Introduction: The Scientific Imagination in South Africa

South Africa offers an inviting vantage point from which to write on the scientific imagination. It was a regional rather than a world power, and in global terms it was not a major centre for invention or the generation of new scientific ideas. Yet the country possesses distinctive features that make it worthy of attention for a wide audience. Its geographic position on the African continent made it a staging post for Portuguese, Dutch and British colonialism; from the mid-seventeenth century, the Cape and subsequently all of South Africa became part of an expanded global imaginary. Colonisation by Britain brought the region into tight connection with one of the most powerful, and technologically advanced, world empires in the nineteenth and early twentieth centuries.¹

From the sixteenth century onwards, marvels and curiosities reported by European travellers and explorers fed the European imagination. By the mid-eighteenth century, and following the publication of Linnaeus’s ordered system of classification, South Africa was becoming an important site for botanical and zoological exploration by visitors with a scientific bent.² The Cape’s natural endowments, notably its thousands of plant species, as well as the region’s diverse fauna, attracted sustained attention. The quest for scientific order also prompted speculation about the country’s repository of ancient fossil and hominin remains. By the early twentieth century there was

accumulating evidence that the country may have constituted the ‘cradle’ of modern human evolution. South Africa was at key moments a significant incubator and testing ground of innovation, which had profound social and economic effects on the country. In the nineteenth century, improved agricultural technology underpinned exports of wool and ostrich feathers. Devastating new rifles developed for European warfare helped to change the balance of power in favour of colonial regimes. The mineral revolution of the late nineteenth century created the impetus for the final conquest of African societies and launched a phase of rapid industrialisation. This necessitated developments in applied geology and the chemistry of gold extraction. Mining delineated scientific practice in related fields from electrification and explosives to medicine and this shaped and thickened the web of science in South Africa. Some older strands, such as botany and geology, thrived and economic growth as a whole in the first half of the twentieth century generated momentum in fields such as veterinary medicine and oil from coal technology. Key advances were often a response to urgent economic and technological requirements, but the scientific imagination was also more exploratory with respect to curiosity-driven fields such as astronomy, palaeontology, and wildlife conservation.

As a crucible of racial politics in the twentieth century, South Africa has long been seen as a social laboratory for the study of ‘race relations’. Its complex peopling and diversity gave birth to two powerful nationalisms – Afrikaner and African – which have both impacted profoundly on its scientific as well as political trajectory. White South Africans were also carriers of a darker intellectual tradition – the attempts to justify racial segregation in scientific terms. In the relatively brief era of African nationalist rule after 1994, the state has espoused more universalist and developmental goals and the segregationist drive to account for differences in kinds of humans has yielded to an emphasis on common humankind.

This book does not examine, systematically, the growth of particular disciplines in South Africa. It is largely a history of individuals, associations, and institutions that were at the fulcrum of important scientific developments. We have used the ‘scientific imagination’ as a title

because we wish to capture linked thematic strands. We aim to illustrate the scientific imagination as an expression of human curiosity, ingenuity, and the ability to make unlikely connections. In this sense, scientists were exploring the frontiers of knowledge in relation to core areas of scientific and technological innovation.

The idea of a scientific imagination was long discussed amongst European scientists. In the seventeenth and eighteenth century, they explicitly debated whether their activities were primarily the pursuit of imagination, considering this in relation to scientific hypotheses and understanding how to observe. The term has also been used to describe innovation by individual scientists in the twentieth century. We have not found much evidence of such discussions in South Africa and therefore explore scientific imaginations in a slightly different sense. Many of the scientific traditions in which we are interested involved thinking about how science could shape society. Science was therefore imbricated in the exercise of power: bound up in the imaginary of an expanding British Empire, later of an ambitious Afrikaner state and, in the present, the hopes of post-apartheid democracy. We are concerned with scientific innovations and interventions that had broader socio-economic and political impact – or the potential to do so. As a result, our discussion has a strong focus on the politics of science.

The rise of segregation and apartheid established an extreme system of racial division that for many years excluded the bulk of the population from scientific training and opportunity. Nevertheless, black people were always carriers of knowledge: indigenous (or local, vernacular) knowledge informed their medical, veterinary, botanical, environmental, and linguistic practices, and their cultural traditions too. Especially in the period before the twentieth century, these knowledge systems were absorbed and appropriated in published texts by amateur and professional scientists, often with inadequate attribution. We discuss the interactions between indigenous and scientific knowledge especially in Chapter 1 and 7.

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All knowledge organises or systematises information and observation, and in this sense has been ‘cooked’ or processed. There are no hard and fast boundaries between science and indigenous or local knowledge. Especially in the eighteenth century, when scientific training and discrete disciplines were in their infancy, texts by scientific travellers interspersed authorial observation with hearsay and vernacular ideas (Chapter 1). Patrick Harries has illustrated in detail the botanical and entomological work of Swiss missionary Henri Junod in Mozambique and the Transvaal in the late nineteenth and early twentieth centuries. Junod became an authority on butterflies, many of which were collected by skilled African assistants such as diviner Elias Libombo (Chapter 4). Interview-based research still draws on local knowledge. Following the political transition in the 1990s, there has been renewed scientific and political interest in what was specifically called indigenous knowledge (Chapter 7).

Although we mention examples of fertile interconnection, our concern is not to find the origins of science in indigenous knowledge. We focus largely on formal, disciplinary-based and scientific work. By this we mean published or written ideas by those with specialist training who were familiar with disciplinary developments and international thought. We cannot aim at encyclopaedic coverage. Our choice of examples is shaped by our own previous research as well as a subjective sense of important and interesting developments bearing on society. Scientific knowledge and its application has been central to South Africa’s development; understanding its history is one essential element in explaining the country’s complex and uneven path to modernity. This claim is not clearly evident in the broader historiography, where discussions have tended to focus on relations of conflict between coloniser and colonised, capital and labour. We argue that it is impossible to fully understand patterns of change or to imagine contemporary society, without consideration of the impact of science and technology.

Scientists, especially those who were educated elsewhere, often saw their work through eyes trained in a global, comparative frame.

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Although there were notable contributors to pure and abstract sciences, a higher proportion of original work in South Africa emerged out of field sciences, that is from observation born of the desire to comprehend the country’s natural phenomena. We evaluate the contributions made by relatively well-known individuals and illuminate some of those whose work has been overlooked. This includes self-trained specialists whose knowledge and enthusiasm fed into fields such as botany. We are also alert to the scientific associations in which they participated. Such institutions were key building blocks of colonial identity and deserve to be seen as additional constitutive elements in national and ethnic imaginaries.

At another level, the scientific imagination refers to what Sheila Jasanoff calls ‘socio-technical imaginaries’. These move beyond the ideas or visions of brilliant individuals to encompass broader collective views capable of ‘uniting members of a social community in shared perceptions of futures that should or should not be realized’. We concur with Jasanoff that the role of science and technology in national imagining has been underestimated by comparison, say, with cultural and linguistic production, whose importance to ‘imagined communities’ has received sustained attention. In this book we focus on the impact of science in conceptions of national and ethnic identities. This had important implications for shaping the boundaries of political and social belonging and, reciprocally, in determining and legitimating grounds for exclusion or marginalisation.

While there is little evidence of scientists in South Africa imagining social utopias or dystopias, they were certainly active in conceiving how society could be shaped or improved. The relatively close proximity of scientists to politicians often gave individual scientists special leverage. In a country as divided as South Africa, this implied controversial interventions in the social domain geared to the defence or modification of racial privilege. But there were also important periods

when the medical sciences, for example, were a repository for imagining radically alternative futures.  

Immediately before Afrikaner nationalists came to power in 1948, a broadly integrative, developmentalist conception of liberal progress (with African nationalist and socialist variants) was elaborated. Elements of this developmentalism were repurposed in techno-nationalist ways to feed apartheid conceptions of white supremacy and autarchic self-reliance. In the post-apartheid era, non-racial visions combined the discourse of universal human rights with hopes that participation in global science might bring broader social benefits as well as international standing. Such claims were counterposed by appeals to indigenous knowledge and a suspicion of Western science as an agent in maintaining, rather than eroding, existing racial hierarchies.

Who were the scientists? Until the mid-twentieth century, they were mostly European men born or trained outside of the country. Although they came from many different backgrounds and countries, including France, Germany, the Netherlands, Switzerland, and the United States, British-born scientists predominated. Many became key figures in government departments, institutions, and universities. These patterns of migration are, in themselves, clues to the globality and connectedness of South African science. As professional and scientific education gradually expanded in South African universities from the interwar years, English- and Afrikaans-speaking white South African-born scientists filled rapidly expanding opportunities in the state and universities. In the apartheid era (1948–1994) Afrikaners were favoured in state employment and benefitted from the mushrooming of new universities.

White women had few opportunities to train or to work as scientists in the nineteenth century, although a few, such as Mary Barber, managed to educate themselves and contribute as non-employed specialists to scientific endeavour. In the first half of the twentieth century, a limited number were able to forge scientific careers, especially in the field of botany. Opportunities for black scientists were


highly constrained. Jotello Soga trained as a vet in Scotland and was able to find government employment in the late nineteenth-century Cape (Chapter 3). Institutions such as Lovedale and Fort Hare provided science courses for a small number of black students, and some were recruited to teach in African schools or gained medical qualifications in the United States and Britain. But the rise of segregation excluded the bulk of the population from any opportunity to develop as professional or research scientists until posts were introduced in segregated universities during the apartheid era.

To mark the centenary of South Africa’s elite Royal Society of scientists, A. C. Brown edited a collection, written by fellow scientists, entitled *A History of Scientific Endeavour in South Africa* (1977). The twenty-one disciplinary-specific chapters aimed to be comprehensive and stretched to about 300,000 words. Even so, Brown felt that they could not achieve ‘complete coverage’ and noted that his collection of essays amounted to ‘a history’ and not ‘the history’ of science. At less than half the length, and covering another four decades, our volume must necessarily be selective. Our approach is to think across disciplines over the long term and to highlight important themes. The chapters follow a chronological sequence, consonant with major political eras, whose periodisation will be recognisable to historians of the country.

**Eighteenth- and Nineteenth-Century Southern Africa in Global Science: A Summary**

When the Dutch plunged into the Indian Ocean at the beginning of the seventeenth century, they brought with them both a new form of capitalism and fresh ways of looking at nature. Their sprawling seaborn empire turned Amsterdam and Leiden into centres for the collection of global knowledge. Colonised regions were systematically

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scoured for valuable natural resources and curiosities. Jan van Riebeeck, Simon van der Stel, and Rijk Tulbagh, among other Cape governors, were keen amateur naturalists. While African food species found at the Cape made only a limited global impact, decorative plants and flowers were disproportionately important. In ways similar to world exhibitions and imperial or national museums, botanical gardens and herbaria presented the world, in all its exotic novelty, to their metropolitan visitors. Such institutions served as portals to, and gatekeepers of, knowledge. The late eighteenth and early nineteenth centuries produced a rich literature on South Africa, as scientific interest drew it into the orbit of educated Europeans. They and their published accounts have become the focus of intense recent academic interest.

We begin by exploring the curiosity and legacy of these scientific sojourners, linking the ideas they generated both to local knowledge and to European Enlightenment understandings (Chapter 1). Some of the writers became scientists of consequence. Luminaries who visited and wrote about the Cape included Carl Peter Thunberg, who became the leading botanist at Uppsala; Hinrich Lichtenstein, later professor of zoology in Berlin; John Barrow, a key scientific figure in the British Admiralty and the Royal Society; and William Harvey, who, after being appointed to Trinity College Dublin, compiled the most thorough list of Cape plants. These travellers often reported local knowledge and collectively created a literary tradition about the Cape that helped to define the region’s character and interest to scientists.

The final transfer of the Cape from Dutch to British control in 1806, during the Napoleonic Wars, gave the region new geopolitical prominence as the British imperial meridian shifted eastwards, thus linking the Indian and Atlantic oceans. For the next seventy years all shipping between Europe and Asia passed, and usually stopped at, southern African ports. In the case of the post-abolition slave trade, East

African ports became connected to Brazil via the growing hub of Cape Town.\textsuperscript{18}

The Cape sea-route became strategically ever more important just as the new colonial authorities sought to consolidate their control of the southern African hinterland. British colonisers legitimated their presence at the Cape, and in Natal, by insisting on their commitment to civilisation, progress, and commercial development. Writer J. M. Coetzee has argued that from the beginnings of European settlement, terms like ‘indolence, sloth, laziness, torpor’ suffuse descriptive accounts of indigenous Khoesan peoples; the British were also highly critical of the ‘idleness of the Boers.’\textsuperscript{19} They were keen to demonstrate that they were better colonists than their European competitors, measured by their industriousness, capacity for governance, and moral virtue. Scientific accomplishment and receptiveness formed part of this suite of civilisational skills.

Charles Somerset, autocratic governor from 1814 to 1826, oversaw a damaging war with the Xhosa (1818–19) coupled with the British settlement programme in 1820; he also came into intense conflict with British immigrants who tried to launch a free press along with robustly independent literary and scientific associations. Less frequently noted is his role in the foundation of a library and reforming medical institutions (Chapter 2), especially with the appointment of James Barry, a military physician whose life has recently attracted intense interest.\textsuperscript{20} Simultaneously, the Zulu kingdom was consolidating its strength, establishing links with British traders at Port Natal, and expanding its military organisation and weapons production. Other kingdoms were also changing rapidly as they absorbed new military technologies such as horses and firearms.

In the 1820s, the Cape was selected by the British Admiralty as the site of a new Royal Observatory. This was intended not only to expand knowledge of positional astronomy in the underexplored southern hemisphere, but also to help with practical matters such as navigation.


mapping, and measurement. The handsome building housing the observatory was designed to be seen and admired, serving as a visible symbol of British imperial power and rational order. The independent arrival at the Cape in 1834 of gilded British scientist John Herschel gave southern astronomy added prominence. During his brief stay at the Cape, Herschel participated energetically in establishing scientific networks and associations with secure footholds in local colonial society.

In the first half of the nineteenth century these networks supported the establishment of a natural history museum (1825), the revival of the government’s botanical garden, as well as new publications and zoological expeditions into the interior – notably by Andrew Smith. As British rule expanded eastwards, fledgling institutions were created, such as botanical gardens at Durban and the Albany Museum in Grahamstown. Dr William Atherstone, a physician and polymath based at Grahamstown, became the centre of a committed group of interdisciplinary scientists writing on everything from geology and botany to medicine and ostrich breeding. Some had a strong interest in African medical remedies. Amongst them, Andrew Geddes Bain turned to geology in order to understand the curious stratigraphies he encountered as a road-builder in the 1830s. Bain discovered exciting fossils in the Karoo which caught the attention of T. H. Huxley and Richard Owen in London as well as the Royal Geographical Society. Ancient geological formations prompted new thinking about the age of the earth and the peopling of the country. Flints and middens found in the environs of Cape Town, whose meaning and significance proved puzzling, helped to catalyse archaeology as a new field of interest and source of wonder.

In the second half of the nineteenth century, the Cape became a place of brokerage for ideas as well as commodities such as wool and wine, diamonds and ostrich feathers. No longer only looking outwards to Europe, it also became a permanent base for scientific institutions, expeditions, and collecting. The German comparative philologist Wilhelm Bleek, who arrived to catalogue governor Sir George Grey’s private library in 1856, revealed the complexity of indigenous languages and grammar and this prompted deeper interest in Bushman mythology and rock art. Coming at a time when Darwinian ideas were

21 Dubow, A Commonwealth of Knowledge.