13. Jan Smuts and the Atomic Bomb

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The life and legacy of Jan Christiaan Smuts continue to elicit widespread academic and political interest. However, a neglected aspect of Smuts's career relates to the atomic bomb and the emergence of the atomic age. During World War II, South Africa's rich uranium resources drew the attention of Britain and other states as the Allied powers became aware of Germany's atomic programme. In 1944, British Prime Minister Winston Churchill approached Smuts to compile an inventory of South Africa's uranium as Allied powers scrambled to build the ultimate weapon. Uranium deposits in South Africa were reported in the 1920s and confirmed significant uranium resources.

Smuts's intellect, and his extensive scientific interests and vigour is clear from, for example, his own writings, and scholarship on him. Smuts was a polymath and read widely. His scientific interests were widely recorded. In addition to this, Smuts also served on scientific bodies. He was, for example, the President of the British Association for the Advancement of Sciences. Pertinent to this chapter, Smuts's own writings displayed an understanding of Physics, the Theory of Relativity and Quantum Theory (Smuts, 1926; 1932). The chapter addresses a neglected aspect of Smuts's life and political career as Prime Minister (1919-1924 and 1939-1948) and international statesman, i.e., Smuts's role in the development of the atomic bomb during World War II and the use of the bomb on Japan on 6 and 9 August 1945. Although the chapter provides a historical context of the development of atomic physics, its main focus is on the development of the atomic bomb during World War II, 1939 to 1945.

The term 'atomic', rather than nuclear, is used throughout because it was the term used at the time. The

chapter aims to illuminate Smuts's role at the onset of the atomic age; in the development of nuclear science in South Africa; and his declared position on nuclear non-proliferation. This second historical phase of Smuts and the bomb presented here covers the period from 1945 to Smuts's election defeat by the National Party (NP) under the leadership of D.F. Malan in the general election of 1948. Therefore, the chapter is not concerned with the techno-nationalism under the National Party government that led, inter alia, to South Africa's development of six and a half nuclear bombs. This period is documented elsewhere (Newby-Fraser, 1979; Von Wielligh & von Wielligh-Steyn, 2015; Albright & Stricker 2016).

The chapter proceeds with a brief discussion on the development of nuclear physics and the discovery of the nuclear chain reaction, and especially developments in Germany in this field and the outbreak of World War II. It also refers to physicists' realisation of the destructive power of the nuclear chain and its use as the ultimate weapon. The section also refers to some scientists' efforts to build the bomb, and others' calls for control of the bomb and its non-use. Hereafter, the chapter turns to Smuts and South Africa's uranium, and the Anglo-American quest to build the atomic bomb. The third part of the chapter focuses on Smuts and the global atomic order after World War II. The penultimate section of the chapter assesses Smuts's contribution to nuclear science and nuclear proliferation before presenting the chapter's findings.

The Dawn of the Atomic Age

In 1789, German chemist Martin Klaproth discovered uranium, naming it after the planet Uranus. More than a century lapsed before Wilhelm Röntgen discovered ionising radiation in 1895. Before the end of the nineteenth century, Henri Becquerel, and Marie and Pierre Curie's work, for example, resulted in the discovery of radioactivity. The beginning of the twentieth century saw Albert Einstein, Ernst Rutherford, Niels Bohr, and Frederick Soddy, amongst others, advancing nuclear science

with their theories and discoveries. Bohr received the Nobel Prize for Physics in 1922. By the 1930s, he took a keen interest in atomic physics and involved himself in the discovery of fission. In 1932, James Chadwick discovered the neutron, followed, in 1938, by German psychists Otto Hahn and Fritz Strassmann discovering nuclear fission. Their German compatriots Lise Meitner and her nephew Otto Frisch, working under Bohr, discovered the splitting of the nucleus. Building upon their predecessors, Meitner and Frisch discovered the massive energy released by this splitting; effectively proving Einstein's theoretical work published in 1905 (WNA, 2020).

In Germany, these scientific developments had particularly accelerated since Adolf Hitler came to power in 1933. The development of atomic science was one of the dedicated Nazi science projects and politically supported; albeit it in earnest from 1941 onwards (Cornwell, 2013). By this time, Germany had lost many 'non-Aryan' scientists to, for example, the United States (US) and Britain. Subsequent to Hitler's invasion of Austria and Czechoslovakia in 1938, large numbers of physicists, predominantly Jewish, had left Europe for academic positions in the US. Amongst these refugees were Leo Szilard, Edward Teller, Hans Bethe, James Franck and Eugene Wigner. These scientists knew the work of German atomic physicists who were concerned with Hitler's atomic bomb ambitions. German scientists Hahn and Strassmann, for example, discovered the self-sustaining nature of nuclear chain reactions in 1939.

In April 1939 (barely five months before World War II erupted), Werner Heisenberg was appointed to lead Germany's nuclear energy development project. In hindsight, this was a sign that was misread by, for example, US President Franklin Roosevelt and British Prime Minister Winston Churchill. However, scientists did not misread Heisenberg's appointment, heightening their concerns about Germany's nuclear ambitions. By the time World War II broke out in September 1939, nuclear physics was well advanced in Germany and elsewhere by additional research by, amongst others, Francis Perrin, Rudolf Peierls and Werner Heisenberg

(WNA, 2020). By 1939, Bohr, for example, had been working on Uranium[235] and the mineral's ability to accelerate a chain reaction.

Mindful of German advances in atomic physics, Szilard, Teller and Wigner contacted Albert Einstein to approach US President Franklin Roosevelt to warn him of these advances and the risk they posed. On 2 August 1939 (a month before the start of World War II), Einstein wrote to President Roosevelt informing him of new research on uranium that identified the potential for a large mass of uranium to trigger a nuclear chain reaction. Einstein also mentioned the possibility of the production of unprecedented destructive bombs based on this technology. Moreover, Einstein also mentioned that the US lacked sufficient uranium, but pointed to its abundance in Canada and the Belgian Congo. More disturbingly, Einstein indicated that Germany had stopped the sale of uranium from occupied Czechoslovakia and had taken over the country's uranium mines. Einstein also informed Roosevelt that the German Under Secretary of State, physicist Carl Friedrich von Weizsäcker's son was attached to the Kaiser Wilhelm Institute for Physics in Berlin where some of the US scholarship on uranium was disseminated. The senior von Weizsäcker studied with Werner Heisenberg, Friedrich Hund and Niels Bohr. Von Weizsäcker worked at the Kaiser Wilhelm Institute where he developed the theory behind a plutonium bomb. Einstein also recommended that the US should secure its supply of uranium and accelerate experimental work (Einstein, 1939). Einstein received no response from the White House and never participated in the Manhattan Project. Von Weizsäcker was present at a meeting in September 1939 where it was decided that Nazi Germany would develop a nuclear bomb under the leadership of Heisenberg. By 1941, it was reported that more than 1,000 scientists were, for example, working at one German research institute in Munich alone (Sondern, 1941).

Hitler's *Blitzkrieg* (Lighting War) in 1940, although initially successful, met resistance as the Russian winter set in. Whereas Germany was winning the conventional war at the time, it was already struggling in some of its campaigns, and

the US's joining of the war after the Japanese attack on Pearl Harbour in December 1941 meant that Germany was set to face even fiercer competition. The scientific-military industrial complex in Germany was pressured to deliver fast results to counter this. In June 1942, Heisenberg and his colleagues were already under pressure to deliver an atomic bomb. Heisenberg told an audience that included Albert Speer, the new Nazi Minister of Armaments, that: 'according to the positive results received so far, after the construction of the nuclear reactor one can follow the path proposed by von Weizsacker in order to create nuclear explosives a million times more effective than those currently known' (Grunden, Walker & Yamazaki, 2005:114).

Coincidently, when Heisenberg made the statement (June 1942), the US president was informed of the status of the US atomic weapons programme, namely that it was possible to build an atomic bomb that could be decisive in combat. The president was given the undertaking that such a bomb could be ready to determine the outcome of World War II. Roosevelt approved the report containing the information. Following this, Lesley Groves was appointed as the Director of what became known as the Manhattan Project to develop the atomic bomb (Groves, 1962). Technical challenges and the financial cost were only two of the factors that delayed the development of the atomic bomb, but, in mid-1944, Groves was adamant that the bomb would be ready by 1 August 1945. On 16 July 1945, the US tested its first atomic bomb (Gosling, 1999:40, 48).

Hitler invaded Poland in 1939, and Denmark in 1940, where Bohr was working in parallel with his involvement in British academia. Once the American presence was felt in the theatre of war, the search for a German 'wonder weapon' became politically more urgent but, as Hitler started to lose the war, funding increasingly became scarce. By 1943, the British government, fully aware of Bohr's scientific advances, was keen to evacuate Bohr from Denmark; especially after Moscow became aware of Bohr's work, as well as Anglo-American ambitions to build an atomic bomb. Not only

did academic freedom suffer under German occupation, but Britain and its Allies were concerned about reports of Germany's nuclear weapons programme. The Soviet Union was also keen to have Bohr on their side and invited the scientist and his family to Moscow 'where everything would be done to give you shelter' (Pais, 1991:499). However, in September 1943, Bohr and his son Aage, also a physicist, fled to Sweden and, with the assistance of British intelligence, was flown to Britain on 6 October 1943. Upon his arrival, Bohr's British colleagues informed him of Anglo-American atomic energy developments. By this time the Quebec Agreement had been signed and British scientists had already been posted to Los Alamos, Berkeley and New York to collaborate on atomic research. General Leslie Groves approved a British request for Bohr and his son to visit the American facilities. In the US, Bohr spent time at Los Alamos and in Washington. During this period, he made further technical contributions to the development of the atomic bomb (Cockcroft, 1963:37-46).

By February 1944, Bohr's concerns over the implications of atomic bombs for the future of humanity increasingly surfaced. Bohr was also concerned about the future control of these weapons. He was also of the opinion that, after the surrender of Germany, the mere possession, rather than the use of, the atomic bomb by the US and Britain would force Germany to submit to the demands of the Allies and secure humanity's future. Bohr argued that humanity's common purpose to prevent the use of atomic bombs could, in fact, be the basis for peaceful cooperation with the Soviet Union. Through an intermediary, Bohr was also able to correspond to Roosevelt on the future political implications of the bomb which was referred to as 'x' in their correspondence. Roosevelt undertook to discuss future safeguards with his British counterpart, Churchill (Cockcroft, 1963:38-46).

In April and May 1944, Bohr engaged with influential Britons, such as Sir John Anderson (Churchill's minister for the bomb), and Lord Cherwell (wartime adviser to Churchill), to discuss the future safeguarding and international control of the bomb with the British Prime Minister. Cherwell eventually

arranged for him and Bohr to meet with Churchill, but Bohr regarded the meeting as a failure.

Hereafter, Anderson and Cherwell contacted Smuts, a member of Churchill's inner circle. A meeting between Smuts and Bohr followed during which the scientist briefed the statesman on the imminent production of the atomic bomb. Like Bohr, Smuts had strong views on the dangers of releasing the atomic genie out of the bottle and was also in favour of international control of nuclear weapons and energy. In a subsequent meeting with Churchill, Smuts was able to impress on the Prime Minister the need to discuss the matters raised by Bohr (i.e., international control and safeguards etc.) with Roosevelt.

A few months later, on 26 August 1944, Bohr was able to meet privately with President Roosevelt. Bohr's position was that the Soviet Union should be informed of the atomic bomb built by the US before it was used, but that no technical details should be shared with them. For Bohr this was essential to build trust between the US, Britain and the Soviet Union, and foster collaboration on scientific and industrial nuclear issues to prevent a nuclear arms race. However, when Roosevelt and Churchill met a month later, it was decided to keep the atomic bomb top secret and not share details with Stalin (Cockcroft, 1963:38-46).

By July 1945, Hitler had committed suicide and Germany surrendered while her ally, Japan, was extending the war in the Pacific. Allied powers convened a meeting in Potsdam in Germany to, inter alia, discuss the fate of Japan. President Harry Truman succeeded Roosevelt after his passing on 12 April 1945. Truman therefore attended the Allies' Potsdam Conference on 26 July 1945 and, despite Britain's opposition to informing Stalin, he was told of the US superbomb. Stalin's casual response to Truman was not unexpected as he had been informed of the atomic weapons programme as early as 1942 as a result of the espionage of Klaus Fuchs (Gosling, 1999:50). Fuchs, a German-born scientist, who became a British citizen in 1942, worked on Britain's equivalent of the

Manhattan Project, the Tube Alloys programme, was sent to represent Britain at the Manhattan Project (MI5, 2024). After the war, Fuchs (1950) admitted his role in passing information of Anglo-American scientific development to Moscow. In conclusion, Smuts's atomic diplomacy included his role in the British war effort by supporting Churchill and Britain publicly, while at the same time advancing his personal interests and those of South Africa (Baker, 2011).

South African Uranium, and the Anglo-American Quest for the Atomic Bomb

During World War II, the US, Canada and Britain signed the Quebec Agreement in August 1943 to collaborate on nuclear research. Under the leadership of US president Franklin Roosevelt, and the Prime Ministers of Canada (MacKenzie King) and Britain (Winston Churchill), the US, Canada and Britain established the Combined Policy Development Committee in terms of the Quebec Agreement. The purpose of the Committee was to exchange information and resources on the development of the atomic bomb. Another outcome of the Quebec Agreement and the Committee was the establishment of the Combined Development Trust, charged with the procurement of uranium and to finance uranium extraction. Canada was excluded from the trust as it had shown no interest in developing the atomic bomb. Following the establishment of the Combined Development Trust, officials of these countries studied North America, India, Portugal and the Belgian Congo for uranium. However, by this time, Groves had already commenced on a clandestine programme, code-named Murray Hill, to identify and procure uranium from international sources for the American atomic programme (Herken, 1980:54). Ultimately, the Manhattan Project's bombs were fuelled with uranium from the Belgian Congo. However, the latter's uranium resources proved to be insufficient, and the search was extended to South Africa (Fig, 1999a:76-78).

The existence of the Combined Development Trust was kept secret for five years and not even Smuts was

informed of its existence. Meanwhile, Britain was under pressure to contribute uranium in terms of the Combined Development Trust. By now, the US and Britain were wary of Stalin's intention of embarking on the development of an atomic capability adding to these countries' intense efforts to develop the atomic bombs before the Soviet Union. Britain had to rely on members of the Commonwealth to assist in the procurement of uranium. As Fuchs (1950) has admitted, by then he had already started to spy for Moscow.

As the Anglo-American search for uranium intensified, Churchill approached Smuts in 1944 to investigate earlier reports of uranium deposits in South Africa and its League of Nations Class C Mandate, South West Africa (now Namibia). It was known that, in 1888, Sir William Crooks attributed to uranium the green fluorescence of small diamonds recovered amongst Witwatersrand (the wider Johannesburg region) gold ore. More exploration occurred and by 1923 metallurgist R.A. Cooper identified uranite in a heavy mineral concentrate at City Deep Gold Mine on the Witwatersrand (AEC, 1988:i). However, to convince Smuts, Churchill needed to provide Smuts with the rationale for his request. It was only then, despite their close relationship, that Churchill informed Smuts of Anglo-American collaboration on the development of an atomic bomb. Following Churchill's request to Smuts and further exploration, large uranium deposits were discovered on the Witwatersrand gold-bearing reef around Johannesburg. The discovery of these large South African uranium deposits added to the US and Britain's security of supply. However, it was not only Britain that sought uranium in South Africa. Possibly due to Groves' Murray Hill project, two individuals attached to the Manhattan Project, W. Bourret and F. West, visited South Africa in 1944 to determine the uranium potential of the Witwatersrand gold reefs (AEC, 1988:i). It remains unclear why Smuts was not informed of the programme *ab initio*; a matter that requires further research. One possible explanation was the secret nature of these decisions and the institutions that were established in terms thereof.

Smuts took a personal interest in uranium exploration in South Africa. One reason was that South African uranium is found in gold-bearing rock; thus, mining for the one also produced the other. Smuts also realised the economic potential and political leverage value of South Africa's uranium (Fig, 1999b:59).

At Home and Abroad: Smuts and the Atomic Order after World War II

After World War II and the establishment of the United Nations, South Africa was increasingly attacked for its racial policies by the Soviet and Afro-Asian blocs that formed at the UN. Smuts was aware of the significance of South Africa's ties with the US and Britain as a counterbalance to these blocs. Smuts was also mindful of the economic advantage to South Africa should the US and Britain remain dependent on uranium from South Africa. As these developments transpired, Smuts, inspired by the US Atomic Energy Commission and the British Atomic Energy Authority, established the South African Uranium Research Committee in 1945 to control atomic research and development in South Africa, and to control the production and trade of radioactive substances on behalf of the state as their owner (Fig, 1999a:76-78). The Uranium Research Commission was independent of the Council for Scientific and Industrial Research (CSIR) but effectively was answerable to Smuts himself.

As Smuts was often in Britain during World War II, he at times met up with South African scientist Basil Schonland, Director of Britain's Atomic Energy Research Establishment at Hartwell and, during the war, head of Britain's Army Operational Research Group (i.e., effectively in charge of all scientific work in the War Office) and Field Marshall Bernard Law Montgomery's scientific adviser at the 21st Army Group Main Headquarters during the invasion of Europe. Smuts had known Schonland's family and was impressed with the young scientist and, as Smuts was already thinking beyond the end of the war, he extended a personal invitation to Schonland

to return to South Africa to establish and lead the country's scientific and industrial research organisation. Schonland accepted Smuts's offer and left the 21st Army Group in August 1944 and returned to South Africa to establish the country's Council for Scientific and Industrial Research (CSIR) in 1945 (Austin, 2016:262). Schonland's vision of the development of nuclear physics in South Africa was an extension of his earlier associations with the Cavendish Laboratory at Cambridge and his subsequent wartime networks. Schonland was also a friend of Edward Appleton, the recipient of the Nobel Prize in Physics, and John Cockcroft of the British nuclear establishment. Cockcroft was, through his association with the Chalk River Laboratories in Canada, involved in the Manhattan Project and aware of South Africa's uranium deposits (Beinart & Dubow, 2021:264).

By February 1946, Smuts had appointed scientists and officials to the Committee. Links were established with institutions in the US and Britain. In fact, Smuts went on a personal mission to meet General Groves, who led the Manhattan Project. Besides this, Smuts eventually negotiated a secret agreement with the US and Britain to be the recipients of almost all South Africa's uranium exports; a major boost for South Africa's post-war economic reconstruction and development (Fig, 1999b:59).

Churchill, who lost the British general election on 5 July 1945 just months after Victory in Europe Day (VE Day) on 8 May 1945, was succeeded by the Labour Party's Clement Attlee. After the war, Attlee continued with efforts to secure Britain's uranium supplies. Given its abundant uranium resources, South Africa was a natural choice to secure supply. However, Smuts was initially opposed to Britain's suggestions in this regard. Britain appealed to Smuts's strong Commonwealth sentiments. Smuts was persuaded to prevent Britain, and by extension the Commonwealth, from being left behind in the atomic race. Attlee was also confident that South Africa would easily provide uranium to Britain. However, after a meeting between the US president and the Prime Ministers of Britain and Canada that decided that Britain would supply

these countries with uranium from South Africa, Britain was surprised by Smuts's reluctance in December 1945 to sell South African uranium to Britain exclusively (Asuelime, 2013:34-35). Britain now faced insecure uranium supplies which it had hoped it could use as a bargaining chip to continue nuclear collaboration with the US. Smuts was aware of the economic and industrial benefits of uranium. Smuts, therefore, refused to agree to the British offer, but Britain dispatched its High Commission in the Union of South Africa, Sir Evelyn Baring, to consult with Smuts and reiterate Britain's commitment to the Union and the strategic benefits for the Commonwealth should South Africa agree to the British offer. Baring relayed a message from his Prime Minister to Smuts, namely that Britain had established solid relations with the US to advance its own nuclear programme that would also be beneficial to the Commonwealth. It was only when Smuts attended a Commonwealth meeting in Britain in May 1946 that he informed Lord Portal, the senior official responsible for atomic energy in the British Ministry of Supply, that South Africa would sell its uranium to Britain. Smuts did not agree to a specific volume to provide to Britain. More importantly, Smuts was not fully informed of the Commonwealth's position in the Combined Development Trust and its obligations to the US. However, Smuts was not opposed to providing uranium to the US as he saw it as an opportunity to garner for American investment in South Africa, but at the 1946 Commonwealth meeting, members were informed that their direct links to the US should not prejudice Anglo-US relations and collaboration in the nuclear field.

When Britain decided to proceed with the construction of atomic weapons, it expected generous American scientific sharing and collaboration. However, for Britain this did not materialise, which led Britain to turn to the Commonwealth. British officials proposed plans to develop African atomic capabilities as a Commonwealth joint venture and that South Africa should foot the bill. Eventually, the technical difficulties and the danger of spreading nuclear technology elsewhere

were also considered and made some contribution to stopping the African nuclear project.

In the meantime, American patience with Britain on the delay of South African uranium supplies wore thin. Smuts was part of the delay as he first wanted to consult with the gold industry in South Africa and only accepted a British offer to sell uranium in May 1947. At this time, Britain's war time financial woes continued and the country was unable to meet its financial obligations promised to Smuts. Britain attempted to rescue itself by considering offering a lower price, but Smuts was also aware that British investment in the South African mining industry had slumped. He agreed to discuss the matter during his attendance of the wedding of Princess Elizabeth.

In his meeting with Attlee, Smuts was more agreeable to the British offer and to supplying uranium to the US. Smuts also offered to provide the financial capital for the extraction and supply of uranium. Despite the efforts to please the US, as indicated earlier, Britain's expectations of comprehensive nuclear collaboration with the US did not fully materialise. For the US, a secure supply of uranium became more pressing as its nuclear, military and industrial complex grew. Following Bourret's and West's visit to South Africa in 1944, Dr G. Bain, a consultant to the Manhattan Project, and C.F. Davidson, a geologist attached to the British Atomic Energy Board, visited South Africa. Bain and Davidson continued investigations of the Reef that proved to be more uriniferous than previous sampling. The US and Britain intended to use the Combined Development Trust to finance four uranium extraction plants on four Witwatersrand gold mines; an initiative that eventually expanded to 17 plants serving 27 gold mines on the Witwatersrand (AEC, 1988:i).

At this time, Smuts dispatched Schonland, director of the CSIR, and Leonard Taverner, director of the Government Metallurgical Laboratory, to the US and Britain to discuss uranium contracts with potential investors. Smuts was also preparing for an election against the National Party and was clear that he would only develop a uranium policy for South

Africa later in 1948. This never materialised because Smuts lost the election; further complicating the uranium issue (Asuelime, 2013:6-41).

By the time Smuts left office in 1948, South Africa was the only Commonwealth country that could sustainably supply uranium. Britain remained concerned that it could not supply uranium to the US. It was also clear that Smuts was taking South African uranium development into a direction more favourable to itself rather than to Britain (Asuelime, 2013:36-41). The National Party under D.F. Malan, ironically, took the development of uranium and nuclear energy further than Smuts intended. With the promulgation of the Atomic Energy Act (Act 35 of 1948) Smuts's Uranium Research Committee was transformed into the Atomic Energy Board on 1 January 1949 (Fig, 1999a:76-78).

'Smuts's contribution to nuclear science and nuclear non-proliferation

Smuts is widely acknowledged for his contribution in the establishment of a stable international order after the two world wars. Besides his involvement instituting the League of Nations in 1919 (Smuts, 1918), he was also actively involved in the establishment of the United Nations in 1945. His preference for, and advocacy of multilateralism, made him an outstanding international statesman. His understanding of science, particularly physics, made him all too aware of the dangers of nuclear weapons and a proponent of nuclear non-proliferation. In fact, he confided to Churchill: '...it [the nuclear bomb] will no longer remain a secret, and its disclosure after the war may start the most destructive competition in the world.... If ever there was a matter for international control, this is one' (Masiza, 1993:35). Smuts also laid a strong scientific and industrial foundation for South Africa. His achievements include, for example, the establishment of the Electricity Supply Commission (Escom) in 1923 and the CSIR in February 1945. Besides the establishment of national institutions, Smuts's own identity as a scientist played an

enormous role. His wide scientific interests were further stimulated as he moved on the global stage and developed, for example, his ideas on holism. Smuts also engaged with scientists to promote South African interests and patriotism. His interest in South African scientific research raised awareness of South African scholarship abroad. Moreover, his interest in South Africa's natural world and the stimulation of South African science could be regarded as the establishment of South African science and scientific South Africanism (Beinart & Dubow, 2021:203, 206). Besides his scientific publications, Smuts often spoke on science and addressed scientific audiences and conferences (Smuts, 1925; 1926; 1932). He also led several South African and international scientific organisations such as the South African Association for the Advancement of Science (S2A3) (as president in 1925) and invited numerous scientists to South Africa (Beinart & Dubow, 2021:237). Smuts was thus actively involved in and supportive of scientific knowledge production in South Africa.

Besides the establishment of Escom and the CSIR, Smuts was also a keen promoter of scientists to lead national institutions. Besides the appointment of Schonland, the case of Hendrik van der Bijl is illustrative. Van der Bijl completed a doctorate in physics in Leipzig in 1912 and moved to New York in 1913 to take up employment at the American Telephone Company (later Bell Telephone Laboratories). Van der Bijl kept a keen eye on American industrial development and, cognisant of its lessons for South Africa, produced a paper, *Scientific research and industrial research* in 1919. This and van der Bijl's (1920) groundbreaking work on thermionic valves to amplify radio and telephone signals and his book, *The Thermionic Tube and Its Applications*, did not pass Smuts unnoticed. In 1920, after World War I, Smuts appointed van der Bijl as his Scientific and Industrial Advisor on Industrial Development in the Department of Mines. Van der Bijl's first major success back in South Africa was the establishment of the state-owned power utility, Escom (later Eskom) in 1923. Hereafter two other public entities followed, the South African Iron and Steel Corporation (Iscor) (1925) and the Industrial Development

Corporation (IDC) (1940). At the outbreak of World War II, Smuts appointed van der Bijl as his Director-General of War Supplies (effectively Minister of Supply) to purchase or develop armaments for South Africa's war effort (Schonland, 1950:27-34).

Conclusion

Jan Smuts had left an indelible mark on South Africa and the international arena. For this he received many accolades. He remains a historical figure with immense contemporary relevance. The chapter addressed a neglected aspect in Smutsian studies, i.e., Smuts's involvement, role and views on the development, use and control of the atomic bomb. Smuts, the scientist, fully understood physics and the potential of nuclear energy development. During his two terms as Prime Minister, Smuts invested in the development of science and industrial research through the establishment of institutions such as the CSIR and Escom. As a confidant, colleague and friend of Churchill, Smuts was instrumental in Britain's war campaigns. Although Smuts was deeply committed to the Commonwealth and the Union's status and role in it, he was cautious to seal a uranium export agreement with Britain. Smuts maintained that Britain's offer was not serving South Africa's national interests, and that South Africa should gain more economic, scientific and industrial advantage from the country's uranium resources. Britain's uranium offer to South Africa was a cause of concern for Britain's commitment to the US and the Quebec Agreement. However, and despite his close relations with Churchill and his inner circle, the development of the atomic bomb was top secret, and Smuts was only informed of its development in 1944. This could be regarded as a snub to Smuts who would have supported the development of nuclear science on a global scale, as he did in South Africa. Smuts's role in the Allies' war against Nazi Germany was significant.

On a personal level, Smuts maintained private correspondence with nuclear physicists such as Einstein and

Bohr. Smuts's close relations with Bohr was also instrumental in the statesman's views on the bomb. Whereas Bohr was concerned about the devastation the use of a nuclear bomb could cause, he was in favour of telling the Soviet Union, as a member of the Allied alliance, of the development and existence of the bomb. Bohr was nevertheless adamant that Stalin should not be provided with the technical details of the programme. Smuts diverged from his friend and, like Churchill, maintained that, under no circumstances, should the Soviet Union be informed of the bomb. However, as indicated, Stalin became aware of the programme in 1943, and Germany was, at the time, also making significant progress in their atomic bomb programme. Smuts was, like Einstein and Bohr, for example, a proponent of the international control of the atomic bomb to prevent nuclear proliferation. There is no record of Smuts's opposition to the development of the atomic bomb but, in his writings, for example, he made it clear that scientific development should be to the advantage of humanity; a position - the peaceful use of nuclear energy - that later emerged as one of the three pillars of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) which entered into force in March 1970.

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