

Contents

FOREWORD	i
PREFACE	v
ACRONYMS AND ABBREVIATIONS	viii
PROLOGUE	xiv
Part 1	1
25 CENTURIES FROM ABDERA TO HIROSHIMA	3
THE ATOM HAS A STORY OF ITS OWN ...	3
Stereotypes	3
Holy curiosity	3
A long history	4
Of apples and planets	5
Faraday, Maxwell and the Cavendish Laboratory	6
The Republic of Science	7
Joseph John Thomson	8
Ernest Rutherford	8
Exhilarating decades	11
After 2 500 years, a workable model of the atom	12
Things get more complex	13
Neutron bombardment	14
A detour to Switzerland	14
How much more damage?	16
Neutron bombardment continues	17
Multiplication	18
Isotope separation	20
Bellicose atoms	21
The spadework	21
Bat bombs	24
Behind the scenes in Britain	24
The necessary spark	26
From theory to practice	26

The momentum builds up	29
Plutonium	32
Basic nuclear weapons design	33
Criticality and critical mass	36
Dilemma	38
A physics experiment becomes a political cudgel	39
Did the nuclear bombs force Japan to surrender?	42
The death throes of the Manhattan Project	44
A time to reap	45
What did the Germans achieve?	47
Soviet moles	48
The Soviet Union catches up with the USA	51
Scaling up	53
“With the bloody Union Jack on top of it ...”	56
Another consequence of the Quebec Agreement	57
France, the fourth country with the <i>force de frappe</i>	59
China, the fifth nuclear power	62

Part 2 **65**

ATOMS IN THE SERVICE OF PEACE (OR HOW TO TAME A MONSTER) **67**

A very old story	67
Peaceful applications – a possibility?	69
“Good” and “bad” electricity	70
Heir presumptive of a remarkable family; wars and peacekeeping bodies	71
A delicate balancing act	73
The general triumphs in the talking shop	74
How altruistic were Eisenhower’s plans?	77
Birth pangs	79
Pronouncements at the First Geneva Conference	80
What are safeguards?	82
Were the safeguards adequate?	84
Back to the drawing board: the design of comprehensive safeguards agreements	87
IAEA inspections	88
Smiling Buddha, and the cat is set among the pigeons	90

India's hostile neighbours	90
Chain reaction of another kind	92
How do the Zangger Committee and the Nuclear Suppliers Group operate?	93
International control over the proliferation of nuclear weapons	94
Part 3	95
THE BOMB IN THE BUSHVELD	97
EARLY BEGINNINGS	97
The home-grown product	97
Ampie Roux	98
Wally Grant	99
The father of South Africa's nuclear weapons	100
Wynand de Villiers brings a souvenir home	101
"Let's get down to work"	102
Tragedy on the farm Pelindaba	102
The heart of Pelindaba	104
The Safari-1 reactor	106
A difficult choice	110
Northern Tyres and Accessories – what the façade concealed	112
UF ₆ and hydrogen	114
Separative work	116
FLEXING THEIR MUSCLES	117
John Vorster's announcement of 20 July 1970	120
ISOLATION AND RESOURCEFULNESS	123
Criticism	123
Wooing the Germans	124
The Y-plant	126
Technical aspects	126
Courage in action	128
A love-hate relationship	130
Indian breach of faith affects South Africa	131
A more aggressive approach	133
SPIED ON AND SHUNNED	134
Progress	134
Nuclear devices and nuclear weapons	135
Dirty work in the desert	136
What the spooks in the USA thought	142

How did the Soviet Union know where to look?	143
Another Trojan horse?	146
Further interference by the Americans	147
In case of need	149
MYSTERIOUS INCIDENT NO. 747 OF 22 SEPTEMBER 1979	150
Plutonium for the crocodiles	150
Vela 6911 registers a double flash	151
Double flashes and bhangmeters	152
Search for the truth	155
If it was a weapons test, who did the testing?	157
Vela postscript – a ghost from the past	160
Jonathan Jay Pollard	161
ARMSCOR STEPS UP	164
The Kentron Circle facility	166
The programme makes headway	170
Nuclear weapons	174
The Gouriqua project: materials for sophisticated devices	174
Ad hoc cabinet committee: September 1985	176
Overview of the most important UNSC resolutions	178
The RSA missile series	184
Missiles and South Africa's interest in them	184
Further reflections on Project Festival	187
The requirements of the South African Defence Force	189
Status in September 1987	190
ELSEWHERE ON THE FARM	193
Koeberg, the Z-plant and Beva	193
Koeberg nuclear power plant	196
More "sabotage" – of a kind that casts a long, dark shadow	199
The Z- and U-plants and Beva	200
Eskom's PBMR	205

Part 4 **207**

THE END OF AN ERA **209**

Butterflies and chaos	209
The butterfly in the USSR	209
The new broom	213
The "Mantel" Project	216
Nuclear weaponry command and control procedures	218

The dismantlement process	222
Chuck Norris to the rescue	223
The destruction of documentation	224
Saddam Hussein causes trouble	226
Unscm and the IAEA's action team	227
The Additional Protocol	229
Signing the NPT and the IAEA's Safeguards Agreement	230
The IAEA: organisation and legal rights	236
A game with new rules	237
The corpse with the dagger in its back	240
In search of the MUF	242
What is MUF?	242
Pale faces and furious blushes	245
Ballpoint pens to the rescue	246
Deep in the desert	247
Nuclear forensics	249
The pressure builds up	251
The 5000 building complex	255
A rough neighbourhood – and a surprise announcement	258
Putting things in perspective	261
Prelude to 23 March 1993	263
Resuscitating the CCI	267
A Russian bomb-maker takes the wheel	269
The remainder of that chaotic year: 1993	269
A magical substance	272
A spectacular affair	275
An interesting visit	275
An African bomb?	278
Jorge Risquet Valdés	281
Part 5	283
COOPERATION BETWEEN ISRAEL AND SOUTH AFRICA	285
The Israeli nuclear programme	285
Christian convert/successful spy	289
Strange bedfellows – the Jewish parallel	291
Operation Tea Leaves	294
The end of the friendship	299

Part 6	303
FROM POLECAT TO MODEL CITIZEN	305
A modern Aeolus	305
Harold Macmillan and the biggest ever Western nuclear disaster	307
The last decade of the 20th century	309
South Africa in the non-proliferation arena	311
Theft and an application for membership of the NSG	314
South Africa's missile programme and the MTCR	316
Distress on the other side of the Atlantic	317
Bankrolling demolition	320
The big prize – membership of the MTCR	321
A spectacular debut in New York	322
The NAM – “a broad church”	323
A new man on the scene	334
Interlude in Iraq	337
An unworthy end to a career	339
Part 7	341
A SOUTH AFRICAN STALL IN KHAN'S ATOMIC BAZAAR	343
The UNSC	343
Gernot Zippe's legacy	344
In the land of cheese and windmills	345
Two Germans and a South African	349
Friends, butter factories and skulduggery	352
Espionage and letter bombs	352
The tide turns against Pakistan	354
An impending threat and missile systems	355
India and Israel	355
The other Khan works behind the scenes	358
Indian and Pakistani nuclear tests	358
A party with an agenda	360
Gaddafi's dream, Khan's contract	362
The nuclear smugglers fall into a snare	364
The dominoes fall	365
The second domino	367
Names mentioned in the Malaysian press release	367
Arrests in Switzerland, Germany, Turkey and the Netherlands	368

How did the Americans and the British know about the cargo on board the <i>BBC China</i> ?	369
The Tinnens	371
Paid for but not delivered – the focus shifts	372
A visit to Tradefin in Vanderbijlpark and further arrests	373
Fact or fiction?	380
Meyer provides the nails for the coffin	382
The case	386
Lerch's fate	388
Did A.Q. Khan do the unthinkable?	388
Part 8	391
A MURKY CRYSTAL BALL	393
Deterrent or miracle?	393
The Cuban missile crisis of 1962 and the man who saved the world	399
The faceless enemy	405
War can get dirty	408
The world has changed	410
“Global (no?) zero”	410
Nuclear weapons: states that have them and those that want them	412
Unholy curiosity	419
International treaties and disarmament	421
Black swans and nuclear power	423
The Fukushima disaster	424
Nuclear energy, green energy and the German experiment	430
And South Africa?	434
GLOSSARY	439
BIBLIOGRAPHY	451
APPENDIX	459
INDEX	515

Foreword

Nic von Wielligh and I go back a long way. We were closely associated during the dismantling of South Africa's nuclear capability in the early 1990s and subsequent accession to the Nuclear Non-Proliferation Treaty (NPT) of the United Nations. I have always found Nic to be an extremely precise and professional person who strives to uphold high ethical standards in everything he does. This is amply illustrated by the following incident:

After South Africa signed the NPT on 10 July 1991, the country was given eighteen months to enter into a comprehensive safeguards agreement with the International Atomic Energy Agency (IAEA) in Vienna. Within two months of the conclusion of this agreement a so-called Initial Report on all nuclear material and nuclear facilities which fell within the safeguards had to be submitted. This inventory is an extremely important document, since the subsequent credibility of the member country is measured by the extent of its disclosure of its nuclear activities. This was by no means a simple task for the then Atomic Energy Corporation (AEC), because the inventory had to cover far more than the billets of highly enriched uranium under safeguards in a vault at Pelindaba. There were literally hundreds of smaller quantities of uranium stored in various degrees of enrichment and various chemical forms in all the test loops and in many laboratories, even on filters and in cylinders. The mass of every quantity of uranium, its degree of enrichment, form and position had to be defined as far as possible for the purpose of subsequent verification by the IAEA inspectors.

Understandably Nic pleaded that we should use the full eighteen months' grace before signing the comprehensive safeguards agreement to give him and his team sufficient time to compile this inventory. However, South Africa was under enormous political pressure to "prove" its credibility to the international community. The country had to be able to demonstrate that it was serious in its bid to accede to the NPT and not, like North Korea and Iraq at that time, "playing games" while continuing behind the scenes with illicit nuclear activities that fell outside the provisions of the NPT. My answer was therefore: "Sorry, Nic, this is the position: State President F.W. de Klerk's orders are that South Africa must strive for maximum acceptance by the international community in its entry into the NPT. We will probably sign the IAEA's safeguards agreement shortly, in September 1991, at the General

In a discussion with the authors of this text in March 2013, Waldo Stumpf emphasised that he remains sceptical about the value that South Africans as outsiders could add by sharing knowledge and experience gained from their own nuclear weapons dismantlement process with the world. “It remains a political decision,” he says. “Nuclear weapons are a political matter.”

Furthermore, each case is unique because it plays out in a particular period of history, against a particular political and strategic background. What most cases have in common is severe tension between parties in an unstable regional context, such as in the cases of India and Pakistan as well as Israel and its neighbours.

An unworthy end to a career

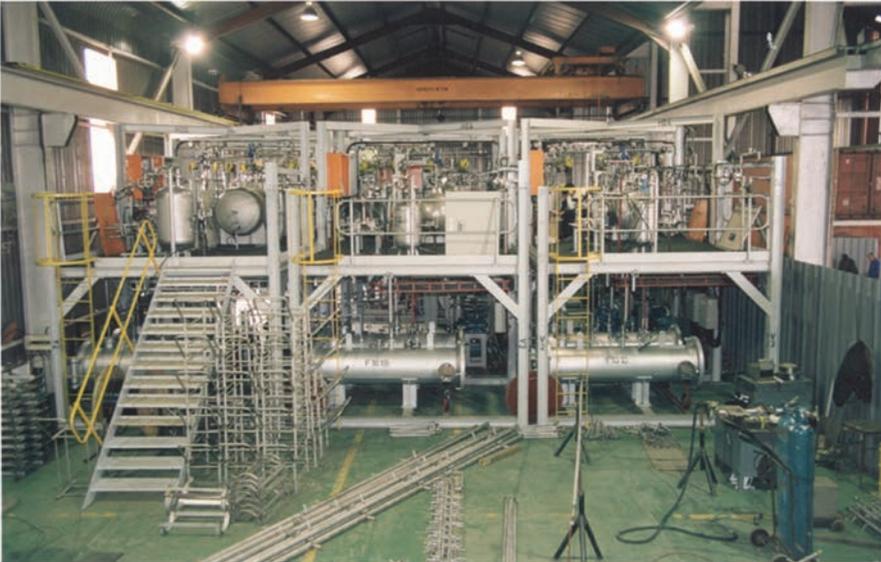
After Deputy President F.W. de Klerk and his NP colleagues left the government of national unity at the end of June 1996, the writing was clearly on the wall for the incumbent chairmen and executive heads of semi-state institutions like Eskom, Armscor and the AEC. These people were aware that they would have to make way for appointments by the new ruling party. The process that followed was vacillating, protracted and unworthy of highly trained people with decades of specialised knowledge and managerial experience behind them. What happened to Waldo Stumpf is a case in point. (Johan Alberts of Armscor and Allen Morgan of Eskom suffered similar humiliation.)

Pik Botha was the Minister of Mineral and Energy Affairs from 1994 to 1996, when the NP left the government. In 1996 he was replaced by Penuell Maduna, with Susan Shabangu as his deputy.

At the time the IAEA in Vienna happened to be looking for a deputy director-general who would be responsible for the worldwide application of safeguards. Stumpf was approached as the most suitable candidate and several member countries, including Germany and the USA (which contributes almost one-quarter of the IAEA’s budget), supported him strongly. A candidate for such a senior position should preferably enjoy the support of his or her own government. Minister Maduna was consequently informed about the situation with the expectation that this would provide an ideal solution. Stumpf would be able to make a graceful exit from the AEC and devote his talents to a greater cause. The minister in turn would be able to appoint someone of his own choice. But after Maduna had discussed the matter with President Mbeki, his reply to Stumpf was: “No, as long as I am minister you will remain in that post.” In 1999 Maduna was moved to a different port-



Behind this partly demolished false wall J.A.M. Meyer of the firm Tradefin Engineering concealed 11 shipping containers full of components made in his Vanderbijlpark factory for the Libyan enrichment plant.
Source: Author's own photograph



A photograph of assembled process equipment (destined for Libya) in the Tradefin Engineering factory prior to dismantling and packing in shipping containers.
Source: Court case against J.A.M. Meyer and Gerhard Wissler