weapons: Comprehensive Test Ban Treaty," In *CRS Report For Congress*, CRS issue brief for Congress, 2006.
- Melman, Yosi, "Did Israel Play a Role in the 1979 South Africa Nuclear Test?" *Ha'aretz*, August 2, 2009.
- "North Korea Declared: We Will Hold a Nuclear Test in the Future." *Ha'aretz*, October 4, 2006.
- Mitchell, Allison, "Clinton, at U.N., Signs Treaty Banning All Nuclear Testing" *New York Times* September 25, 1996, 1.
- Myong Chol, Kim, "Kim's Message: War Is Coming to U.S. Soil", *Asia Times on-line*, October 6, 2006.
- News, BBC World, "North Korea Conducts Nuclear Test." <http://news.bbc.co.uk/1/hi/8066615.stm>.
- Nur, Nadav, and Hasson, Oren, "Phenotypic Plasticity and the Handicap Principle" *Journal of Theoretical Biology*, 110 (1984): 275-97.
- Perkovich, George, *India's Nuclear Bomb*, Berkeley: University of California Press, 1999.
- Popham, Peter, and Whitaker, Raymond, "Pakistan Defies Impotent West" *The Independent*, May 31, 1998, 1.
- Pritchard, Charles, *Failed Diplomacy: the Tragic Story of How North Korea Got the Bomb*, Washington: Brookings Institution Press, 2007.
- Richelson, Jeffrey T., *Spying on the Bomb: American Nuclear Intelligence from Nazi Germany to Iran and North Korea*, New York: W.W. Norton, 2006.
- Rizvi, Hasan-Askari, "Pakistan's Nuclear Testing", *Asian Survey* 41, no. 6 (2001): 943-55.
- Sanger, David E, "Despite A-Test, U.S. Won't Bar Pakistan Bailout", *New York Times*, July 22, 1998
- Sanger, David E., "G.O.P.'S Baker Hints Iraq Plan Needs Change", *New York Times*, October 9, 2006.
- Security Council, United Nations "Resolution 1172 (S/Res/1172)".
- . "Resolution 1695 (S/Res/1695)." New York, 2006.

- "Resolution 1718 (S/Res/1718)."
- Shaikh, Farzana, "Pakistan's Nuclear Bomb: Beyond the Non-proliferation Regime" *International Affairs (Royal Institute of International Affairs 1944)* 78, no. 1 (2002).
- Shrader, Katherine, "U.S. Agencies Confirm N. Korea Nuke Test" *Associated Press news wire*, October 17, 2006, 12:35 AM GMT
- Stout, David, "Defeat of a Treaty: The Reaction; a Disappointed Clinton Says the Fight Is 'Far from over'", *The New York Times*, October 14, 1999, 14.
- Smith, John Maynard, "Honest Signaling: The Philip Sidney Game," *Animal Behavior* 42: 1034-35.
- . "Sexual Selection and the Handicap Principle", *Journal of Theoretical Biology* 57 (1976): 239-42.
- Synnott, Hilary, *The Causes and Consequences of South Asia's Nuclear Tests*, Vol. 332, Adelphi Papers. Oxford: Oxford University Press for the International Institute for Strategic Studies, 1999.
- Tannenwald, Nina, "Stigmatizing the Bomb: Origins of the Nuclear Taboo" *International Security* 29, no. 4 (2005): 5-49.
- "U.S. And Other Powers Reach Tentative Understanding on North Korea's Nuclear Program." *The American Journal of International Law*, 99, no. 4 (2005): 914-16.
- Vajpayee, Atal Bihari, "Letter to the President, Bill Clinton", *New York Times* May 13, 1998.
- Walker, William, "Nuclear Order and Disorder", *International Affairs (Royal Institute of International Affairs 1944)*, 76, no. 4 (2000): 703-24.
- Weinraub, Bernard, "India Rules out Atomic Arms", *New York Times*, May 23, 1974, 6.
- "White House Casts Doubt on N. Korean Nuclear Arms", October 10, 2006.
- Young, Stephen, "India Scuppers Test Ban Treaty," *The Guardian*, August 15, 1996, 11.
- Zahavi, Amotz, and Zahavi, Avishag, *The Handicap Principle: A Missing Piece of Darwin's Puzzle*, Oxford: Oxford University Press, 1997.
- Zahavi, Amotz, "The Cost of Honesty (Further Remarks on the Handicap Principle)," *Journal of Theoretical Biology*, 67 (1977): 603-05.
- Zahavi, Amotz, "Mate Selection – a Selection for a Handicap", *Journal of Theoretical Biology* 53 (1975): 36.